



Teck Coal Environmental Office
Bag Service 2000, 421 Pine Avenue
Sparwood, B.C. Canada V0B 2G0

+1 250 425 3331 Tel
www.teck.com

Technical Report Overview

Report: 2018 Chronic Toxicity Program - Elk Valley Testing to Satisfy Permit Requirements

Overview: This report presents the results of quarterly and semi-annual chronic toxicity tests undertaken in 2018 for Teck's steelmaking coal mining operations in the Elk Valley. This report interprets results by evaluating correspondence between water chemistry and toxicological responses and identifies recommendations for revision or augmentation of planned future programs.

This report was prepared for Teck by Golder Associates Ltd. and relies on testing completed by Nautilus Environmental.

For More Information

If you have questions regarding this report, please:

- Phone toll-free to 1.855.806.6854
- Email feedbackteckcoal@teck.com

Future studies will be made available at teck.com/elkvalley



REPORT

**2018 Chronic Toxicity Program
Elk Valley Testing to Satisfy Permit Requirements**
Interpretive Report

Prepared for:

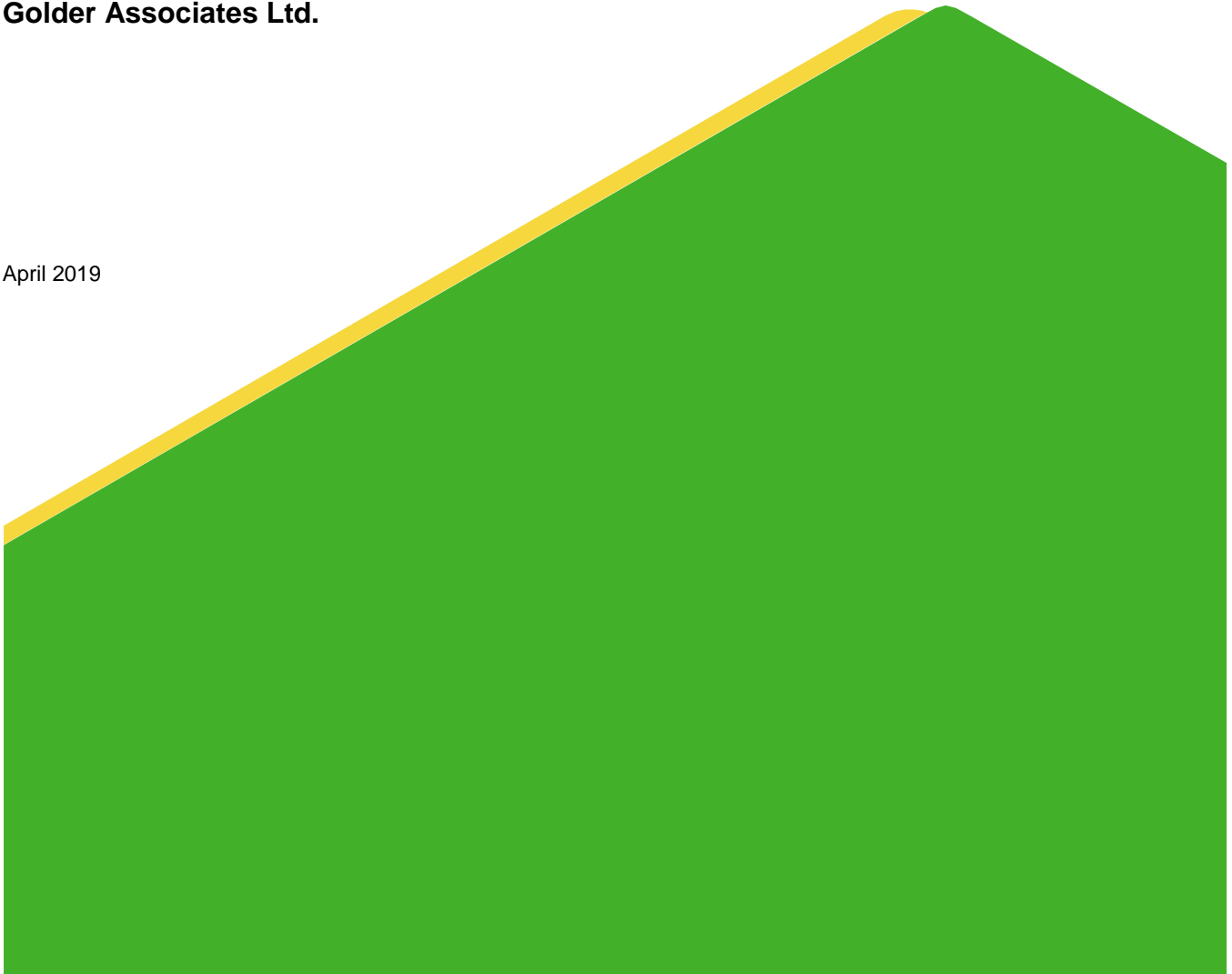
Teck Coal Limited

Cait Good, Lead Regional Water Monitoring
Sparwood Environmental Office
124B Aspen Drive
Sparwood, BC V0B 2G0

Prepared by:

Golder Associates Ltd.

April 2019



Abbreviations

%	percent
~	approximately
<	less than
>	greater than
≥	greater than or equal to
=	equals
±	plus or minus
°C	degrees Celsius
∑TU	sum of toxic units
µg/L	micrograms per litre
AMP	Adaptive Management Plan
BC	British Columbia
BC WQG	British Columbia water quality guideline
CaCO ₃	calcium carbonate
CCME	Canadian Council of Ministers of the Environment
<i>C. dubia</i>	<i>Ceriodaphnia dubia</i>
CETIS™	Comprehensive Environmental Toxicity Information System
CM_MC1	Reference site on Michel Creek upstream of Operations (EMS E258175)
CM_MC2	Test site on Michel Creek upstream of Andy Goode Creek (EMS E58937)
CN	control-normalized
Cu	copper
CV	coefficient of variation
DOC	dissolved organic carbon
e.g.	for example
EC _x	concentration resulting in x percent adverse effect for a dichotomous endpoint (e.g., normality)
EDTA	ethylene diamine tetra-acetic acid
EMC	Environmental Monitoring Committee
EMS	Environmental Monitoring Station
ENV	British Columbia Ministry of Environment and Climate Change
EV_HC1	Test site on Harmer Spillway at Elk Valley Operations (EMS E102682)
EV_MC2	Test site on Michel Creek at Highway 3 Bridge (EMS E300091)
EVWQP	Elk Valley Water Quality Plan
FR_FRCP1	Test site on Fording River downstream of Cataract Creek (EMS E300071)

FR_UFR1	Reference site on Fording River upstream of Henretta Creek (EMS E216777)
GH_ER2	Reference site on Elk River upstream of Greenhills Operations (EMS 200389)
GH_ERC	Test site on Elk River downstream of Thompson Creek (EMS E300090)
GH_FR1	Test site on upper Fording River downstream of Josephine Falls [Order Station FR4] (EMS 200378)
Golder	Golder Associates Ltd.
<i>H. azteca</i>	<i>Hyallela azteca</i>
ID	Identification
i.e.	that is
IC _x	concentration resulting in x percent inhibition for a non-dichotomous endpoint (e.g., growth)
LC_LCDSSLCC	Test site on Line Creek downstream of South Line Creek (EMS E297110)
LC _x	concentration resulting in x percent lethality
mg	milligram
mg/L	milligrams per litre
mL	millilitre
mm	millimetre
MoE	British Columbia Ministry of Environment (now ENV)
n	sample size
N	nitrogen
NaBr	sodium bromide
NaCl	sodium chloride
Nautilus	Nautilus Environmental
NO ₃	nitrate
NR	normal range
NTU	Nephelometric Turbidity Units
<i>O. mykiss</i>	<i>Oncorhynchus mykiss</i>
PCA	principal component analysis
PC	principal component
<i>P. promelas</i>	<i>Pimephales promelas</i>
<i>P. subcapitata</i>	<i>Pseudokirchneriella subcapitata</i>
Q1	quarter 1
Q2	quarter 2
Q3	quarter 3
Q4	quarter 4
QA/QC	quality assurance/quality control

RAEMP	Regional Aquatic Effects Monitoring Program
Ref	reference
SD	standard deviation
SPO	Site Performance Objective
TDS	total dissolved solids
Teck	Teck Coal Limited
the Permit	Permit #107517 issued under the Environmental Management Act
TIE	toxicity identification evaluation
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TSS	total suspended solids
TU	toxic units
US EPA	United States Environmental Protection Agency
WCT	westslope cutthroat trout
WQ	water quality

Executive Summary

Golder Associates Ltd. (Golder) was retained by Teck Coal Limited (Teck) to prepare this interpretive report on quarterly and semi-annual chronic toxicity tests undertaken in 2018 for Teck's coal mining operations in the Elk Valley.

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP) to support implementation of the Elk Valley Water Quality Plan (EVWQP), to achieve water quality targets including calcite targets, ensure that human health and the environment are protected and where necessary restored, and to facilitate continuous improvement of water quality in the Elk Valley. Following an adaptive management framework, the AMP identifies six Management Questions that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. For each Management Question, the AMP describes how the question will be periodically re-evaluated, and how key uncertainties will be reduced. The chronic toxicity testing program discussed herein supports Management Question 2 (*"Will aquatic ecosystem health be protected by meeting the long-term Site Performance Objectives [SPOs]?"*) and Management Question 5 (*"Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?"*). To inform the Management Questions listed above, this report presents and interprets the results from 2018 chronic toxicity testing, and identifies recommendations for revision or augmentation of planned future programs.

To help answer these questions, the analysis of chronic toxicity data consisted of the following five steps:

- Reviewed data quality to confirm that results met acceptability criteria
- Standardized the data to help discern toxicological responses from other sources of variability in data
- Considered the size of response in each test and how that compared to responses in tests of reference waters (not influenced by mining) to categorize each result as "no", "possible", or "likely" adverse response
- Evaluated the correspondence between test responses and indicators of mine-related water quality. This evaluation included statistical assessment of patterns and specialized laboratory tests (called "toxicity identification evaluations") designed to identify causes of toxicity.
- Compared 2018 test results to previous years to identify potential patterns in toxicity responses and/or indicators of cause.

The following bullets summarize key findings from the 2018 interpretive report.

- **Data Quality**—The data generally met acceptability criteria and were fit for the intended purpose. In the few cases where data quality was suspect, actions were taken to process the data to avoid improper influence on findings.
- **Data Processing**—The data analysis benefited from the inclusion of additional reference water results in 2018. These reference water responses were used to refine "normal ranges" that bracket typical test performance under non mine-influenced conditions. The 2018 data confirmed that variations are observed among reference waters, confirming the value of collecting data from multiple references.
- **Initial Categorization**—The 2018 test results categorized as "no adverse response", "possible adverse response", or "likely adverse response" are illustrated on Figure ES-1 and summarized station-by-station at the end of this executive summary. Key findings were:

- For all species, most tests were categorized as no adverse response. Likely adverse responses were most common for water fleas and least common for algae and rainbow trout.
- Stations FR_FRCP1 (Fording River below Cataract Creek) and CM_MC2 (Michel Creek below Corbin Creek) had the highest frequency of possible or likely adverse responses.
- **Concentration-Response Assessment**—The constituents identified as potential causes of toxicity in 2018 tests are summarized in Table ES-1. Key findings were:
 - Sulphate and total dissolved solids were identified in the winter FR_FRCP1 test as potentially contributing to observed effects to all test species. For water fleas, this aligned with toxicity identification evaluation findings.
 - Nickel was identified in CM_MC2 tests as a potential or likely cause of toxicity to two types of crustacean invertebrates (water fleas and amphipods). Results for Permit tests aligned with toxicity identification evaluation findings for these test species.
- **Temporal Assessment**—Some differences relative to previous years were identified:
 - At FR_FRCP1, there has been a trend towards more and larger responses for water fleas in recent years. A higher prevalence of adverse responses in Q4 2018 testing was observed relative to previous years, which appeared to be influenced by higher sulphate and TDS concentrations relative to previous years' testing. Teck has initiated several actions under the Adaptive Management Plan to better understand and manage water quality in the upper Fording River.
 - At CM_MC2, there has been a trend towards more and larger responses for crustacean test species. The trend in responses corresponds with an increase in aqueous nickel concentrations between 2015 and 2018. Teck has initiated several actions under the Adaptive Management Plan response framework to better understand and manage water quality in Michel Creek.

Recommendations from the 2018 testing program include making refinements to test procedures to reduce confounding factors (i.e., factors that obscure responses to mine-related substances), continuing the recently expanded reference water testing to support interpretation of test water responses, and extending the investigation of nickel toxicity to include amphipods.

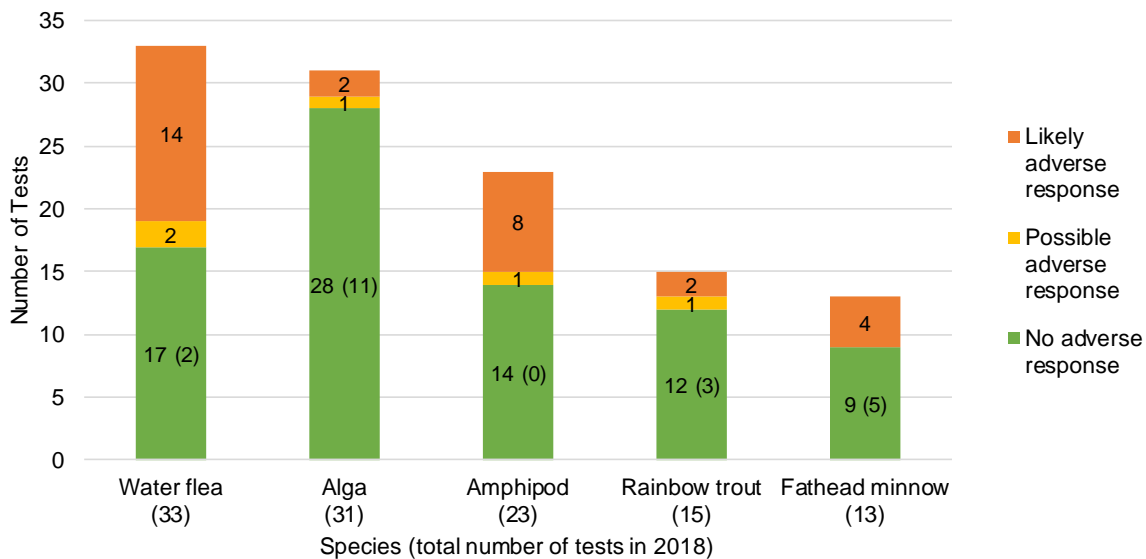
Specific technical findings of 2018 quarterly (quarters named as Q1, Q2, Q3, and Q4) and semi-annual toxicity testing are summarized below by test species and sampling location:

- Responses in test site waters were statistically different from one or more upstream reference waters in 49% of tests (56 of 115 tests), including tests with the water flea *Ceriodaphnia dubia* (18 of 33 tests), the green alga *Pseudokirchneriella subcapitata* (14 of 31 tests), the amphipod *Hyalella azteca* (9 of 23 tests), rainbow trout (*Oncorhynchus mykiss*; 6 of 15 tests), and fathead minnow (*Pimephales promelas*; 9 of 13 tests). The remaining test results could be confidently designated as non-toxic.
- Tests with statistically significant results were categorized as “no adverse response”, “possible adverse response”, or “likely adverse response”, based on the response size in the test and how the response compared to the typical range of results observed in reference waters unaffected by mine influence. Of the tests for which a statistically significant result was identified, approximately 38% (21 of 56 tests) were categorized as no adverse response, approximately 9% (5 of 56 tests) were categorized as a possible adverse response, and approximately 54% (30 of 56 tests) were categorized as a likely adverse response.

- Categories for 2018 test results are summarized by test species in Figure ES-1. For all species, most tests were categorized as no adverse response. Likely adverse responses were most common for the water flea test and least common for the rainbow trout and algae tests.
- Categories for 2018 test results are summarized by test site in Figure ES-2 to Figure ES-10. Constituents identified as potential causes of toxicity in 2018 tests categorized as possible or likely are summarized in Table ES-1. A summary of the results is provided below by test site:
 - **FR_FRCP1**. This location is on the Fording River downstream of Cataract Creek. Adverse test responses were observed in all quarters, but were largest in magnitude and affected more test endpoints in winter, when most or all of the Fording River flows underground in this reach, and water quality at FR_FRCP1 predominantly reflects flows from Cataract Creek. Analysis of correlations between test responses and water quality indicated the following:
 - In Q1 testing, nickel, nitrate, sulphate, and total dissolved solids were identified as potentially contributing to observed effects on water flea reproduction. Nitrate was the only constituent identified as potentially contributing to effects on amphipod growth.
 - In Q4 testing, sulphate and total dissolved solids were identified as potentially contributing to observed effects to all test species. Additional constituents that were identified as potentially contributing to test responses were nitrate, nickel, and uranium.
 - For several tests, no water quality constituent could be identified as potentially contributing to the observed response.
 - **FR_FRABCH**. This station, which is approximately five kilometers downstream of FR_FRCP1, was added to the program in Q4 2018 to better represent mixed Fording River water quality and reduce the confounding influence of mid-winter Cataract Creek flows at FR_FRCP1. Possible or likely adverse responses were observed in amphipod, rainbow trout, and fathead minnow tests conducted in Q4. Nitrate was identified as potentially contributing to effects to amphipod growth. No water quality constituent was identified as potentially contributing to other tests results.
 - **GH_FR1**. This station is on the Fording River downstream of Greenhills Creek. Likely adverse responses were observed in the Q2 water flea test and Q4 rainbow trout test. No water quality constituent was identified as potentially contributing to observed responses in these tests.
 - **GH_ERC**. This station is in the Elk River upstream of the Fording River confluence. One possible adverse response was observed in Q2 for water flea reproduction, but no water quality constituent was identified as potentially contributing to observed responses in this test.
 - **EV_HC1**. This station is in Harmer Creek, which flows into Grave Creek and then into the Elk River downstream of Sparwood. No adverse responses were observed in any test.
 - **CM_MC2**. This station is on Michel Creek downstream of Corbin Creek. Likely adverse responses were observed in all quarters for water flea reproduction and amphipod survival and growth, and many of these responses could be attributed to nickel. A likely adverse response for fathead minnow survival was observed in Q3 only, but no water quality constituent was identified as potentially contributing to the observed response in this test.

- CM_MC3.** This station, which is approximately 1 kilometer downstream of CM_MC2, was added to the program to characterize the spatial extent of effects observed in previous CM_MC2 testing. Possible or likely adverse responses were observed for water flea reproduction in Q2, Q3, and Q4, and amphipod survival and growth in Q3. As was observed at CM_MC2, nickel was identified as potentially contributing to the observed responses in these tests.
- EV_MC2.** This station is located on Michel Creek downstream of Bodie Creek. One likely adverse response was observed for water flea reproduction in Q1, but no water quality constituent was identified as potentially contributing to observed responses in this test.
- LC_LCDSSLCC.** This station is located on Line Creek downstream of South Line Creek. Likely adverse responses were observed in water flea tests in Q2 and Q4 and the amphipod test in Q4. No water quality constituent was identified as potentially contributing to observed responses in these tests.

Figure ES-1: Summary of 2018 test results by species.



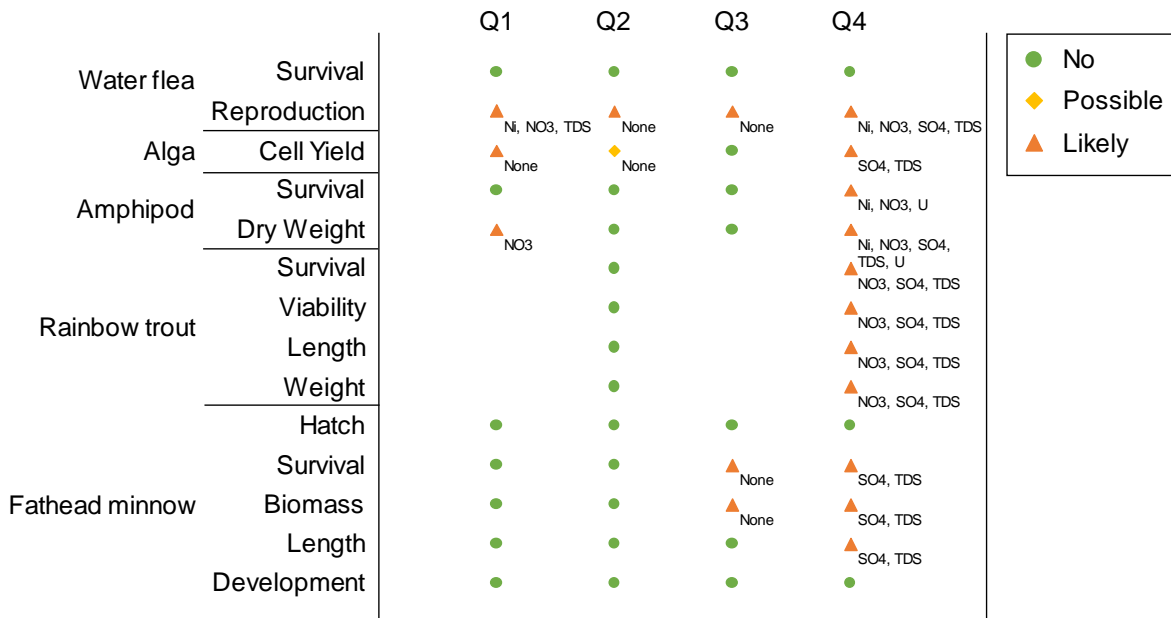
Note: Results are categorized in Section 3.3.1. The number of tests in each category is provided in bar labels. For the “no adverse response” category (green bars), the first number indicates the total number of tests in this category. The number in brackets indicates how many tests with statistically significant responses relative to one or more references were eventually categorized as “no adverse response” based on the decision rules.

Table ES-1: Summary of Constituents Identified as Potentially Contributing to Observed Responses in 2018

Organism	Endpoint	FR_FRCP1	FR_FRABCH	GH_FR1	GH_ERC	EV_HC1	CM_MC2	CM_MC3	EV_MC2	LC_LCDSSLCC
Q1										
Water flea	Reproduction	Ni, NO ₃ , TDS	-	-	-	-	Ni	-	None	-
Alga	Cell yield	None	-	-	-	-	-	-	-	-
Amphipod	Dry Weight	NO ₃	-	-	-	-	Ni	-	-	-
	Survival	-	-	-	-	-	None	-	-	-
Q2										
Water flea	Reproduction	None	-	None	None	-	Ni	Ni	-	None
Alga	Cell yield	None	-	-	-	-	-	-	-	-
Amphipod	Dry Weight	-	-	-	-	-	Ni	-	-	-
	Survival	-	-	-	-	-	None	-	-	-
Q3										
Water flea	Reproduction	None	-	-	-	-	Ni	Ni	-	-
Amphipod	Dry Weight	-	-	-	-	-	Ni	Ni	-	-
	Survival	-	-	-	-	-	Ni	None	-	-
Fathead minnow	Biomass	None	-	-	-	-	-	-	-	-
	Survival	None	-	-	-	-	None	-	-	-
Q4										
Water flea	Reproduction	Ni, NO ₃ , SO₄, TDS	-	-	-	-	Ni	Ni	-	None
Alga	Cell yield	SO₄, TDS	-	-	-	-	-	-	-	-
Amphipod	Dry Weight	Ni, NO ₃ , SO₄, TDS, U	NO ₃	-	-	-	Ni	-	-	None
	Survival	Ni, NO ₃ , U	-	-	-	-	None	-	-	-
Rainbow trout	Length	NO ₃ , SO₄, TDS	-	-	-	-	-	-	-	-
	Survival	NO ₃ , SO₄, TDS	None	None	-	-	-	-	-	-
	Viability	NO ₃ , SO₄, TDS	None	None	-	-	-	-	-	-
	Weight	NO ₃ , SO₄, TDS	-	-	-	-	-	-	-	-
Fathead minnow	Biomass	SO₄, TDS	None	-	-	-	-	-	-	-
	Length	SO₄, TDS	-	-	-	-	-	-	-	-
	Survival	SO₄, TDS	None	-	-	-	-	-	-	-

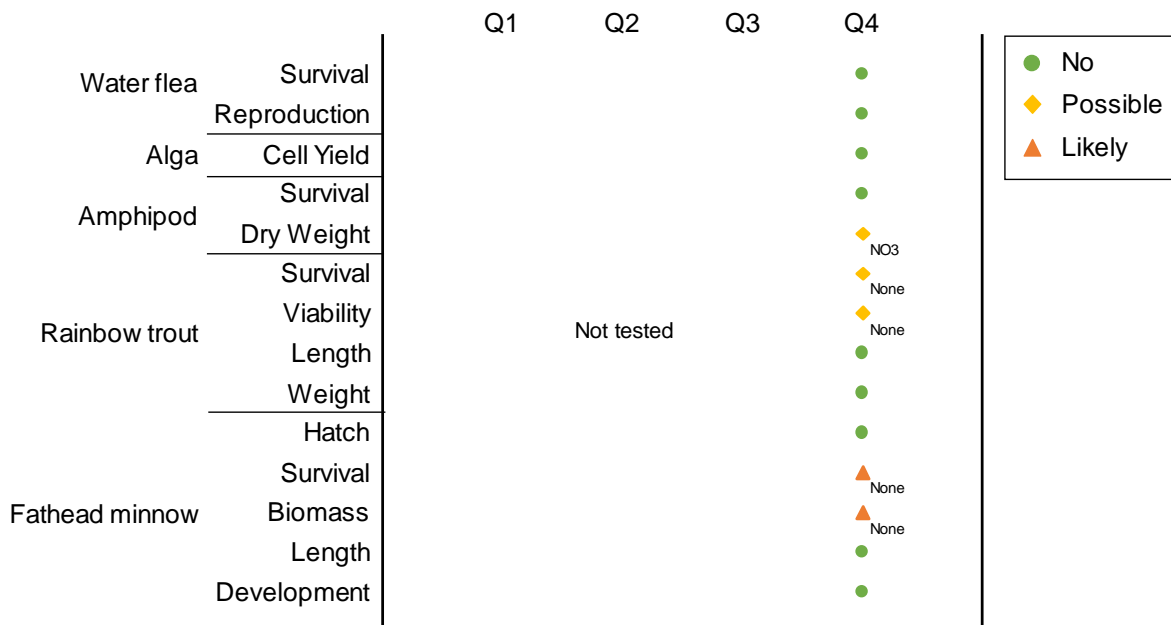
Bold = Primary explanatory variable identified (i.e., sulphate and TDS).
 Species and endpoint shown if one or more tests identified as likely or possible for that quarter.
 '-' = test was categorized as no adverse response;
 Q = quarter of chronic toxicity testing
 Ni = nickel; NO₃ = nitrate; SO₄ = sulphate; TDS = total dissolved solids; U = uranium;
 None = no water quality constituent was identified.

Figure ES-2: Summary of test results by category at FR_FRCP1.



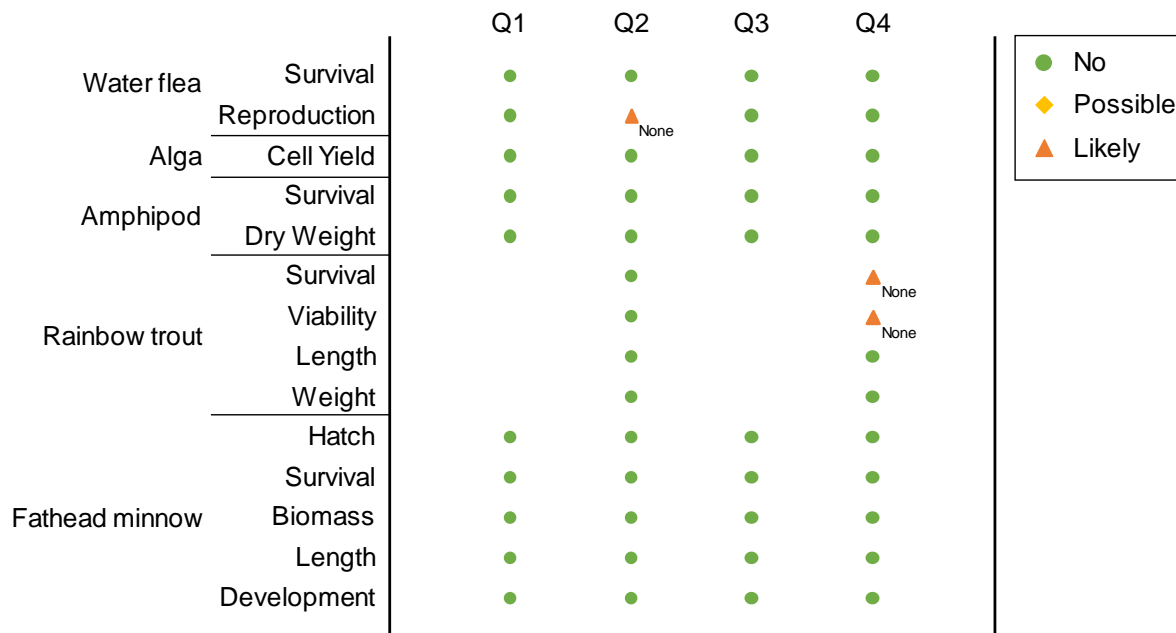
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; NO₃ = nitrate; SO₄ = sulphate; TDS = total dissolved solids; U = uranium; None = no water quality constituent associated with observed responses was identified.

Figure ES-3: Summary of test results by category at FR_FRABCH.



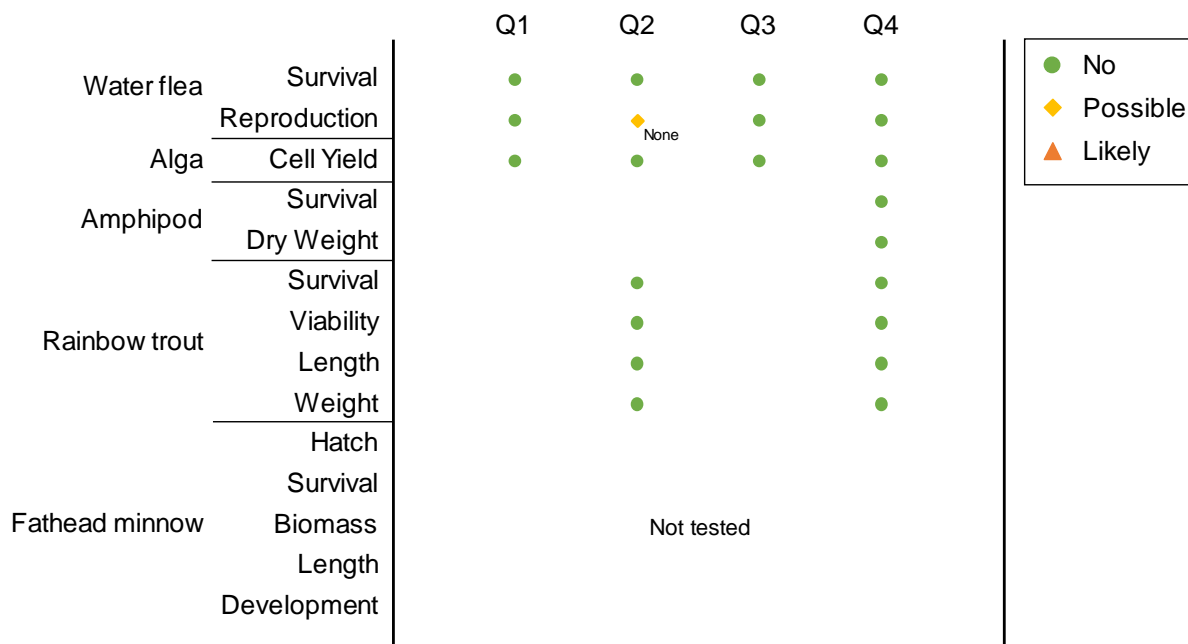
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. NO₃ = nitrate; None = no water quality constituent associated with observed responses was identified. Not tested = no testing conducted at this station in Q1 to Q3, as station is not currently part of Permit requirements (station added to evaluate mainstem Fording River conditions).

Figure ES-4: Summary of test results by category at GH_FR1.



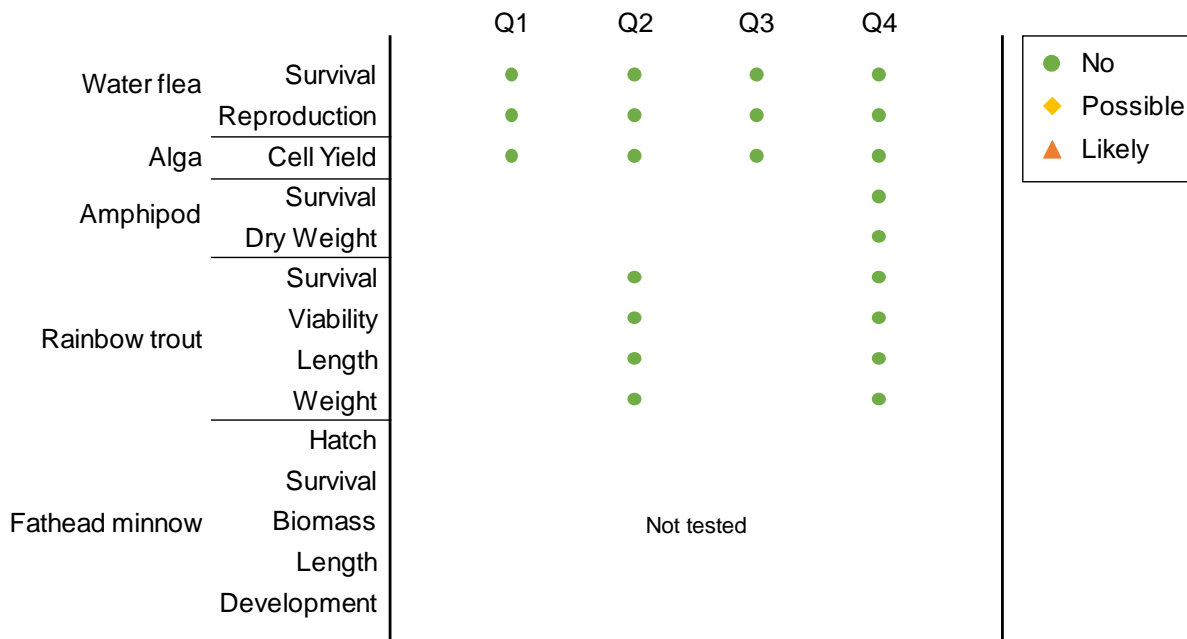
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent associated with observed responses was identified.

Figure ES-5: Summary of test results by category at GH_ERC.



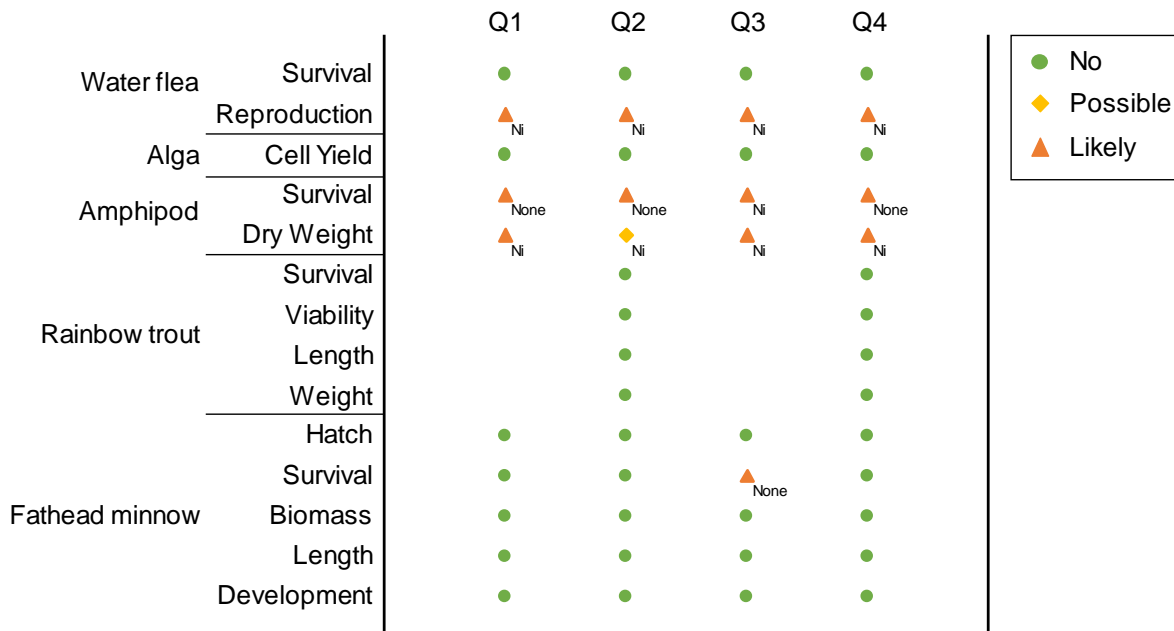
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent associated with observed responses was identified. Not tested = no testing required at this station for fathead minnows, consistent with Permit requirements.

Figure ES-6: Summary of test results by category at EV_HC1.



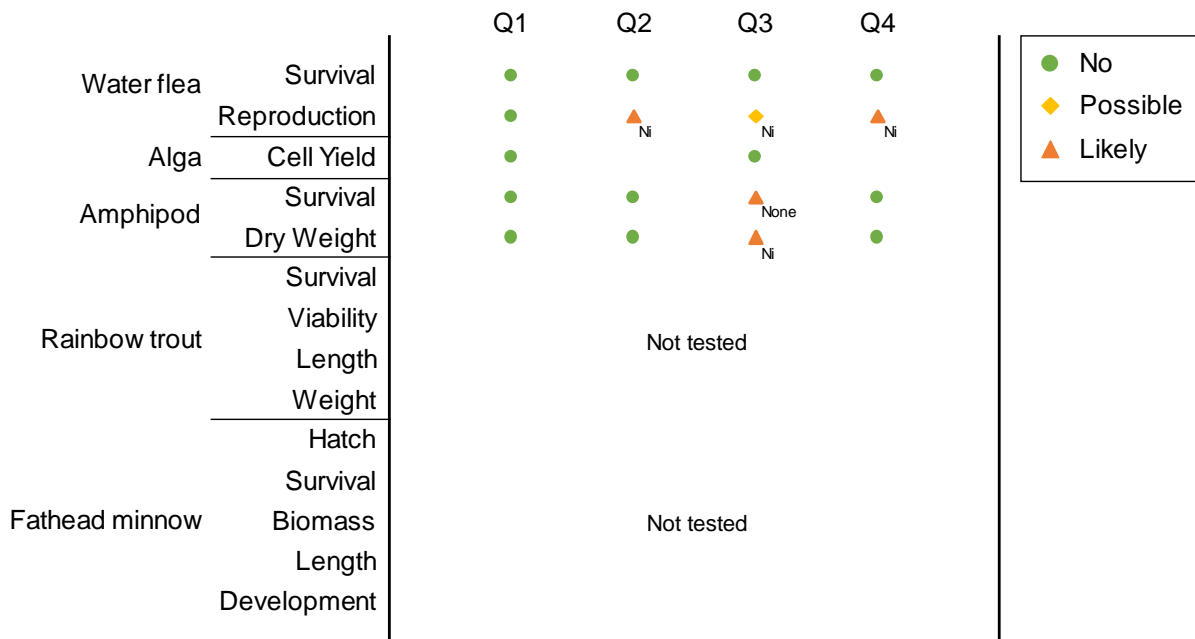
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. Not tested = no testing required at this station for fathead minnows, consistent with Permit requirements.

Figure ES-7: Summary of test results by category at CM_MC2.



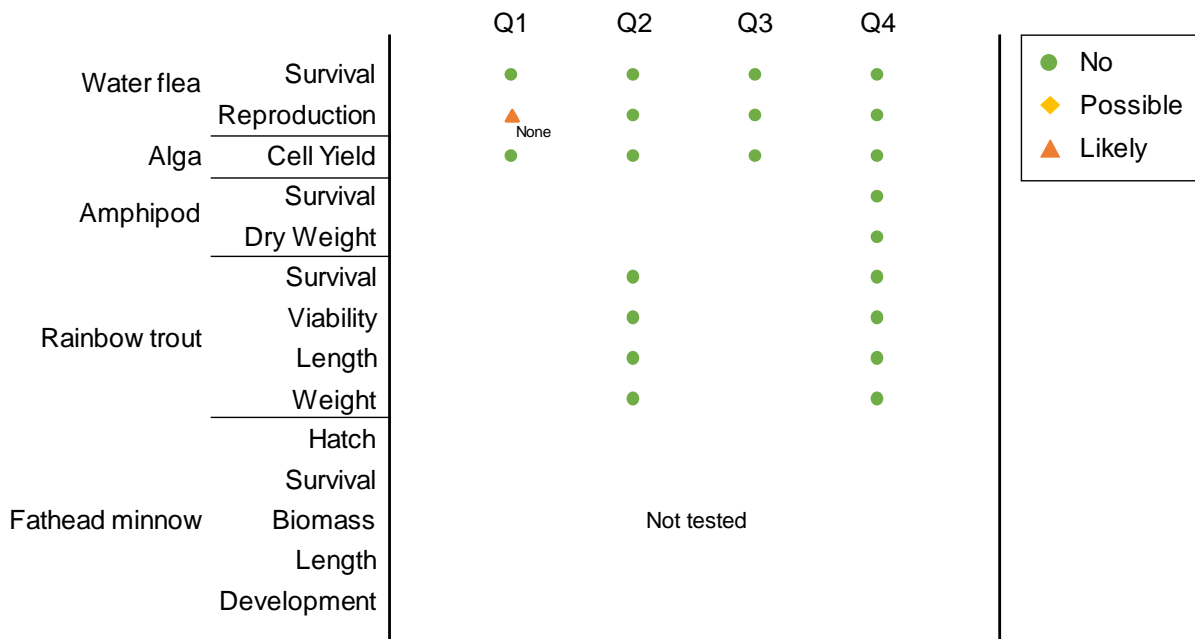
Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; None = no water quality constituent associated with observed responses was identified.

Figure ES-8: Summary of test results by category at CM_MC3.



Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; None = no water quality constituent associated with observed responses was identified. Not tested = no testing conducted for rainbow trout or fathead minnow, as station is not currently part of Permit requirements. Station was assessed for sensitive invertebrate species to characterize spatial extent of effects.

Figure ES-9: Summary of test results by category at EV_MC2.



Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent associated with observed responses was identified. Not tested = no testing required at this station for fathead minnows, consistent with Permit requirements.

Figure ES-10: Summary of test results by category at LC_LCDSSLCC.

		Q1	Q2	Q3	Q4
Water flea	Survival	●	●	●	●
	Reproduction	●	▲ None	●	▲ None
Alga	Cell Yield	●	●	●	●
Amphipod	Survival		●	●	●
	Dry Weight		●	●	▲ None
Rainbow trout	Survival		●		●
	Viability		●		●
	Length		●		●
	Weight		●		●
Fathead minnow	Hatch				
	Survival				
	Biomass		Not tested		
	Length Development		Not tested		

● No
 ◆ Possible
 ▲ Likely

Note: Test results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent associated with observed responses was identified. Not tested = no testing required at this station for fathead minnows, consistent with Permit requirements.

Study Limitations

This report was prepared for the exclusive use of Teck Coal Limited. Any use that a third party may make of this report, or any reliance on or decisions made based on it, is the responsibility of the third parties. We disclaim responsibility for consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

We have relied in good faith on information provided by others as noted. We assume that the information provided is factual and accurate. We accept no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

The services performed as described in this report were conducted in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. The content of this report is based on information collected during our investigation, our present understanding of site conditions, the assumptions stated in this report, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and, therefore, no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change. The findings and conclusions of this report are valid only as of the date of the report. If new information is discovered in future work, or if the assumptions stated in this report are not met, Golder Associates should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products

Table of Contents

Executive Summary	iv
1.0 INTRODUCTION.....	1
1.1 Context and Background.....	1
1.2 Linkages to the Water Quality Adaptive Management Plan for Teck Coal in the Elk Valley	3
1.3 Objective	3
1.4 Incorporating Feedback from the Environmental Monitoring Committee.....	3
1.5 Report Organization	4
2.0 METHODS.....	5
2.1 Field.....	5
2.2 Laboratory	6
2.2.1 Quarterly and Semi-Annual Testing Program.....	6
2.2.2 Supplemental Testing	9
2.2.2.1 Copper- and Argentine-Amended Tests with <i>O. mykiss</i>	9
2.2.2.2 Toxicity Identification Evaluations.....	9
2.3 Data Analysis	12
2.3.1 Quality Assurance/Quality Control.....	12
2.3.2 Sources of Variance.....	12
2.3.2.1 Organism Performance.....	13
2.3.2.2 Organism Sensitivity	13
2.3.2.3 Background Conditions (Normal Ranges)	13
2.3.2.4 Variation in Concentrations of Toxicants	14
2.3.3 Evaluation of 2018 Test Results	14
2.3.4 Concentration-Response Analysis.....	19
2.3.5 Comparison of 2018 Results to Previous Years	22
3.0 RESULTS.....	24
3.1 Quality Assurance/Quality Control	24
3.2 Sources of Variance in Test Water	25
3.2.1 Organism Performance.....	25

3.2.2	Organism Sensitivity	25
3.2.3	Background Conditions (Normal Ranges)	26
3.2.3.1	Ceriodaphnia dubia	26
3.2.3.2	Pseudokirchneriella subcapitata	28
3.2.3.3	Hyalella azteca.....	28
3.2.3.4	Oncorhynchus mykiss.....	30
3.2.3.5	Pimephales promelas	33
3.2.4	Variation in Concentrations of Toxicants (Coefficients of Variation).....	36
3.3	Evaluation of 2018 Test Results	36
3.3.1	Results by Test Species	41
3.3.1.1	Ceriodaphnia dubia.....	41
3.3.1.2	Pseudokirchneriella subcapitata	47
3.3.1.3	Hyalella azteca.....	51
3.3.1.4	Oncorhynchus mykiss.....	55
3.3.1.5	Pimephales promelas	68
3.3.2	Results by Test Site	77
3.4	Concentration-Response Analysis.....	82
3.4.1	Ceriodaphnia dubia Reproduction	83
3.4.2	Pseudokirchneriella subcapitata Cell Yield.....	94
3.4.3	Hyalella azteca Survival and Growth	100
3.4.4	Oncorhynchus mykiss Survival, Viability, Length, and Weight.....	118
3.4.5	Pimephales promelas Survival, Biomass, and Length.....	131
3.5	Comparison of 2018 Results to Previous Years	141
3.5.1	FR_FRCP1.....	156
3.5.2	FR_FRABCH.....	159
3.5.3	GH_FR1	161
3.5.4	GH_ERC	163
3.5.5	EV_HC1	165
3.5.6	CM_MC2.....	167
3.5.7	CM_MC3.....	169

3.5.8	EV_MC2.....	171
3.5.9	LC_LCDSSLCC	173
4.0	SUMMARY	175
5.0	UNCERTAINTY	178
6.0	RECOMMENDATIONS	180
7.0	CLOSURE	181
8.0	REFERENCES	182

TABLES

Table ES-1: Summary of Constituents Identified as Potentially Contributing to Observed Responses in 2018....	viii
Table 2.1-1: Reference Locations and Tests Sites used in the Quarterly and Semi-Annual Toxicity Testing	5
Table 2.2-1: Summary of Quarterly and Semi-Annual Toxicity Tests	6
Table 2.2-2: Summary of Quarterly and Semi-Annual Tests Conducted in 2018 ^(a,b,c)	8
Table 2.3-1: Reference and test site pairings used in the local NR comparison.	16
Table 3.3-1: Results of Quarterly and Semi-Annual Toxicity Tests—Raw Results ^(a)	37
Table 3.3-2: Results of Quarterly and Semi-Annual Toxicity Tests—Control-Normalized Results ^(a)	39
Table 3.3-3: Brood Output in 2018 <i>C. dubia</i> Tests.....	43
Table 3.3-4: Summary of Untreated and Treated Tests with <i>O. mykiss</i> ^(a)	65
Table 4-1: Summary of Constituents Identified as Potentially Contributing to Observed Responses in 2018	177

FIGURES

Figure ES-1: Summary of 2018 test results by species.	vii
Figure ES-2: Summary of test results by category at FR_FRCP1.	ix
Figure ES-3: Summary of test results by category at FR_FRABCH.	ix
Figure ES-4: Summary of test results by category at GH_FR1.....	x
Figure ES-5: Summary of test results by category at GH_ERC.....	x
Figure ES-6: Summary of test results by category at EV_HC1.....	xi
Figure ES-7: Summary of test results by category at CM_MC2.....	xi
Figure ES-8: Summary of test results by category at CM_MC3.....	xii
Figure ES-9: Summary of test results by category at EV_MC2.	xii
Figure ES-10: Summary of test results by category at LC_LCDSSLCC.....	xiii

Figure 1.1-1: Overview of Elk Valley Chronic Toxicity Testing Program.....	2
Figure 2.3-1: Decision framework for inclusion of endpoints and constituents in the concentration-response analysis.	16
Figure 2.3-2: Example data plot for individual replicate results.....	17
Figure 2.3-3: Example data plot for mean results.	18
Figure 2.3-4: Decision framework for inclusion of endpoints and explanatory variables in the graphical analysis.	20
Figure 3.2-1: Reference toxicant data from 2018 laboratory reports (Appendix B).	26
Figure 3.2-2: Mean results for <i>C. dubia</i> survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	27
Figure 3.2-3: Mean results for <i>C. dubia</i> reproduction in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	27
Figure 3.2-4: Mean results for <i>P. subcapitata</i> cell yield in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	28
Figure 3.2-5: Mean results for <i>H. azteca</i> survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	29
Figure 3.2-6: Mean results for <i>H. azteca</i> weight in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	30
Figure 3.2-7: Mean results for <i>O. mykiss</i> survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	31
Figure 3.2-8: Mean results for <i>O. mykiss</i> viability in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	32
Figure 3.2-9: Mean results for <i>O. mykiss</i> length in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	32
Figure 3.2-10: Mean results for <i>O. mykiss</i> weight in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	33
Figure 3.2-11: Mean results for <i>P. promelas</i> hatch in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	34
Figure 3.2-12: Mean results for <i>P. promelas</i> survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	34
Figure 3.2-13: Mean results for <i>P. promelas</i> biomass in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	35

Figure 3.2-14: Mean results for <i>P. promelas</i> length in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panel).	35
Figure 3.2-15: Mean results for <i>P. promelas</i> development in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel).	36
Figure 3.3-1: Individual replicate and mean results for <i>C. dubia</i> survival in reference (Ref) and test site waters.	44
Figure 3.3-2: Individual replicate and mean results for <i>C. dubia</i> reproduction in reference (Ref) and test site waters.	44
Figure 3.3-3: Mean results for <i>C. dubia</i> survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	45
Figure 3.3-4: Mean results for <i>C. dubia</i> reproduction in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters. Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	46
Figure 3.3-5: Individual replicate and mean results for <i>P. subcapitata</i> cell yield in reference (Ref) and test site waters.	49
Figure 3.3-6: Mean results for <i>P. subcapitata</i> cell yield in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th and 97.5 th percentile) are shown as bars (right panels).	50
Figure 3.3-7: Individual replicate and mean results for <i>H. azteca</i> survival in reference (Ref) and test site waters.	52
Figure 3.3-8: Individual replicate and mean results for <i>H. azteca</i> dry weight in reference (Ref) and test site waters.	52
Figure 3.3-9: Mean results for <i>H. azteca</i> survival in the Fording River reference and its test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	53
Figure 3.3-10: Mean results for <i>H. azteca</i> dry weight in the Fording River reference and its test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	54
Figure 3.3-11: Individual replicate and mean results for <i>O. mykiss</i> survival in reference (Ref) and test site waters.	56
Figure 3.3-12: Individual replicate and mean results for <i>O. mykiss</i> viability in reference (Ref) and test site waters.	57
Figure 3.3-13: Individual replicate and mean results for <i>O. mykiss</i> length in reference (Ref) and test site waters.	57
Figure 3.3-14: Individual replicate and mean results for <i>O. mykiss</i> weight in reference (Ref) and test site waters.	58

Figure 3.3-15: Mean results for *O. mykiss* survival in the Fording River reference and its test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels)..... 59

Figure 3.3-16: Mean results for *O. mykiss* viability in the Fording River reference and its test site waters (top left panel), and Elk River and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels). 60

Figure 3.3-17: Mean results for *O. mykiss* length in the Fording River reference and its test site waters (top left panel), and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels). 61

Figure 3.3-18: Mean results for *O. mykiss* weight in the Fording River reference and its test site waters (top left panel), and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels). 62

Figure 3.3-19: Individual replicate and mean results for *O. mykiss* survival in reference (Ref) and test site waters (untreated and copper-treated)..... 66

Figure 3.3-20: Individual replicate and mean results for *O. mykiss* viability in reference (Ref) and test site waters (untreated and copper-treated)..... 66

Figure 3.3-21: Individual replicate and mean results for *O. mykiss* length in reference (Ref) and test site waters (untreated and copper-treated)..... 67

Figure 3.3-22: Individual replicate and mean results for *O. mykiss* weight in reference (Ref) and test site waters (untreated and copper-treated)..... 67

Figure 3.3-23: Individual replicate and mean results for *P. promelas* hatch in reference (Ref) and test site waters. 69

Figure 3.3-24: Individual replicate and mean results for *P. promelas* survival in reference (Ref) and test site waters. 69

Figure 3.3-25: Individual replicate and mean results for *P. promelas* biomass in reference (Ref) and test site waters. 70

Figure 3.3-26: Individual replicate and mean results for *P. promelas* length in reference (Ref) and test site waters. 70

Figure 3.3-27: Individual replicate and mean results for *P. promelas* normal development in reference (Ref) and test site waters. 71

Figure 3.3-28: Mean results for *P. promelas* hatch in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels)..... 72

Figure 3.3-29: Mean results for *P. promelas* survival in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels)..... 73

Figure 3.3-30: Mean results for *P. promelas* biomass in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels)..... 74

Figure 3.3-31: Mean results for *P. promelas* length in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels)..... 75

Figure 3.3-32: Mean results for *P. promelas* normal development in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom

left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	76
Figure 3.3-33: Summary of test results by category at FR_FRCP1.....	78
Figure 3.3-34: Summary of test results by category at FR_FRABCH.....	78
Figure 3.3-35: Summary of test results by category at GH_FR1.....	79
Figure 3.3-36: Summary of test results by category at GH_ERC.....	79
Figure 3.3-37: Summary of test results by category at EV_HC1.....	80
Figure 3.3-38: Summary of test results by category at CM_MC2.....	80
Figure 3.3-39: Summary of test results by category at CM_MC3.....	81
Figure 3.3-40: Summary of test results by category at EV_MC2.....	81
Figure 3.3-41: Summary of test results by category at LC_LCDSSLCC.....	82
Figure 3.4-1: Mean <i>C. dubia</i> reproduction versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).....	88
Figure 3.4-2: Mean <i>C. dubia</i> reproduction versus concentrations of dissolved organic carbon (top left), total chromium (top right), total cobalt (bottom left), and total iron (bottom right).....	89
Figure 3.4-3: Mean <i>C. dubia</i> reproduction versus concentrations of total lithium (top left), total nickel (top right), phosphorus (bottom left), and total strontium (bottom right).....	90
Figure 3.4-4: Mean <i>C. dubia</i> reproduction versus concentrations of total dissolved solids (top left), total Kjeldahl nitrogen (top right), total organic carbon (bottom left), and total suspended solids (bottom right).....	91
Figure 3.4-5: Mean <i>C. dubia</i> reproduction versus concentrations of turbidity (top left), total uranium (top right), sum of toxic units calculated using BC WQGs only (bottom left), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom right).....	92
Figure 3.4-6: Mean <i>C. dubia</i> reproduction versus concentrations of total vanadium (top left), PC1 (top right), PC2 (bottom left), and PC3 (bottom right).....	93
Figure 3.4-7: Mean <i>C. dubia</i> reproduction versus PC1 for the 2018 dataset (left) and PC3 for the 2018 dataset (right).....	94
Figure 3.4-8: Mean <i>P. subcapitata</i> cell yield versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).....	97
Figure 3.4-9: Mean <i>P. subcapitata</i> cell yield versus concentrations of dissolved organic carbon (top left), total lithium (top right), total nickel (bottom left), and total dissolved solids (bottom right).....	98
Figure 3.4-10: Mean <i>P. subcapitata</i> cell yield versus concentrations of total uranium (top left), total vanadium (top right), sum of toxic units calculated using BC WQGs only (bottom left), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom right).....	99
Figure 3.4-11: Mean <i>P. subcapitata</i> cell yield versus PC1 for the combined dataset (left) and PC3 for the 2018 dataset (right).....	100
Figure 3.4-12: Mean <i>H. azteca</i> survival versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).....	105
Figure 3.4-13: Mean <i>H. azteca</i> survival versus total nickel (top left), nitrite (top right), total strontium (bottom left), and total dissolved solids (bottom right).....	106

Figure 3.4-14: Mean *H. azteca* survival versus total uranium (top left), sum of toxic units calculated using BC WQGs only (top right), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom left), and PC1 for the combined dataset (bottom right). 107

Figure 3.4-15: Mean *H. azteca* survival versus PC3 for the combined dataset (top left), PC4 for the combined dataset (top right), PC1 for the 2018 dataset (bottom left), and PC3 for the 2018 dataset (bottom right). 108

Figure 3.4-16: Mean *H. azteca* survival versus PC4 for the 2018 dataset. 109

Figure 3.4-17: Mean *H. azteca* dry weight versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 114

Figure 3.4-18: Mean *H. azteca* dry weight versus total cobalt (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right). 115

Figure 3.4-19: Mean *H. azteca* dry weight versus total strontium (top left), total dissolved solids (top right), total uranium (bottom left), and sum of toxic units calculated using BC WQGs only (bottom right). 116

Figure 3.4-20: Mean *H. azteca* dry weight versus sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top left), PC1 for the combined dataset (top right), and PC3 for the combined dataset (bottom left), and PC4 for the combined dataset (bottom right). 117

Figure 3.4-21: Mean *H. azteca* dry weight versus PC1 for the 2018 dataset (left), PC3 for the 2018 dataset (right). 118

Figure 3.4-22: Mean *O. mykiss* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 121

Figure 3.4-23: Mean *O. mykiss* survival versus concentrations of total lithium (top left), total dissolved solids (top right), total uranium (bottom left), and PC1 (bottom right). 122

Figure 3.4-24: Mean *O. mykiss* survival versus PC2 for the 2018 dataset. 123

Figure 3.4-25: Mean *O. mykiss* viability versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 124

Figure 3.4-26: Mean *O. mykiss* viability versus concentrations of total lithium (top left), total dissolved solids (top right), total uranium (bottom left), and PC1 (bottom right). 125

Figure 3.4-27: Mean *O. mykiss* viability versus PC2 for the 2018 dataset. 126

Figure 3.4-28: Mean *O. mykiss* length versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 127

Figure 3.4-29: Mean *O. mykiss* length versus PC1 (top left), PC2 (top right), and PC2 for the 2018 dataset (bottom left). 128

Figure 3.4-30: Mean *O. mykiss* weight versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 129

Figure 3.4-31: Mean *O. mykiss* length versus PC1 (top left), PC2 (top right), and PC2 for the 2018 dataset (bottom left), and PC3 for the 2018 dataset (bottom right). 130

Figure 3.4-32: Mean *P. promelas* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). 134

Figure 3.4-33: Mean *P. promelas* survival versus concentrations of total lithium (top left), total nickel (top right), nitrite (bottom left), and total strontium (bottom right). 135

Figure 3.4-34: Mean <i>P. promelas</i> survival versus concentrations of total dissolved solids (top left), total Kjeldahl nitrogen (top right), total uranium (bottom left), and sum of toxic units calculated using BC WQGs only (bottom right).	136
Figure 3.4-35: Mean <i>P. promelas</i> survival versus sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top left), PC1 (top right), PC2 (bottom left), and PC1 for the 2018 dataset (bottom right).	137
Figure 3.4-36: Mean <i>P. promelas</i> biomass versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).	138
Figure 3.4-37: Mean <i>P. promelas</i> length versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).	139
Figure 3.4-38: Mean <i>P. promelas</i> length versus PC1 (top left), PC3 (top right), and PC4 (bottom left).	140
Figure 3.5-1: Mean results for <i>C. dubia</i> survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	142
Figure 3.5-2: Mean results for <i>C. dubia</i> reproduction in the Fording River reference and its paired test site waters (top left panel), in the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	143
Figure 3.5-3: Mean results for <i>P. subcapitata</i> cell yield in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	144
Figure 3.5-4: Mean results for <i>H. azteca</i> survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	145
Figure 3.5-5: Mean results for <i>H. azteca</i> dry weight in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	146
Figure 3.5-6: Mean results for <i>O. mykiss</i> survival in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	147
Figure 3.5-7: Mean results for <i>O. mykiss</i> viability in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	148
Figure 3.5-8: Mean results for <i>O. mykiss</i> length in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	149
Figure 3.5-9: Mean results for <i>O. mykiss</i> weight in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).	150

Figure 3.5-10: Mean results for <i>P. promelas</i> hatch in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	151
Figure 3.5-11: Mean results for <i>P. promelas</i> survival in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	152
Figure 3.5-12: Mean results for <i>P. promelas</i> biomass in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	153
Figure 3.5-13: Mean results for <i>P. promelas</i> length in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	154
Figure 3.5-14: Mean results for <i>P. promelas</i> normal development in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5 th to 97.5 th percentile) are shown as bars (right panels).....	155
Figure 3.5-15: Summary of test results by category at FR_FRCP1.....	158
Figure 3.5-16: Summary of test results by category at FR_FRABCH.....	160
Figure 3.5-17: Summary of test results by category at GH_FR1.....	162
Figure 3.5-18: Summary of test results by category at GH_ERC.....	164
Figure 3.5-19: Summary of test results by category at EV_HC1.....	166
Figure 3.5-20: Summary of test results by category at CM_MC2.....	168
Figure 3.5-21: Summary of test results by category at CM_MC3.....	170
Figure 3.5-22: Summary of test results by category at EV_MC2.....	172
Figure 3.5-23: Summary of test results by category at LC_LCDSSLCC.....	174
Figure 4-1: Summary of 2018 test results by species.....	176

APPENDICES

APPENDIX A

Summary of Regulatory Requirements for Chronic Toxicity Testing

APPENDIX B

Nautilus Reports - Quarterly and Semi-Annual Chronic Toxicity Testing and Summary of Acute Toxicity Testing

Appendix B-1 First Quarter 2018 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca* and *Pimephales promelas*

Appendix B-2 Second Quarter 2018 Results: Toxicity testing on Elk Valley samples with Ceriodaphnia dubia, Pseudokirchneriella subcapitata, Hyalella azteca, Pimephales promelas and Oncorhynchus mykiss

Appendix B-3 Third Quarter 2018 Results: Toxicity testing on Elk Valley samples with Ceriodaphnia dubia, Pseudokirchneriella subcapitata, Hyalella azteca and Pimephales promelas

Appendix B-4 Fourth Quarter 2018 Results: Toxicity testing on Elk Valley samples with Ceriodaphnia dubia, Pseudokirchneriella subcapitata, Hyalella azteca Pimephales promelas and Oncorhynchus mykiss

Appendix B-5 Memo: TIE testing for FR_FRCP1 (Fourth quarter, 2018)

Appendix B-6 Memo: TIE testing for CM_MC2 and CM_MC3

Appendix B-7 Summary of 2018 Acute Toxicity Testing

APPENDIX C

Water Quality Screening

APPENDIX D

Toxicity Testing Data Paired with Response Variables

APPENDIX E

Principal Component Analysis

APPENDIX F

Spearman Rank Analysis

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) is pleased to provide Teck Coal Limited (Teck) with the following interpretive report summarizing quarterly and semi-annual chronic toxicity tests undertaken in 2018 for Teck's coal mining operations in the Elk Valley. This study represents the fourth full year of chronic toxicity testing and interpretation to satisfy requirements under permits and associated regulatory approvals.

1.1 Context and Background

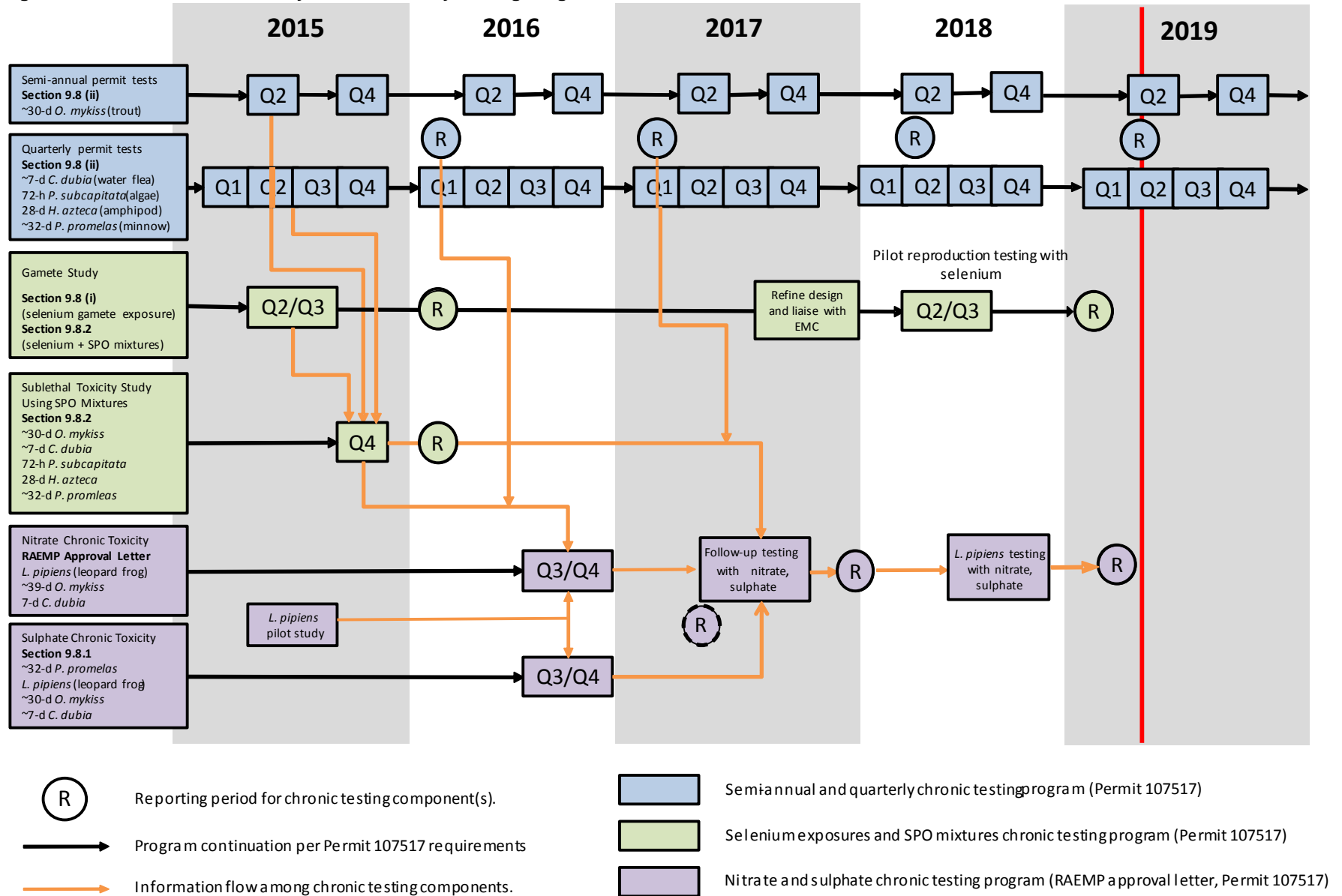
Requirements for chronic toxicity testing associated with Teck's coal mining operations in the Elk Valley are specified in Section 9.8 of Permit 107517 issued under the *Environmental Management Act* (the Permit) and a 14 November 2014 letter from the British Columbia Ministry of Environment (MoE, now Ministry of Environment and Climate Change Strategy [ENV]) approving the study design for the Regional Aquatic Effects Monitoring Program (the RAEMP approval letter). Chronic toxicity testing requirements specified in these documents are summarized in Appendix A.

The chronic toxicity testing program has been organized into three components (Figure 1.1-1), reflecting the underlying objectives of Permit and RAEMP approval letter requirements:

- **Quarterly and Semi-Annual Testing.** This subprogram, depicted in blue in Figure 1, includes periodic testing of water samples at compliance points in the Elk Valley. Relative to other subprograms, these tests are the most prescriptive in terms of protocols, frequency, and sampling locations. This subprogram addresses Permit 107517 Section 9.8(ii) requirements. This program will continue into 2019, with revisions to some specific test procedures and scheduling of tests anticipated, in alignment with discussions with the Environmental Monitoring Committee (EMC) on an integrated program of chronic toxicity testing for the entire Elk Valley.
- **Gamete Study and Sublethal Toxicity Study Using Site Performance Objectives (SPO) Mixtures.** This subprogram, depicted in green in Figure 1, included chronic toxicity tests required to satisfy Permit 107517 requirements specified in sections 9.8(i) and 9.8.2. The SPO Mixtures portion of this subprogram was completed in 2015, The westslope cutthroat trout (WCT) gamete study was also completed in 2015. In the 25 August 2018 amendment to Permit 107517, the WCT subprogram was revised to shift focus from WCT to gametes from other aquatic species. To this end, pilot studies in 2018 were initiated with one amphibian species (Columbia Spotted Frogs) and one fish species (Redside Shiner). Reporting for these tests is being conducted under separate scope.
- **Nitrate and Sulphate Toxicity Studies.** This subprogram, depicted in purple in Figure 1, addresses requirements for additional chronic testing of nitrate and sulphate. Requirements for additional nitrate testing were specified in the RAEMP approval letter and requirements for additional sulphate testing are specified in Permit Section 9.8.1. Both requirements are intended to address residual uncertainty for these substances for untested species (i.e., amphibians) and at high hardness levels. In August 2018, BC Ministry of Environment and Climate Change notified¹ Teck that the interpretive report for high hardness levels was accepted, therefore satisfying Permit requirements for this uncertainty. Amphibian testing was completed in 2018. Reporting for these tests is being conducted under separate scope.

¹ BC Ministry of Environment and Climate Change. 2018. Re: Acceptance of the Final Interpretive Report Chronic Toxicity Testing of Nitrate and Sulphate to Support Permit Requirements (March 31, 2018). Letter submitted to Teck Coal Limited. 27 August 2018.

Figure 1.1-1: Overview of Elk Valley Chronic Toxicity Testing Program



1.2 Linkages to the Water Quality Adaptive Management Plan for Teck Coal in the Elk Valley

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP) to support implementation of the EVWQP to achieve water quality targets including calcite targets, ensure that human health and the environment are protected, and where necessary, restored, and to facilitate continuous improvement of water quality in the Elk Valley. Following an adaptive management framework, the AMP identifies six Management Questions (MQs) that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. Triggers also have been identified for specific MQs, which if reached, initiate action under the AMP Response Framework. The AMP also identifies key uncertainties that need to be reduced to fill gaps in current understanding and support achievement of the EVWQP objectives.

The results presented in this report provide information relevant to two of the six MQs and many of the key uncertainties identified in the AMP. Chronic toxicity testing results along with data collected from other programs are needed for re-evaluating the answers to MQ 2 (“Will the aquatic ecosystem be protected by meeting the long-term Site Performance Objectives [SPOs]?”), and MQ 5 (“Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?”). Reaching an answer of “no” or “uncertain” to a Management Question would lead to action under the Response Framework in the AMP. Examples of findings that have prompted action under the Response Framework are discussed in Sections 2.2.2 (methods) and 3.3.1 (results).

Chronic toxicity testing results also assist in reducing KU 2.1 (“How will the science-based benchmarks be validated and updated?”), KU 2.2 (“How will the integrated assessment methodology used to derive area-based SPOs be validated and updated?”), and KU 5.1 (“How will monitoring data be used to identify potentially important mine-related effects on the aquatic ecosystem?”). Progress on reducing these key uncertainties, and associated learnings, will be described in Annual AMP Reports.

Please refer to the 2018 AMP (Teck 2019a) for more information on the adaptive management framework, Management Questions, key uncertainties, the Response Framework, Continuous Improvement, linkages between the AMP and other EVWQP programs, and AMP reporting.

1.3 Objective

The objective of this interpretive report is to present results from 2018 chronic testing, interpret test results by comparing to reference water responses, evaluate correspondence between water chemistry and toxicological responses, and identify recommendations for revision or augmentation of planned future programs. This report is provided to Teck to meet the chronic toxicity related reporting requirements of Permit 107517 Section 10.3 (amended 18 January 2019).

1.4 Incorporating Feedback from the Environmental Monitoring Committee

Technical advice was provided by EMC members on the 2017 chronic toxicity interpretive report via written advice and subsequent discussions during the June 2018 and October 2018 meetings and the February 2019 conference call. Key changes made in response to EMC advice were:

- Exclude selenium from the sum of toxic unit (Σ TU) calculation (Section 2.3.4)
- Incorporate graphical station-by-station summary of chronic toxicity results. To aid readers with distinguishing colours, the alternative figure proposed by the EMC was used (Section 3.3.2).

- Incorporate a tabular summary of the principal causes of toxicity. The summary also identified tests for which no mine-influenced constituent was identified as a potential cause of toxicity (Section 4.0).
- Evaluate temporal trends of responses using two approaches: (1) the temporal trend as a direct measure of whether conditions are stable, improving, or worsening; and (2) temporal response as an indicator of whether documented changes in specific water quality constituents (e.g., nickel in CM_MC2) are consistent with identifying that constituent as a demonstrated toxicant (i.e., insight into causation) (Section 3.5).
- Incorporate Elk Valley Water Quality Benchmarks or water quality guidelines on concentration-response figures (Section 3.4).

1.5 Report Organization

The remaining sections of this report present the methods (Section 2.0), results of the 2018 chronic toxicity testing program including concentration-response evaluation and comparisons to previous findings (Section 3.0), summary of findings (Section 4.0), uncertainty assessment (Section 5.0), and recommendations (Section 6.0). A summary of the acute toxicity testing conducted in 2018 is presented in Appendix B.

2.0 METHODS

2.1 Field

Water samples were collected from reference locations upstream of mine-related influences and test sites downstream of mining, as shown in Table 2.1-1. Water samples were submitted to Nautilus Environmental (Nautilus; Burnaby, British Columbia and Calgary, Alberta) for toxicity testing (Section 2.2) and to ALS Environmental (Burnaby, BC) for chemical analysis. Weekly refresh samples were collected for toxicity tests longer than 7 days. Water samples were submitted for chemical analysis each time samples (whether for test initiation or refresh) were collected. Water collection dates and maps of reference and test sites are provided in Appendix B.

Rationale for inclusion of these stations is as follows:

- All four references (FR_UFR1, GH_ER2, CM_MC1, LC_SLC) were incorporated by Teck to provide information on responses in Elk Valley waters for samples upstream of the zone of mine influence. The four reference locations are not specified in the Permit but are included to assist with the interpretation of responses observed in mine-influenced waters.
- Seven of nine test sites (all except FR_FRABCH and CM_MC3) were included in the program, following Permit specifications.
- Two of nine test sites (FR_FRABCH and CM_MC3) were incorporated by Teck to provide information on responses downstream of the Permit-specified locations, including a candidate future compliance location (FR_FRABCH) and to characterize the spatial extent of effects in Michel Creek (CM_MC3). As discussed in Section 2.2.2.2, these stations were added following the AMP Response Framework.

Table 2.1-1: Reference Locations and Tests Sites used in the Quarterly and Semi-Annual Toxicity Testing

Watercourse	Reference or Test Site	Teck WQ Station ID ^(a)	EMS ID	Station Name
Fording River	Reference	FR_UFR1	E216777	Fording River upstream of Henretta Creek
	Test Site	FR_FRCP1	E300071	Fording River downstream of Cataract Creek
		FR_FRABCH ^(b)	—	Fording River upstream of Chauncey Creek
		GH_FR1	200378	Upper Fording River downstream of Greenhills Creek [Order Station FR4]
Elk River	Reference	GH_ER2	200389	Elk River upstream of Greenhills Operations
	Test Site	GH_ERC	E300090	Elk River downstream of Thompson Creek
Michel Creek	Reference	CM_MC1	E258175	Michel Creek upstream of Operations
	Test Site	CM_MC2	E258937	Michel Creek upstream of Andy Goode Creek
		CM_MC3 ^(b)	—	Michel Creek downstream of Andy Goode Creek
		EV_MC2	E300091	Michel Creek at Highway 3 Bridge
Harmer Creek	Test Site	EV_HC1	E102682	Harmer Spillway at Elk Valley Operations
South Line Creek	Reference	LC_SLC	E282149	South Line Creek West Side of Main Rock Drain
Line Creek	Test Site	LC_LCDSSLCC	E297110	Line Creek downstream of South Line Creek

ID = Identification; WQ = water quality

^(a) Stations are listed from upstream to downstream for each watercourse.

^(b) Station not currently part of Permit requirements but added to characterize spatial extent of effects (CM_MC3) or to evaluate mainstem Fording River conditions (FR_FRABCH). Non-permitted sites that were monitored in 2018 may be adjusted in future sampling events to better understand/reflect spatial extent or mixed conditions

2.2 Laboratory

2.2.1 Quarterly and Semi-Annual Testing Program

Test organisms and procedures used in the quarterly and semi-annual testing program followed requirements outlined in Permit Section 9.8(ii). An overview of this program is provided in Table 2.2-1. Laboratory reports for each round of quarterly and semi-annual testing are provided in Appendix B, including detailed methodology, raw data, laboratory notes, quality assurance overview, and statistical significance tests, per protocol requirements.

Table 2.2-1: Summary of Quarterly and Semi-Annual Toxicity Tests

Test Species	Test Duration [days]	Endpoint(s)	Test Protocol	Number of Replicates per Test	Frequency of Testing
Water flea— <i>Ceriodaphnia dubia</i>	7 ± 1	Survival and reproduction	Environment Canada (2007a)	10	Quarterly
Green alga— <i>Pseudokirchneriella subcapitata</i> (formerly <i>Selenastrum capricornutum</i> , reclassified as <i>Raphidocelis subcapitata</i>)	3	Cell yield (growth inhibition)	Environment Canada (2007b)	8 (references and laboratory control); 4 (test sites)	Quarterly
Rainbow trout— <i>Oncorhynchus mykiss</i>	30	Survival, viability (which assesses incidence of deformities), length, weight, behaviour ^(a)	Environment Canada (1998) embryo-alevin test	4	Semi-annual
Amphipod— <i>Hyalella azteca</i>	28	Survival and growth	Modified from US EPA (2000), as described in Norberg-King et al. (2014)	5	Quarterly
Fathead minnow— <i>Pimephales promelas</i>	28 days post-hatch ^(b)	Survival, hatch, length, biomass, normal development	US EPA (1996) and ASTM (2013)	4	Quarterly

^(a) The behaviour endpoint is limited to documentation of unusual behaviours, rather than a quantitative endpoint. Permit 107517 also includes hatching as an endpoint. Hatch rate is not part of the Environment Canada (1998) protocol. However, the survival endpoint provides an appropriate measure of successful hatch, since the test is terminated shortly following hatch (Appendix B).

^(b) Test duration is from <24 hour eggs until the organisms reach 28 days post-hatch. Total test duration is usually between 30 and 32 days (James Elphick, pers. comm.).

Table 2.2-2 summarizes the number of tests conducted in 2018 for each test species and station. Following permit requirements, quarterly (*Ceriodaphnia dubia* and *Pseudokirchneriella subcapitata*) and semi-annual (*Oncorhynchus mykiss*) chronic toxicity tests were conducted using water collected from seven of nine test sites listed in Table 2.1-1. As discussed in Section 2.1, two of nine test sites (FR_FRABCH and CM_MC3) were incorporated by Teck to provide information on responses downstream of the Permit-specified locations, including a candidate future compliance location (FR_FRABCH) and to help characterize the spatial extent of effects in Michel Creek (CM_MC3). The Fording River (FR_UFR1), Elk River (GH_ER2), and Michel Creek references were tested in all four quarters (Q1–Q4), whereas the South Line Creek reference was tested in Q2, Q3, and Q4. Quarterly toxicity tests with *Hyalella azteca* and *Pimephales promelas* were conducted at a subset of test sites per Permit requirements. Laboratory control water tests were also conducted for each species and test date, as specified in Appendix B.

For some tests, minor amendments of site waters were incorporated to improve the ability of the tests to identify mine-related responses, as distinct from spurious adverse effects caused by a natural biological agent (e.g., microbes causing fungal infections in fish) or lack of nutritional elements for laboratory organisms (e.g., low halides inhibiting crustacean development). These adjustments, which consisted of additional or trace amounts of copper or halides, were carefully designed to avoid introduction of adverse responses, and therefore reduce variation in test responses without introducing analytical bias. *Pimephales promelas* tests in 2018 were conducted in copper-amended water. As discussed in Appendix B, copper amendment was used to curtail growth of microbes in site water; this test revision incorporates the outcome of previous investigations of anomalous responses (i.e., sporadic mortality phenomenon). Per discussions with EMC² and subsequent approval by ENV³, non-amended *P. promelas* test results from previous sampling years (2015 and Q1 2016) are not included in the statistical analysis of quarterly test results due to their low reliability for assessing toxicant-based responses.

² EMC conference call on 30 November 2016; summary of the conference call is provided in Teck (2016b).

³ MoE (2016). Letter to Teck Coal Limited. Re: Copper amendment for microbial control in the Fish Early-Life Stage Toxicity Test. 23 December 2016.

Table 2.2-2: Summary of Quarterly and Semi-Annual Tests Conducted in 2018 ^(a,b,c)

Watercourse	Reference ^(d) or Test Site	Teck WQ Station ID	<i>C. dubia</i>	<i>P. subcapitata</i>	<i>O. mykiss</i>	<i>H. azteca</i>	<i>P. promelas</i> ^(c)
Fording River	Reference	FR_UFR1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
	Test Site	FR_FRCP1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
		FR_FRABCH ^(e)	Q4	Q4	Q4	Q4	Q4
		GH_FR1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
Elk River	Reference	GH_ER2	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
	Test Site	GH_ERC	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q4	—
Michel Creek	Reference	CM_MC1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
	Test Site	CM_MC2	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
		CM_MC3 ^(e)	Q1, Q2, Q3, Q4	Q1, Q3	—	Q1, Q2, Q3, Q4	—
		EV_MC2	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q4	—
Harmer Creek	Test Site	EV_HC1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q4	—
South Line Creek	Reference	LC_SLC	Q2, Q3, Q4	Q2, Q3, Q4	Q2, Q4	Q2, Q3, Q4	—
Line Creek	Test Site	LC_LCDSSLCC	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	Q2, Q3, Q4	—
Total number of tests per species			48	46	23	38	25

^(a) Stations are listed from upstream to downstream for each watercourse.

^(b) One test was conducted per test species, quarter, and station (i.e., each Q in this table represents one test). Q1 = quarter 1; Q2 = quarter 2; Q3 = quarter 3; Q4 = quarter 4. “—” indicates that the test is not required under Permit 107517.

^(c) *P. promelas* tests were conducted using copper-amended samples (Appendix B).

^(d) Reference locations are not specified in the Permit but are included to assist with the interpretation of responses observed in mine-influenced waters.

^(e) Station not currently part of Permit requirements but added to characterize spatial extent of effects (CM_MC3) or to evaluate mainstem Fording River conditions (FR_FRABCH). Non-permitted sites that were monitored in 2018 may be adjusted in future sampling events to better understand/reflect spatial extent or mixed conditions

2.2.2 Supplemental Testing

Unexpected findings in chronic toxicity monitoring were reviewed in relation to MQ 2 (“Will the aquatic ecosystem be protected by meeting the long-term SPOs?”) and MQ 5 (“Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?”) of the AMP. Unexpected findings would potentially indicate a “no” or “uncertain” answer to these questions, and therefore prompted an evaluation of potential actions under the AMP Response Framework. For the 2018 chronic toxicity program, three unexpected findings triggered further investigation through supplemental tests. Supplemental tests were conducted to evaluate potential effects of microbes on *O. mykiss* test responses (Section 2.2.2.1) and to evaluate potential cause(s) of responses observed in FR_FRCP1 and CM_MC2 tests (Section 2.2.2.2). An overview of methods for supplemental testing and context of related adaptive management responses is provided below. Results are discussed in Section 3.3.1.

2.2.2.1 Copper- and Argentine-Amended Tests with *O. mykiss*

Supplemental *O. mykiss* tests to evaluate potential effects of microbes on test responses were conducted with one reference (Fording) and one test site (GH_FR1) treated with argentine (Q2), argentine and 20 µg/L copper (Q2), 20 µg/L copper (Q2 and Q4), or 40 µg/L copper (Q2 and Q4). These tests represent supplemental investigations of causation of embryo-larval mortality of trout, which was observed at elevated frequency in 2016 and continued through 2017. The amended trout tests have not been advanced to the same level of technical understanding as for the fathead minnow tests (i.e., the efficacy and optimal copper amendment concentrations have not yet been defined in detail). Therefore, this report relies principally on the unamended site water responses (i.e., methods equivalent to previous years of testing), with the paired amended results for rainbow trout considered separately for insight into causation. Results of these supplemental tests are not presented in Appendix B but are summarized herein (Section 3.3). Results are discussed with respect to the efficacy of the treatment and the potential for direct toxicity of the treatment in site waters.

2.2.2.2 Toxicity Identification Evaluations

Following the AMP Response Framework, Toxicity identification evaluations (TIEs) were conducted to investigate the cause of adverse responses observed in the Q4 FR_FRCP1 test and to support the interpretation of nickel as the suspected cause of adverse responses in CM_MC2 tests. To provide context for these supplemental studies, additional information on AMP response actions related to these findings is briefly summarized below and will be discussed further in annual reporting under the AMP.

FR_FRCP1 Adaptive Management Responses

Seasonally variable responses have been observed in previous chronic toxicity testing at FR_FRCP1 (Golder 2018a), and this finding has triggered further evaluation and investigation under the AMP response framework. Water quality monitoring data also show strong seasonal variation in conditions, which is now understood to reflect a seasonal pattern of subsurface flow in the Fording River. The channel bed of the upper Fording River changes from bedrock near the Fording River Operations South Tailings Pond to alluvial sediments in downstream reaches. As a result of the greater permeability of alluvial sediments, a portion of the Fording River flow naturally goes subsurface in this area and travels underground for several kilometers before re-emerging as surface flow. The effect of this subsurface flow on surface hydrology is most pronounced in winter when flow in the Fording River is seasonally lowest.

The effect of subsurface flow on water quality in the upper Fording River is to reduce the dilution available for inputs of mine-affected tributaries entering the Fording River mainstem. In particular, inputs from Cataract Creek can have a pronounced effect on winter water quality at FR_FRCP1, which is located approximately 525 m downstream of the mouth of Cataract Creek. Water quality at FR_FRCP1 has been reported to exceed one or

more compliance limits for selenium, nitrate, and sulphate during winter low-flow conditions since 2015. Seasonal peaks of mine-related constituents occur between November and March of each year, reflecting the influence of Cataract Creek inputs with low or no dilution from upstream surface flow of the Fording River during periods when a relatively large portion of the Fording River flows subsurface.

Given the current understanding of seasonal hydrology and water quality at FR_FRCP1, Teck has initiated several actions:

- First, Teck has applied for approval to expedite conveyance of Cataract Creek flows upstream to the Swift Creek Ponds. This conveyance is ultimately intended to direct Cataract Creek and Swift Creek water into the Fording River Operations South Active Water Treatment Facility (AWTF). Commencing conveyance prior to constructing the AWTF has been proposed as a short-term mitigation action to ameliorate water in the reach of the Fording River with low or no winter surface flow⁴.
- Second, Teck has applied to relocate the Fording River Operations compliance location from FR_FRCP1 to a location approximately 5 km downstream, where the Fording River has returned to surface. The new location will better attain the objective of a compliance location to monitor fully mixed conditions in the receiving environment downstream of FRO and will capture and reflect all or most point and non-point source discharges from the mine site. The proposed location, named FR_FRABCH, is immediately upstream of the confluence with Chauncey Creek. Monitoring at this location is expected to reflect mixed Fording River conditions, and to be less subject to midwinter flows of Cataract Creek water in the Fording River channel. While the application for station relocation was in progress, station FR_FRABCH was added to the chronic toxicity program in Q4 2018 as a better representation of potential effects in mixed Fording River conditions.
- Third, Teck has initiated TIE studies to better understand the cause(s) of toxicity at FR_FRCP1 in Q4 testing. Methods for the Q4 FR_FRCP1 TIE are as follows (Appendix B-5):
 - Treatments were conducted with *C. dubia*, which has been shown to be sensitive to some mine-related constituents of potential concern and to have the highest frequency of adverse responses in 2018 quarterly testing.
 - Initial treatments were designed to identify whether toxicity was caused by divalent metal cations (using ethylene diamine tetra-acetic acid [EDTA] treatment), inorganic constituents (using pH 10 treatment), organic constituents (using C18 treatment), anions (using strong anion exchange treatment), or calcite formation (using antiscalant). Each of four samples collected on a weekly basis between October 30 and November 20 were treated with EDTA. The remaining TIE treatments were conducted on the sample collected on November 6.
 - Dilution series tests were conducted with *C. dubia* and *P. subcapitata* to determine the magnitude of effect in the Q4 FR_FRCP1 sample. In the *P. subcapitata* test, algal cell yield was not below control response, so no further testing was conducted.

⁴ The portion of the Upper Fording River that is primarily subsurface flow varies based on flow conditions, and is greatest in winter. In December 2018, the spatial extent of limited surface flow was approximately two kilometres (i.e., surface flows reappeared near the confluence with Porter Creek), although most of the subsurface flow returned to surface several kilometres downstream (i.e., closer to Chauncey Creek).

CM_MC2 Adaptive Management Responses

Adverse responses have been observed in previous chronic toxicity testing at CM_MC2 (Golder 2018a), with a general increasing trend of frequency and magnitude of responses in crustacean tests across years. In addition, biological monitoring in 2015, 2016, and 2017 reported reduced abundance of mayflies (a sensitive benthic invertebrate taxon) at Michel Creek downstream of Corbin Creek relative to previous years and relative to upstream portions of Michel Creek. These findings triggered further evaluation and investigation under the AMP response framework.

In 2017, a TIE was initiated to investigate the cause of adverse responses observed in CM_MC2 chronic toxicity tests. Nautilus (2018) identified nickel as the likely cause of toxicity in these tests. This interpretation was supported by 1) a review of nickel toxicity data that indicated a potential for effects on sensitive invertebrate species at concentrations near 5 µg/L, below the BC water quality guideline of 150 µg/L for high-hardness waters; and 2) a review of water quality data that indicated the increasing trend in chronic toxicity test responses corresponded with an increasing trend in aqueous nickel concentrations between 2015 (generally ranged from 5 to 15 µg/L) to 2017 (generally ranged from 10 to 45 µg/L) (Golder 2018a).

As a result of identifying nickel as a potential toxicant in CM_MC2 tests, Teck has initiated several actions:

- First, Teck has expanded monitoring at CMO to better understand and delineate potential effects. Station CM_MC3 was added to the chronic toxicity program in Q1 2018. This station is not a Permit location but was added to the program to characterize the spatial extent of potential effects in chronic toxicity tests. Supplemental biological monitoring was conducted at CMO under the RAEMP in 2017 and 2018, and in 2019 this supplemental monitoring was expanded and formalized into a local aquatic effects monitoring program (LAEMP) for CMO.
- Second, Teck has continued TIE studies in 2018 to further support the interpretation of nickel as the cause of adverse responses in CM_MC2 crustacean tests. Methods for the 2018 Michel Creek TIE are as follows (Appendix B-6):
 - Treatments were conducted with *C. dubia* and *H. azteca*, which have been shown to be sensitive to nickel. Treatments were conducted using CM_MC2 water (Q1 to Q4; both species) and CM_MC3 water (Q4; *C. dubia* only). *C. dubia* water collection dates were February 27 (Q1), April 30 (Q2), August 7 (Q3), and October 30 (Q4). *H. azteca* water samples were collected on a weekly basis between February 7 and March 20 (Q1), April 30 and May 22 (Q2), August 7 to 28 (Q3), and January 9 to 30 (Q4)⁵.
 - Treatments were designed to identify whether toxicity was caused by divalent metal cations (using EDTA treatment). Treated and untreated samples were tested concurrently, so that any effect of the treatment could be discerned.
- Third, Teck initiated studies to support the development of site-specific effects benchmarks for nickel in the Elk Valley. This work includes an ongoing series of laboratory-based toxicity studies and desktop data analyses to better understand the toxicity of nickel in Elk Valley waters, the influence of water chemistry factors on toxicity, and to what extent nickel may be contributing to observed effects in the chronic toxicity and biological monitoring programs. The outcome of this work is expected to be a set of site-specific benchmarks that will support evaluation and management of nickel at CMO and throughout the Elk Valley.
- Fourth, Teck is evaluating mitigation options for nickel at CMO. This evaluation is proceeding in parallel to the toxicity investigation work described in the preceding bullet.

⁵ Control survival did not meet the acceptability criterion of 80% in the initial Q4 *Hyalella* test, so the test was re-started in January 2019 (Appendix B-4).

2.3 Data Analysis

Data analysis consisted of the following five steps:

- Review and summarize quality assurance/quality control information from laboratory reports to establish that organism performance in the laboratory control water met acceptability criteria for the protocol (Section 2.3.1)
- Address key sources of variance that could affect responses observed in test waters, so that the ability to detect a true toxicological response is improved (Section 2.3.2)
- Categorize 2018 test results as no, possible, or likely adverse response, based on the response size in the test and how the response compares to the typical range observed in local and regional reference waters (Section 2.3.3)
- Conduct a concentration-response analysis to examine potential causes of responses observed in 2018 tests categorized as possible or likely (Section 2.3.4). TIE results (Appendix B-5 and B-6) were reviewed to evaluate alignment between cause(s) identified in the concentration-response analysis and TIE findings⁶.
- Compare 2018 test results to previous years to identify potential response patterns (i.e., were adverse responses observed in the same quarter and test species in 2018 and previous years) and potential causation patterns (i.e., were adverse responses attributed to the same constituents in 2018 and previous years?) (Section 2.3.5)

2.3.1 Quality Assurance/Quality Control

Laboratory reports for each round of quarterly and semi-annual testing include a quality assurance section (Appendix B). Quality assurance information was reviewed and summarized to establish that organism performance in the laboratory control water met acceptability criteria for the protocol as it pertains to the health histories and sensitivity of the organisms, and that no deviations from test procedures occurred that would influence the reliability of the data.

2.3.2 Sources of Variance

Responses observed in test waters are subject to several sources of variance, including:

- variation in test organism performance
- variation in test organism sensitivity to toxicants
- variation in background water quality characteristics (e.g., environmental and toxicity modifying factors) and their effect on test responses
- variation in concentrations of toxicants in test waters
- other random inter-individual variability that manifests as experimental 'noise'.

One of the objectives of the quarterly and semi-annual interpretive report is to identify toxicological responses and distinguish these responses from other sources of variance. The ability to detect a true toxicological response is

⁶ TIE findings provide a direct assessment of cause-effect hypotheses that are developed from the statistical associations identified in the concentration-response analysis. TIEs have been conducted for stations (e.g., FR-FRCP1 and CM_MC2) that have exhibited patterns of toxicological responses and for which confirmation of a primary toxicant is needed.

improved when confounding effects of the other sources of variance are minimized. Therefore, the following sections outline the approach used to evaluate and address the first four sources of variance. Addressing the first four sources of variance is expected to substantially improve the ability to identify a true toxicological response; therefore, no methods were employed to estimate other factors contributing to experimental noise.

2.3.2.1 Organism Performance

To control for temporal variation in test organism performance (batch sensitivity) as a potential confounding factor, response data (including reference waters and test waters) were control-normalized⁷ before performing data analyses. The objective of control normalization was to use control responses to reduce or eliminate variation in test organism performance among test batches, such that the ability to detect a true toxicological response between test site waters and reference waters is improved. Control normalization was implemented for all endpoints except for *P. subcapitata* cell yield, per agreement at the 5 February 2018 conference call with the EMC. Algal cell yield was excluded from this step because it is largely influenced by the variability in nutrient concentrations and ionic strength of lab water and site water.

2.3.2.2 Organism Sensitivity

To evaluate whether temporal variation in test organism sensitivity was a potential confounding factor, reference toxicant test data were summarized from laboratory reports and compared across test batches. For each test species and endpoint, effect concentrations from reference toxicant tests were expressed as a percentage of the historical mean reference toxicant effect concentration and plotted for visual examination. Values greater than 100% indicate that organisms in that batch are less sensitive relative to the historical mean, whereas values less than 100% indicate organisms are more sensitive relative to the historical mean. Observations of organism sensitivity were considered qualitatively by visually assessing whether responses in reference toxicant tests were consistently above or below the historical mean. Organism sensitivity was considered stable if reference toxicant results fell close to the historical mean (within 15%). Reference toxicant results that deviated farther from the historical mean were evaluated for patterns (e.g., were values consistently above or below the historical mean?). As discussed in Appendix B, the sensitivity of organisms used in the toxicity tests is considered appropriate if the mean response in reference toxicant tests falls within two standard deviations of historical results obtained from the laboratory.

2.3.2.3 Background Conditions (Normal Ranges)

To evaluate whether temporal or spatial variation in background water quality and its effect on test responses might be a confounding factor, normal ranges (NRs) were developed for responses in reference waters. For each endpoint, two types of NRs were calculated:

- Local NR—Local NRs were developed separately for each reference location. Each NR was inclusive of findings from multiple batches of tests (e.g., Fording River NR included all tests conducted to date with Fording River reference water).
- Regional NR—The regional NR was inclusive of findings from multiple batches and multiple reference locations (Fording River, Elk River, Michel Creek, and South Line Creek references).

NRs were developed using the 2015 to 2018 quarterly results from Elk River and Fording River reference sites, the 2017 to 2018 quarterly results from the Michel Creek reference site, and the 2018 quarterly results from the

⁷ $control - normalized\ response = \left(\frac{site\ water\ response}{control\ response} \right) \times 100$

South Line Creek reference site. Per discussions with the EMC at the February 2018 meeting, NRs were defined as the 2.5th to 97.5th percentiles of mean test results (i.e., NRs were intended to identify results that fall at the tails of the distribution, with an overall 5% chance that a randomly selected result would fall outside the NR). Percentiles were estimated using the normal distribution function in Systat™. For some endpoints, assumptions of normality were not met (i.e., p value <0.05), indicating that a normal distribution may not be appropriate for the dataset. This generally occurred when the sample size was small (e.g., three South Line Creek reference tests for *C. dubia*) or the variance in reference test results was low (e.g., control-normalized development for *P. promelas* was 100% in 15 of 20 reference tests). Because normality was not met in all datasets, NRs in some cases may represent a central percentile of values larger or smaller than 95%; however, NRs were still considered to be useful to characterize the typical range of responses observed in reference waters. Responses in reference waters tested in 2015, 2016, 2017, and 2018 were also plotted for visual assessment.

Because of the small number of South Line Creek reference tests for all species ($n = 2$ to 3) and Michel Creek reference tests for *O. mykiss* ($n = 2$), local NRs in these cases were considered preliminary and were not used in the evaluation of test results. Therefore, test sites in these local watersheds were paired with the best reference match *a priori*, based on geography and availability of data (see Section 2.3.3 for more details).

The approach used herein to develop local and regional NRs, as well as the NRs themselves, are based on findings to date. The approach and NRs developed herein are expected to undergo refinement with future chronic toxicity testing results. For example, the preliminary NRs based on low sample sizes will be recalculated for future years of monitoring and will achieve the sample sizes required for derivation of reliable NRs.

2.3.2.4 Variation in Concentrations of Toxicants

To evaluate variation in concentrations of toxicants in test waters, coefficients of variation (CVs) were calculated for mean test concentrations and reviewed to assess whether variability in weekly concentrations. The CV is a measure of relative variability, calculated as the ratio of the standard deviation to the arithmetic mean. If a concentration was below the reported detection limit, the full detection limit was used. CVs were calculated for *H. azteca*, *O. mykiss*, and *P. promelas* tests, as these are the only tests with weekly refresh samples. *C. dubia* and *P. subcapitata* tests are conducted using water collected on a single day (Section 2.1); therefore, this source of variance is not expected to be a confounding factor for these species.

2.3.3 Evaluation of 2018 Test Results

The 2018 test results were evaluated using the following three comparisons:

- **Batch-specific comparison**—Pairwise comparisons of test site responses to reference responses, with analysis limited to batch-specific findings (i.e., test site results for each quarter were compared to all references tested in that quarter). Each quarterly laboratory report includes statistical analyses using CETIS™ (Comprehensive Environmental Toxicity Information System; Tidepool Scientific Software 2013) to identify test sites with mean results statistically significant ($p < 0.05$; herein referred to as ‘significantly’) lower than the mean response in associated Fording River, Elk River, Michel Creek, or South Line Creek reference waters.
- **Local reference comparison**—Mean test site responses were compared to local NRs. As described in the previous section, local NRs were inclusive of findings from multiple batches at a single reference location. Each test site was paired with the best reference match *a priori*, based on geography and availability of data. When available, test sites were paired with an upstream reference in the same local watershed. If an upstream reference was not available, then the test site was paired with the upstream reference on the watercourse that the tributary flows into (e.g., Line Creek is a tributary of Fording River, so the Fording River

reference was used for LC_LCDSSLCC). Pairings are provided in Table 2.3-1. Reference pairings used herein are expected to change over time, as additional data are collected for the chronic toxicity testing program (e.g., new reference stations and/or increased sample size for the existing reference station design).

- **Regional reference comparison**—Mean test site responses were compared to regional NRs. As described in the previous section, regional NRs were inclusive of findings from multiple batches and multiple reference locations.

The 2018 test site results were categorized as no, possible, or likely adverse response according to the methods in Figure 2.3-1. Categories for 2018 test results were presented by test species and test site. Test results were interpreted as follows:

- A test was considered to reflect **no adverse response** if the mean result was:
 - not significantly lower than any reference in the batch (per statistical comparisons in laboratory reports [Appendix B]) or
 - significantly lower than one or more references in the batch but within the local NR and effect size was less than 20%
- A test was considered to reflect a **possible adverse response** if the mean result was significantly lower than one or more references in the batch, but was:
 - within the local NR and the effect size was between 20 and 50% or
 - below the local NR but within the regional NR

Tests in this category were considered to have uncertainty regarding whether the result represents an adverse response to toxicants in the test water or rather reflects variance in test organism performance related to background water quality.

- A test was considered to reflect a **likely adverse response** if the mean endpoint result was significantly lower than one or more references in the batch and:
 - within the local NR but the effect size was greater than 50% or
 - below the regional NR

Any endpoint categorized as a possible or likely adverse response in one or more tests conducted in 2018 was carried forward to the concentration response analysis to evaluate causation (Section 2.3.4). If an endpoint was carried forward, then all available tests for that endpoint were included in the concentration-response analysis (i.e., tests conducted with reference and test site waters in 2015, 2016, 2017, and 2018).

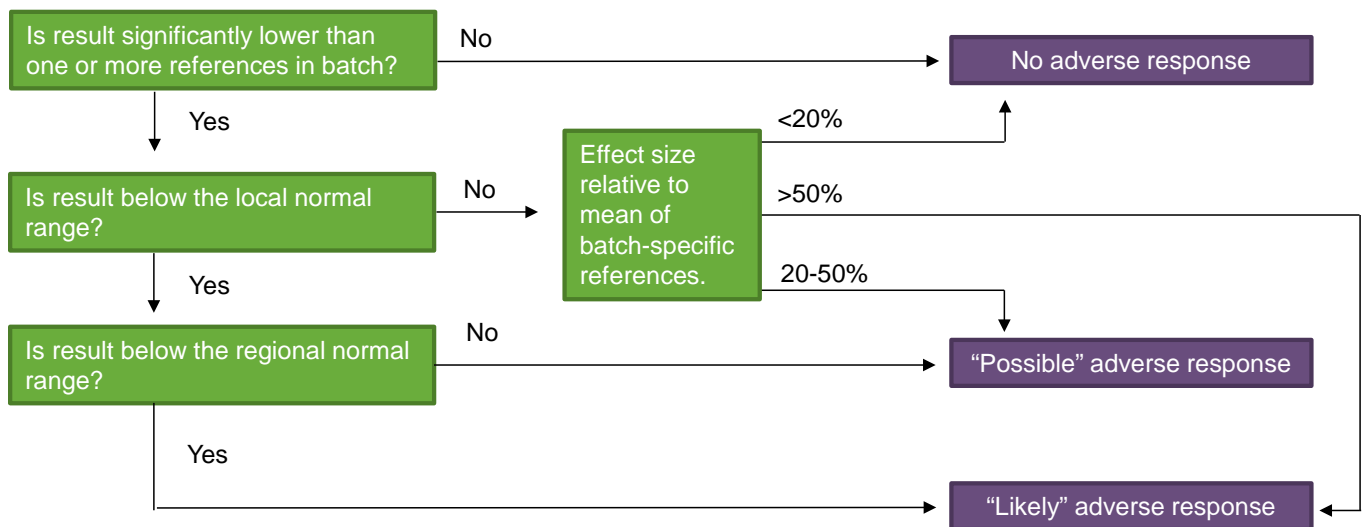
Although the statistical comparisons to NRs remain the primary basis for classification of test results, the effect size decision point recognizes that there can be different levels of test variance (and statistical power) in individual rounds of testing. The effect size decision rule helps to discern results that are statistically significant but with low magnitude of response from those that are larger in response magnitude. The use of the 50% effect size threshold provides a means of flagging larger responses, but for which the variance in NRs is very wide (i.e., low statistical power to identify an adverse response).

Table 2.3-1: Reference and test site pairings used in the local NR comparison.

Test Site	Local Reference Comparison	Rationale
FR_FRCP1	Fording River (FR_UFR1)	Reference is located on the same watercourse.
FR_FRABCH ^(a)		
GH_FR1		Currently there are insufficient South Line Creek reference tests (all species). Line Creek is tributary to Fording River.
LC_LCDSSLCC		
GH_ERC	Elk River (GH_ER2)	Reference is located on the same watercourse.
EV_HC1		Harmer Creek (via Grave Creek) is a tributary to Elk River.
CM_MC2	Michel Creek (CM_MC1) for all species except <i>O. mykiss</i> ; Elk River (GH_ER2) for <i>O. mykiss</i>	Reference is located on the same watercourse. Currently there are insufficient Michel Creek reference tests with <i>O. mykiss</i> to develop reliable normal ranges.
CM_MC3 ^(a)		
EV_MC2		

^(a) Station not currently part of Permit requirements but added to characterize spatial extent of effects (CM_MC3) or to evaluate mainstem Fording River conditions (FR_FRABCH). Non-permitted sites that were monitored in 2018 may be adjusted in future sampling events to better understand/reflect spatial extent or mixed conditions.

Figure 2.3-1: Decision framework for inclusion of endpoints and constituents in the concentration-response analysis.



Individual replicate and mean results were plotted for all endpoints. Example data plots are provided in Figure 2.3-2 (individual replicate results) and Figure 2.3-3 (mean results) with annotation to explain how data plots were interpreted in Section 3.3. As shown in Figure 2.3-3 (mean results), local and regional NRs were shown to illustrate the normal range of test organism responses observed in reference waters tested in 2015, 2016, 2017, and 2018. Because test sites were paired with a single reference for comparison to the local NR and local NRs were used for three reference locations (see Table 2.3-1), three plots were made for each endpoint: one for the Fording River reference and its paired test sites, one for the Elk River reference and its paired test sites, and one for the Michel Creek reference and its paired test sites.

As discussed in Section 2.3.5, mean responses in chronic toxicity tests were plotted over time (2015 to 2018) to compare 2018 responses to previous years. The annotation on Figure 2.3-3 (mean results for 2018) also applies to how data plots were interpreted in Section 3.5 (mean results for 2015 to 2018).

Figure 2.3-2: Example data plot for individual replicate results.

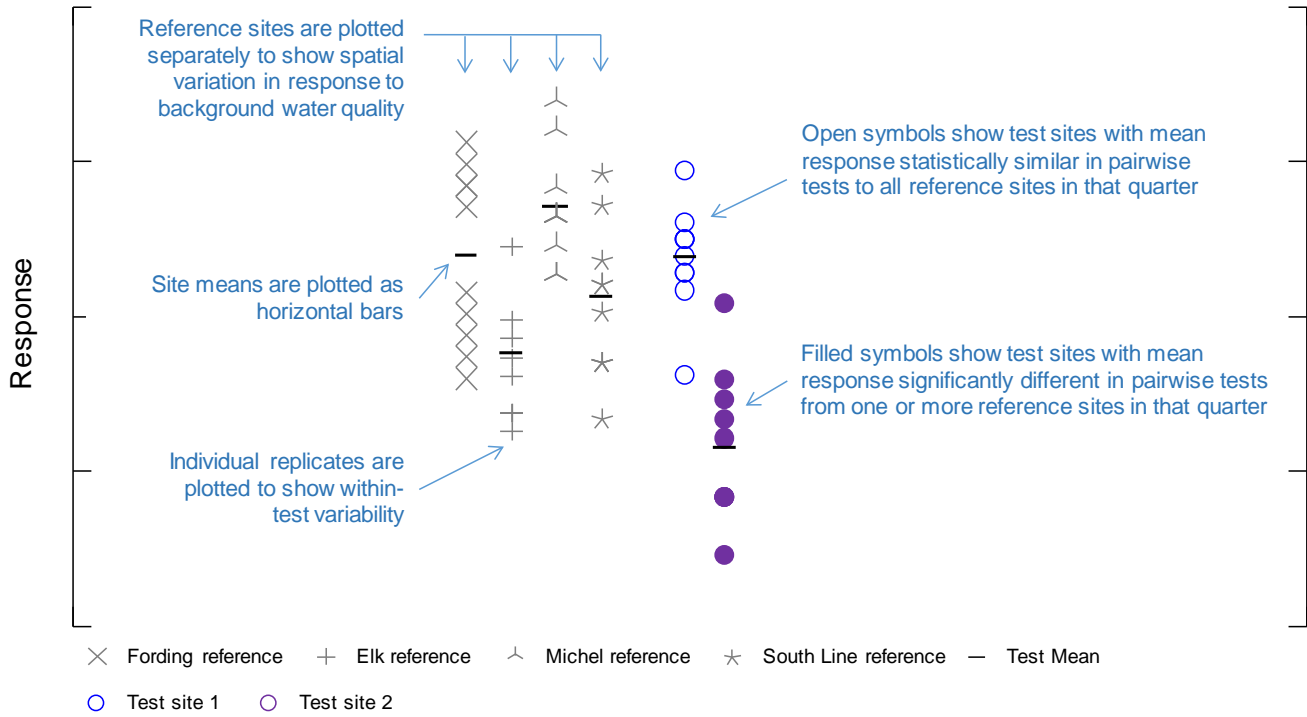
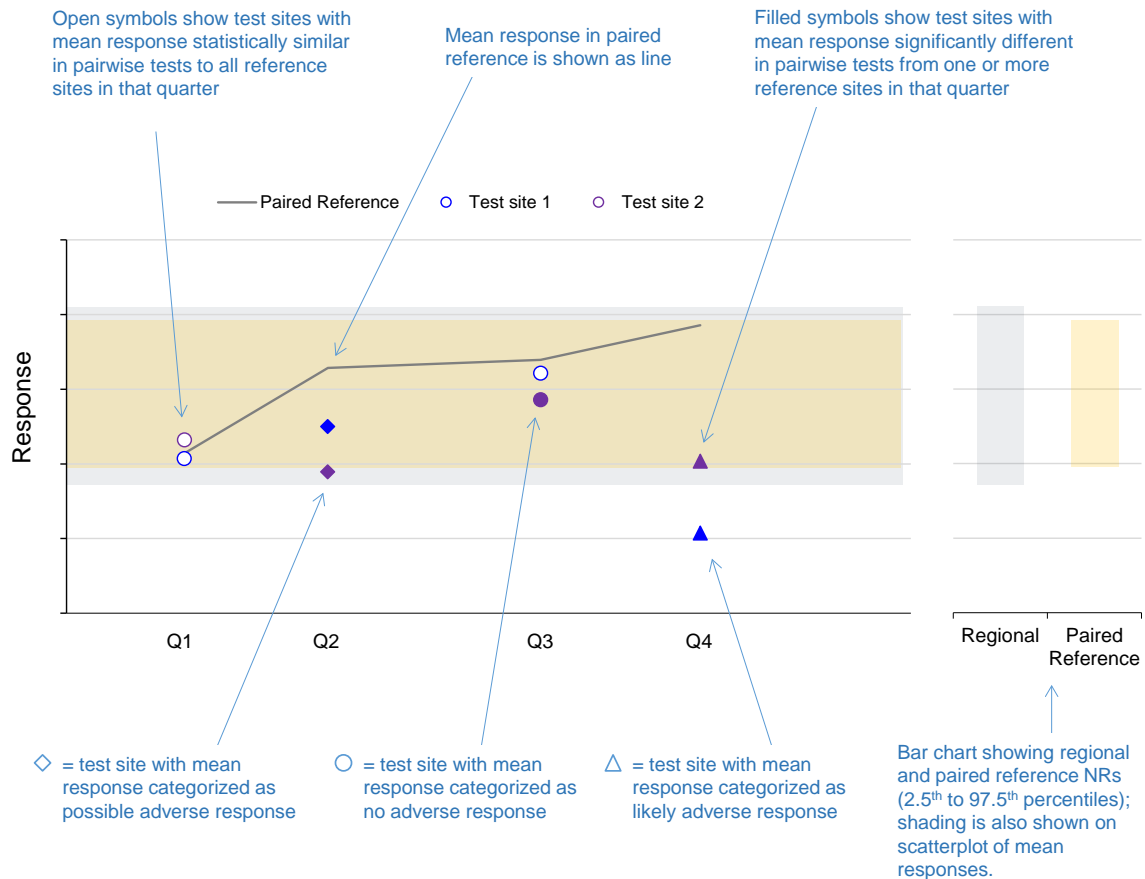


Figure 2.3-3: Example data plot for mean results.



Consideration of *Ceriodaphnia dubia* Broods

Potential implications of the Environment Canada test protocol on *C. dubia* reproduction was discussed with the EMC at the October 2018 meeting and February 2019 conference call. In brief, the *C. dubia* test protocol specifies that the test ends when $\geq 60\%$ of controls produce three or more broods. This has implications for the chronic toxicity testing program, as the reproductive output in reference and/or test site waters could be biased low by tests being terminated just before the third brood is counted. The third brood accounts for approximately 50% of the reproductive output (James Elphick, pers. comm.), which means that minor differences in brood output can have a large impact on reproduction results. Each replicate that does not produce a third brood prior to test termination could theoretically result in a reduction of the overall reproductive output by 5% (e.g., if zero of 10 replicates have a third brood, then the reproductive output could be reduced by 50%; if two of 10 replicates have a third brood, then the reproductive output could be reduced by 40%, etc.).

In consideration of the above and per discussions with the EMC, the *C. dubia* reproduction endpoint was investigated in more detail in the 2018 data processing. The purpose of this investigation was to document tests where there may be lower reproductive output due to minor differences in brood output among tests. The following approach was used to identify tests with a potential downward bias:

- For each reference and test site, the number of replicates with exactly two broods was calculated from the laboratory reports (i.e., identify replicates that may have been affected by tests being terminated just before the third brood).

- Replicates with fewer broods (zero or one) were excluded from the calculation. Exclusion of these replicates may underestimate the downward bias of brood output on reproductive output, but the underestimation is expected to be small given that first and second broods contain fewer offspring.
- Brood output in the laboratory control is used to terminate the test (Appendix B). Because reproduction in the laboratory control is not used in the response assessment (i.e., response sizes are scaled to reference performance, rather than negative control; see Section 2.3.3), control brood output is not expected to affect the overall interpretation provided herein for 2018 test results.
- The difference between the number of replicates with exactly two broods and that for batch-specific references was calculated. For example, if a Q2 test had eight of 10 replicates with two broods and the Q2 mean for references was two of 10 replicates, then the difference would be six.
- The difference was then multiplied by the estimated effect on reproductive output (5% per replicate). Continuing with the example in the previous bullet, six replicates multiplied by 5% results in a potential bias of 30% on the overall reproductive output. An alternative way of looking at this example is to interpret that the reproduction result (as reported) accounts for 70% of the potential reproductive output.
 - Because the purpose of this evaluation was to estimate potential downward bias, estimated effect on brood output was not calculated if the number of replicates with exactly two broods in a test was greater than the mean for batch-specific references.
- Control-normalized reproduction was then adjusted to account for the potential bias. For example, if the mean control-normalized response for reproduction in the same Q2 test was 78% and the measured reproduction accounts for 70% of the potential reproductive output, then the adjusted reproduction (accounting for the bias) would be 111%⁸. The adjusted reproduction result was then categorized as no, possible, or likely adverse response according to the methods in Figure 2.3-1 to evaluate the potential for brood output to affect the 2018 test categories assigned for *C. dubia*.

The above approach was intended to provide a coarse-level evaluation of brood output. In 2019 testing, quarterly chronic toxicity tests with *C. dubia* are being extended to 8 days so that the effect of brood output can be qualified. In 2019 tests, reproduction will be evaluated for both the Environment Canada protocol and for the 8-day test duration; this allows for an assessment of both reproductive output and potential minor differences in the timing of that reproductive output.

2.3.4 Concentration-Response Analysis

A concentration-response analysis was conducted to examine potential causes of adverse responses observed in 2018 quarterly and semi-annual tests. The analysis was conducted for all endpoints for which one or more “possible” or “likely” adverse responses were identified in 2018. Although correlation does not necessarily indicate causation, the analysis of correspondence between test results and water quality may provide insight into potential causes. The correlation analysis included all 2015, 2016, 2017, and 2018 quarterly and semi-annual test results for reference locations and test sites.

The examination of potential causes of responses in the quarterly and semi-annual tests followed three steps:

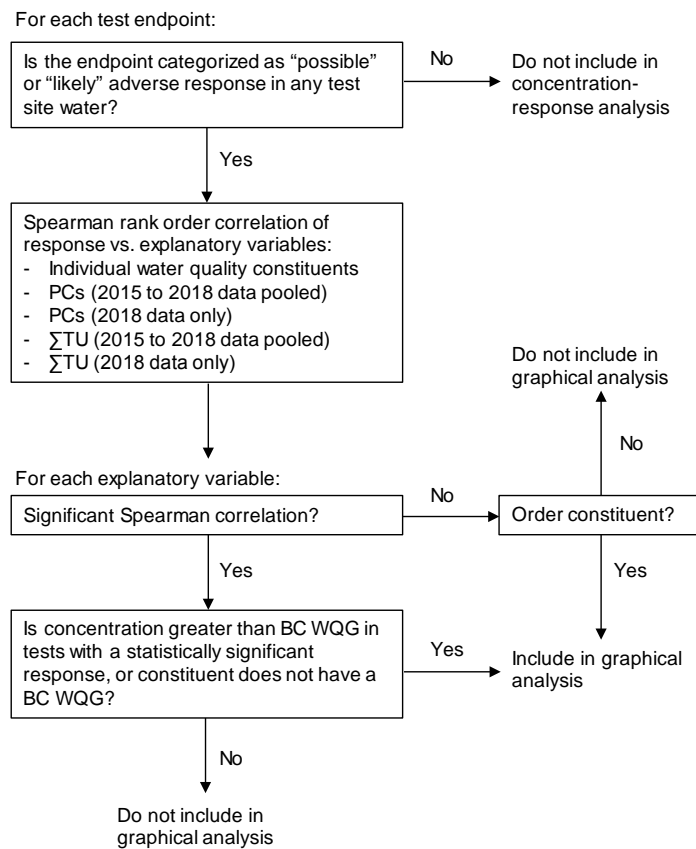
⁸ Adjusted reproduction = (mean control-normalized response ÷ percent of reproductive output accounted for) × 100%. Using the example provided above, adjusted reproduction = (78% ÷ 70%) × 100%.

- Spearman rank order correlation (toxicity endpoint response versus three types of explanatory variables: concentration of individual constituents in water, principal components, and sum of toxic units)
- Screening against water quality guidelines and/or site-specific or published toxicity data
- Graphical concentration-response analysis (toxicity endpoint responses plotted against explanatory variables)

Figure 2.3-4 outlines how the above steps were used to identify explanatory variables for graphical analysis. Additional details are provided below.

To conduct the correlation analysis, responses in chronic toxicity tests were paired with matching water chemistry data. The selection of matched (concurrent and co-located) chemistry data depended on the duration of the test, as some tests entailed multiple measurements of chemical constituents. *C. dubia* and *P. subcapitata* tests, conducted using water collected on a single day, were paired with water chemistry collected on that day. For other test species, effects data were paired with the mean concentration of the weekly submitted samples collected over the duration of the test. Mean water chemistry concentrations, as well as concentrations measured in weekly refresh samples, were screened against the lowest level 1 EVWQP benchmarks (cadmium, nitrate, selenium, sulphate) or chronic BC WQGs (other constituents). As discussed in Section 2.3.2.4, CVs were calculated for the mean concentrations and reviewed to assess variability in weekly concentrations.

Figure 2.3-4: Decision framework for inclusion of endpoints and explanatory variables in the graphical analysis.



Note: BC WQG = British Columbia water quality guideline; PCs = principal components; Σ TU = sum of toxic units. Order constituents are screened against lowest level 1 EVWQP benchmarks, nickel is screened against the interim screening value per concordance at the March 2019 EMC meeting, and all other constituents are screened against applicable BC WQGs.

Spearman rank order correlations were conducted using paired response and water chemistry data from all reference and test sites. Total concentrations were used for metals that have a chronic British Columbia water quality guideline (BC WQG) for the total fraction (e.g., copper) or that lack a chronic BC WQG (e.g., lithium). Dissolved concentrations were used for metals with a chronic BC WQG for the dissolved fraction (e.g., cadmium). Water quality variables were \log_{10} transformed prior to conducting the Spearman rank order correlations.

Correlations were also conducted using responses paired with principal components (PCs) identified via principal component analysis (PCA) of water quality data, and responses paired with the sum of toxic units (Σ TU). The objective of this analysis was to test whether responses could be explained by an overall indicator of mine water influence on water quality (PCA) or mixture effects (Σ TU), in addition to testing individual water quality constituents. These correlation analyses are explained further in the following bullets:

- PCA is a multivariate analysis technique used to describe patterns of inter-correlations among variables of interest. It calculates dominant components of variance from a matrix of chemical variables to reduce the multidimensional nature of the data while retaining much of the information from the original variables. PC scores were used in the Spearman rank correlation as an overall indicator of mine water influence on water quality.⁹ Water quality variables were \log_{10} transformed prior to conducting the PCA in Systat™. PCAs were conducted with two separate datasets (i.e., 2018 only versus pooled 2015 to 2018) to evaluate whether the relationship between test responses and PCs (i.e., indicators of overall mine influence) differed in 2018 relative to the pooled dataset. For example, as water quality differed slightly in 2018 relative to previous years, then the relationship between test responses and PCs may be different for 2018 relative to the pooled dataset. For each PC, component loadings (i.e., the water quality constituents that are strongly correlated with the PC) were reviewed to identify similarities and differences between the two datasets.
- Σ TU is an exposure metric for mixtures. For each constituent in the mixture with a BC WQG, the measured concentration was divided by the chronic BC WQG to calculate toxic units (TUs). If a chronic BC WQG was not available, the short-term BC WQG was used. Where total and dissolved guidelines were available (i.e., iron), the total guideline was used because total concentrations were above BC WQGs more frequently than dissolved concentrations. For nickel, because recent studies conducted by Teck have indicated potential effects attributable to nickel at concentrations lower than the BC WQG, 5 $\mu\text{g/L}$ was used in the denominator¹⁰. Calculated TUs for all constituents in the mixture were summed. The TUs for each mixture was calculated two ways: 1) using the WQG in the denominator (i.e., as described above) and 2) using the lowest level 1 benchmark from the EVWQP in the denominator (Teck 2014; applies to sulphate, nitrate, and dissolved cadmium). Per discussions with the EMC at the 5 February 2019 conference call, selenium was excluded from the Σ TU calculation because benchmarks reflect bioaccumulation-based exposures over long periods and not direct toxicity in standardized toxicity tests. Σ TUs were conducted with separate datasets (i.e., 2018 only versus pooled 2015 to 2018) to evaluate whether the relationship between test responses and Σ TUs (i.e., indicators of potential mixture effects) differed in 2018 relative to the pooled dataset.

⁹ The number of PCs retained for correlation analysis was determined from the inflection point of a plot of eigenvalues (the PCA 'scree plot'). PCs were retained if they had an eigenvalue greater than 1 and were in the steep portion of the scree plot to the left of the inflection point. PCs with eigenvalues less than 1 and/or to the right of the inflection point are relatively uninformative in terms of patterns of covariation among water quality variables.

¹⁰ Per concordance at the March 2019 EMC meeting, the interim screening value of 5 $\mu\text{g/L}$ was used herein. This value corresponds to the lowest level 1 screening value used in recent aquatic health assessments conducted for Teck in the Elk Valley. This value is could change pending further evaluation of site-specific toxicity data.

Constituents with significant correlations with a test response ($p < 0.05$) were carried forward to screening against BC WQGs and/or toxicity data. PC1 scores and Σ TUs with significant correlations with a test response ($p < 0.05$) were carried forward to the graphical analysis.¹¹

For constituents with significant correlations, concentrations in tests categorized as possible or likely were screened against chronic BC WQGs. Constituents with concentrations lower than the chronic BC WQG were not carried forward.¹² If the concentration was greater than a chronic BC WQG or if the constituent did not have a chronic BC WQG, then the constituent was carried forward to the graphical analysis.

Graphical analysis (endpoint responses plotted against explanatory variables) was conducted for all Order constituents (cadmium, selenium, nitrate, sulphate)¹³, and for all other constituents that had statistically significant correlations and that were either greater than a chronic BC WQG or did not have a chronic BC WQG. PC scores and Σ TUs with statistically significant correlations were also included in the graphical analysis as a combined indicator of exposure to mine-affected water (PC scores) or a combined indicator of potential mixture effects (Σ TUs). For constituents that lack a chronic BC WQG but are commonly assessed as a component of total dissolved solids (TDS) (e.g., calcium), the individual constituents were not plotted; instead, responses were plotted against the concentration of TDS. Concentration-response plots were visually examined to assess the consistency of correspondence between constituent concentrations and test responses. A consistent concentration-response relationship is visually apparent when there is broad overlap in responses measured in different tests but at similar concentrations.

Water chemistry in tests categorized as possible or likely was compared to 1) concentrations measured in tests categorized as no adverse response and 2) EVWQP benchmarks (cadmium, nitrate, selenium, sulphate) and BC WQGs (other constituents). The purpose of these comparisons was to identify constituents that may have contributed to the observed response in tests categorized as possible or likely. If the concentration of a constituent in tests categorized as possible or likely was lower than concentrations measured in tests categorized as no adverse response and the BC WQG or EVWQP benchmark for the constituent (if available) was not dependent on modifying factors (e.g., hardness), then that constituent was considered unlikely to be causing toxicity. If the concentration of a constituent in tests categorized as possible or likely was higher than concentrations measured in tests categorized as no adverse response or the concentration was greater than a BC WQG or EVWQP benchmark dependent on modifying factors, then published toxicity data were reviewed to evaluate whether the constituent could be contributing to observed effects.

TIE results (Section 3.3; Appendix B) were reviewed to evaluate alignment between cause(s) identified in the concentration-response analysis and 2018 TIE findings.

2.3.5 Comparison of 2018 Results to Previous Years

Similarities and differences were summarized between test results in the 2018 program and previous programs (2015 to 2017), focusing on the incidence of adverse responses by season and station. The objectives for this comparison were to identify potential seasonal patterns (i.e., were adverse responses observed in the same

¹¹ Because of the large number of correlation analyses being conducted (more than 50 per endpoint), there is an inflated chance of obtaining a significant result ($p < 0.05$) by chance alone. The potential for spurious correlations is also affected by the generally high degree of covariance among water quality variables in mine-influenced water. Because the correlation coefficients were not adjusted for simultaneous multiple comparisons, the significance results presented herein should be interpreted as indicative of a potential relationship between test responses and water quality, not strong evidence that a relationship exists.

¹² Nickel was an exception to this rule because recent studies conducted by Teck have indicated potential effects attributable to nickel at concentrations lower than the BC WQG.

¹³ Order constituents were included in the graphical analysis even if no statistically significant correlation was present because these constituents are the most consistent and widespread indicators of mine-influenced water quality in the Elk Valley.

quarter and test species in 2018 and previous years) and potential causation patterns (i.e., were adverse responses attributed to the same constituents in 2018 and previous years?). Results were summarized by test species/endpoint and test site, as described below.

To summarize by test species and endpoint, mean responses in chronic toxicity tests were plotted against time for all endpoints. Responses were control normalized for all endpoints except *P. subcapitata* cell yield (Section 2.3.2.1). Local and regional NRs, developed using the approach described in the Section 2.3.2.3, were shown on plots to illustrate the normal range of test organism responses observed in reference waters tested in 2015, 2016, 2017, and 2018. As was done for the evaluation of 2018 test results (Section 2.3.3), test sites were paired with a single reference for comparison to the local NR. Therefore, three plots were made for each endpoint: one for the Fording River reference and its paired test sites, one for the Elk River reference and its paired test sites, and one for the Michel Creek reference and its paired test sites. Regional NRs were shown on all three plots. An example data plot is shown in Figure 2.3-3 (2018 responses) and is annotated to explain how data plots were interpreted in Section 3.5 (2015 to 2018 responses). The symbols on each plot indicate whether the mean response was categorized as no (circle), possible (diamond), or likely (triangle). Categories were based on those provided in each annual report (i.e., tests were not re-categorized based on the methods used for the 2018 results). Due to the differences in the details of the statistical interpretations in each annual report, these interannual comparisons are semi-quantitative and should only be used to identify broad patterns rather than precise or detailed comparisons.

To summarize by test site, test categories were plotted against time for all endpoints. The symbols on each plot indicate whether the test endpoint was categorized as no (circle), possible (diamond), or likely (triangle). Categories were based on those provided in each annual report (i.e., tests were not re-categorized based on the methods used for the 2018 results). For tests categorized as possible or likely, symbols are annotated where a potential toxicant was identified.

3.0 RESULTS

3.1 Quality Assurance/Quality Control

Detailed laboratory quality assurance/quality control (QA/QC) information is provided in the Nautilus reports (Appendix B). The following bullets summarize QA/QC information for all quarterly and semi-annual tests:

- Health histories of the test organisms used in the exposures were acceptable and met requirements of the test protocols.
- Water quality constituents remained within ranges specified in the protocol throughout the tests, except for the following:
 - Q1 *P. promelas* test—The temperature increased to 29°C on day 21 of the test as a result of a fault in the thermostat controlling the temperature in the test room. Data for two replicates from sample GH_ER2 were excluded from the statistical analyses as a result of having observed adverse effects in these replicates on Day 21 of exposure, following the thermostat failure. These two replicates, which were proximate to the heater in the test room, experienced complete mortality (Appendix B-1). The deviation in temperature did not appear to adversely impact the remaining test results, and the control performance was well within the required range (Appendix B-1).
- Tests met all control acceptability criteria, except for the Q4 *H. azteca* test. Control survival did not meet the acceptability criterion of 80%, so the test was re-started in January 2019 (Appendix B-4).
- Results of reference toxicant tests fell within the acceptable range for organism performance of mean and two standard deviations based on historical results obtained by the laboratory (i.e., sensitivity of organisms used in the tests was acceptable).
- There were no deviations from the test methodologies, except for the following:
 - Planned modification to the *H. azteca* method—All site waters were supplemented with 25 mg/L chloride and 0.02 mg/L bromide using NaCl and NaBr according to recommendations of the *Hyalella* Advisory Group (chaired by Chris Ingersoll, United States Geological Survey) (Norberg-King et al. 2014) because low concentrations of these halides are known to impair growth of this species (Appendix B).
 - Planned modification to the *P. promelas* tests—*P. promelas* tests were conducted on copper-amended samples (10 µg/L for reference and test sites and 20 µg/L for test sites) to reduce potential adverse effects caused by fungi and microbes that have previously been observed in Elk Valley samples (Appendix B). The 20 µg/L addition was used because 10 µg/L was insufficient to curtail microbial effects (Appendix B). Unamended and copper-amended laboratory control results were statistically similar.
 - *O. mykiss* tests— Eggs were exposed using a blocked design (i.e., eggs from one fish were used for replicate A of each test concentration, eggs from the second fish for replicate B, and so on); this approach deviates from the Environment Canada test method, which indicates that the eggs should be pooled prior to testing (Appendix B). This modification is considered appropriate because it reduces the risk of non-viable eggs affecting the test results (Appendix B). Pooling of eggs without blocking introduces a higher risk that the test will yield a negative control failure, or have a large uncertainty related to inconsistent egg quality that is dispersed throughout the test results (Appendix B). In Q4, eggs in one of the four replicates were considered poor quality, producing consistently lower results for survival across all samples; therefore, data from this replicate were excluded from statistical analysis (Appendix B-4).

- Amending site water with copper successfully curtailed fungal growth in *P. promelas* tests, except for the tests discussed below.
 - Q1 GH_FR1 and CM_MC2 tests (Appendix B-1)—In tests amended with 10 µg/L copper, adverse responses were observed for the length endpoint. When tests were repeated with the addition of 20 µg/L copper, there were no significant adverse responses relative to the reference sites. Test site data from the 20 µg/L copper exposures were used herein for statistical analyses.
 - Q2 tests (multiple tests)—Microbial growth was noted in association with mortalities in reference and test site samples amended with 10 µg/L copper, except for samples CM_MC1 and FR_FRCP1 (Appendix B-2). Microbial growth was also noted in one replicate of GH_FR1 treated with 20 µg/L copper; this replicate had 26.7% survival, compared with an average of 91% survival in the other three replicates. Thus, it appears that 10 µg/L copper in Q2 was not sufficient to curtail microbial growth in these tests¹⁴. For test sites, data from the 20 µg/L copper exposures were used herein for statistical analyses. For references, Q2 tests were only conducted with 10 µg/L copper. References with microbial effects (i.e., Fording and Elk) were excluded from statistical analyses conducted herein.
 - Q3 FR_FRCP1, GH_FR1, and CM_MC2 tests (Appendix B-3)—In tests amended with 10 µg/L copper, adverse responses were observed on survival and biomass. When tests were repeated with the addition of 20 µg/L copper, there were no evidence of microbial growth. Data from the 20 µg/L copper exposures were used herein for statistical analyses.

3.2 Sources of Variance in Test Water

3.2.1 Organism Performance

Performance in the negative laboratory control varied by less than 20% across quarters for all species and endpoints, except for *P. promelas* biomass which varied by 97%. For other endpoints, laboratory control performance in 2018 quarterly tests varied from 0% (*P. promelas* hatch and *O. mykiss* survival) to 19% (*P. promelas* survival). Although variability for most endpoints was small, control normalization was used to reduce the variability in test organism performance among 2018 batches.

Raw results and control-normalized results (for all endpoints except *P. subcapitata* cell yield) are presented in Section 3.3. Analyses presented herein are based on control-normalized results.

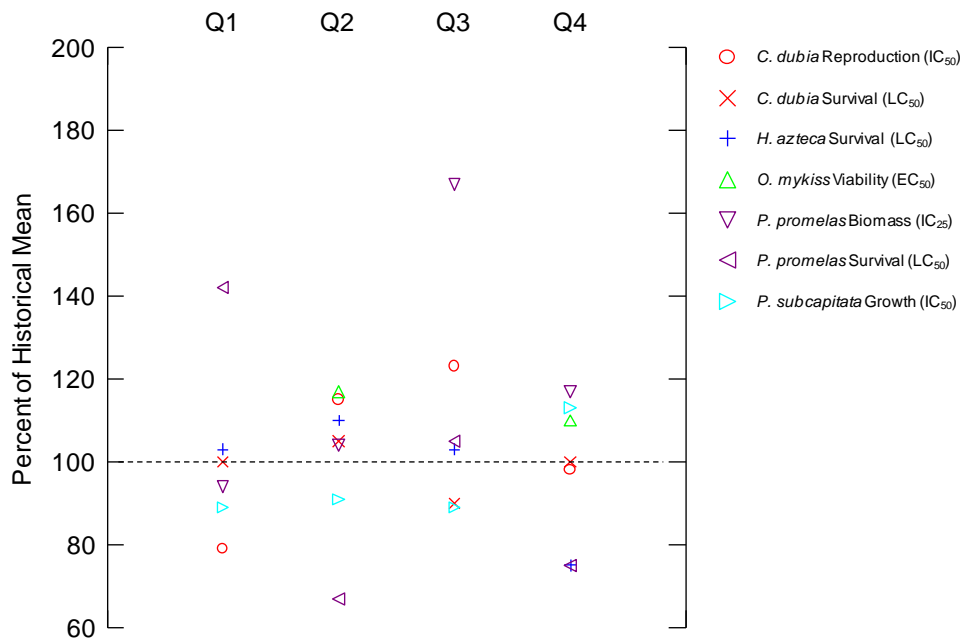
3.2.2 Organism Sensitivity

Reference toxicant results from quarterly reports (Appendix B) are plotted in Figure 3.2-1.

Approximately two thirds (62%) of reference toxicant results fell close to the historical mean (i.e., within 15% of the historical mean), indicating that test organism sensitivity was usually stable (Figure 3.2-1). The largest positive deviation from the historical mean was observed in Q3 for *P. promelas* biomass (167% of the historical mean) and the largest negative deviation was observed in Q2 for *P. promelas* survival (67% of the historical mean). Despite these deviations from the historical mean, all reference toxicant results were within two standard deviations of the historical mean (which is considered an appropriate sensitivity by the laboratory [Appendix B]) and no endpoint was consistently above or below the historical mean. Overall, test organism sensitivity does not appear to be a confounding factor of variability in the interpretation of toxicity testing results among test batches.

¹⁴ Based on previous toxicity modelling for copper (Teck 2019b), bioavailability of copper is expected to be lower in Q2. This is primarily due to elevated dissolved organic carbon in Q2 relative to other quarters.

Figure 3.2-1: Reference toxicant data from 2018 laboratory reports (Appendix B).



Note: IC₅₀ = concentration resulting in 50% inhibition; IC₂₅ = concentration resulting in 25% inhibition; LC₅₀ = concentration resulting in 50% lethality; EC₅₀ = concentration resulting in 50% effect. Dashed line indicates reference toxicant result is equal to the mean historical effect concentration.

3.2.3 Background Conditions (Normal Ranges)

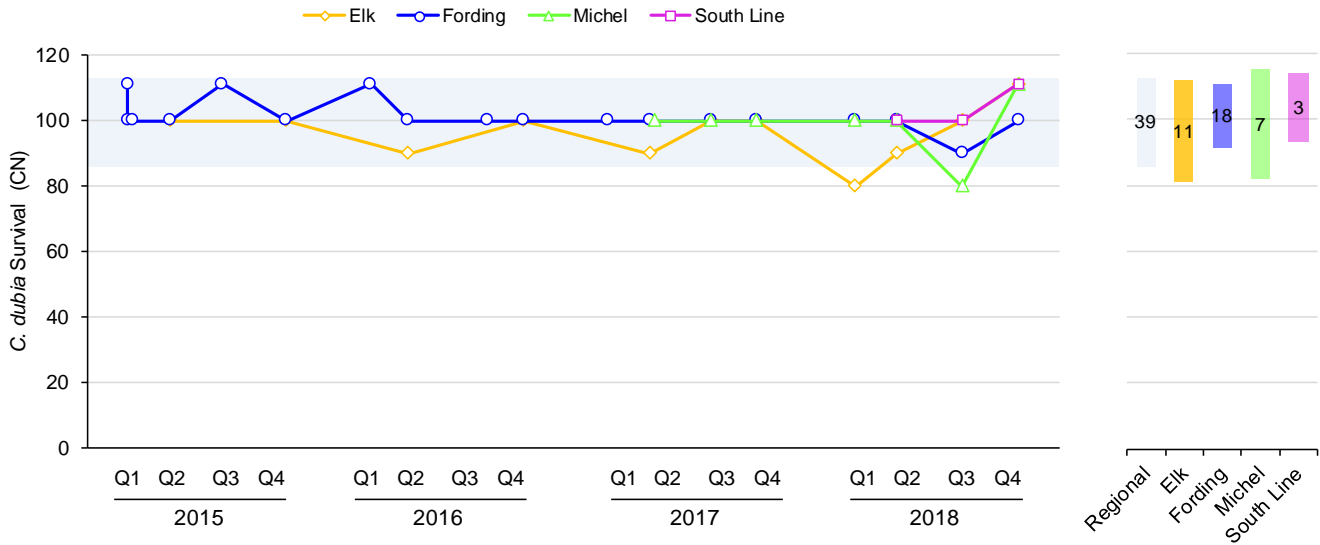
As outlined in Section 2.3.2, local and regional NRs were developed for mean responses in reference waters. Development of NRs was intended to address potential confounding effects of background water quality and its effect on test responses. The following sections present the results of the evaluation of background conditions for each endpoint.

3.2.3.1 *Ceriodaphnia dubia*

Mean control-normalized responses for *C. dubia* tests in reference waters are plotted in Figure 3.2-2 (survival) and Figure 3.2-3 (reproduction). Results are as follows:

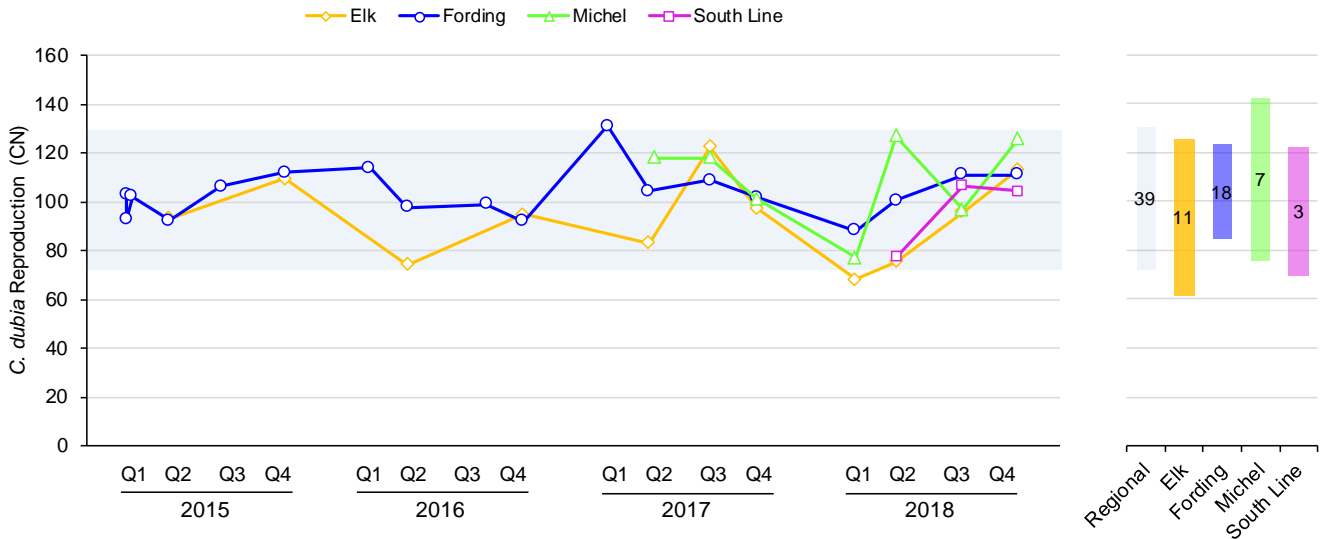
- Mean survival ranged from 80% to 111% in reference tests (Figure 3.2-2). Mean survival was similar across references, which resulted in broad overlap in the regional NR (86% to 113%) and the local NRs for the Elk (81% to 112%), Fording (92% to 111%), and Michel (82% to 115%). A local NR for South Line Creek is shown on Figure 3.2-2 (94% to 114%) but should be considered preliminary because only three values are available.
- Mean reproduction ranged from 68% to 131% in reference tests (Figure 3.2-3). Mean reproduction was generally variable across years and across references, except for Q1 to Q4 2015, Q4 2016 and Q4 2017, where mean reproduction was similar across references (i.e. <20% difference). The regional NR (72% to 130%) and local NRs for the Elk (61% to 125%), Fording (84% to 123%), and Michel (76% to 142%) had broad overlap. A local NR for South Line Creek is shown on Figure 3.2-3 (70 to 122%) but should be considered preliminary because only three values are available.

Figure 3.2-2: Mean results for *C. dubia* survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

Figure 3.2-3: Mean results for *C. dubia* reproduction in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).

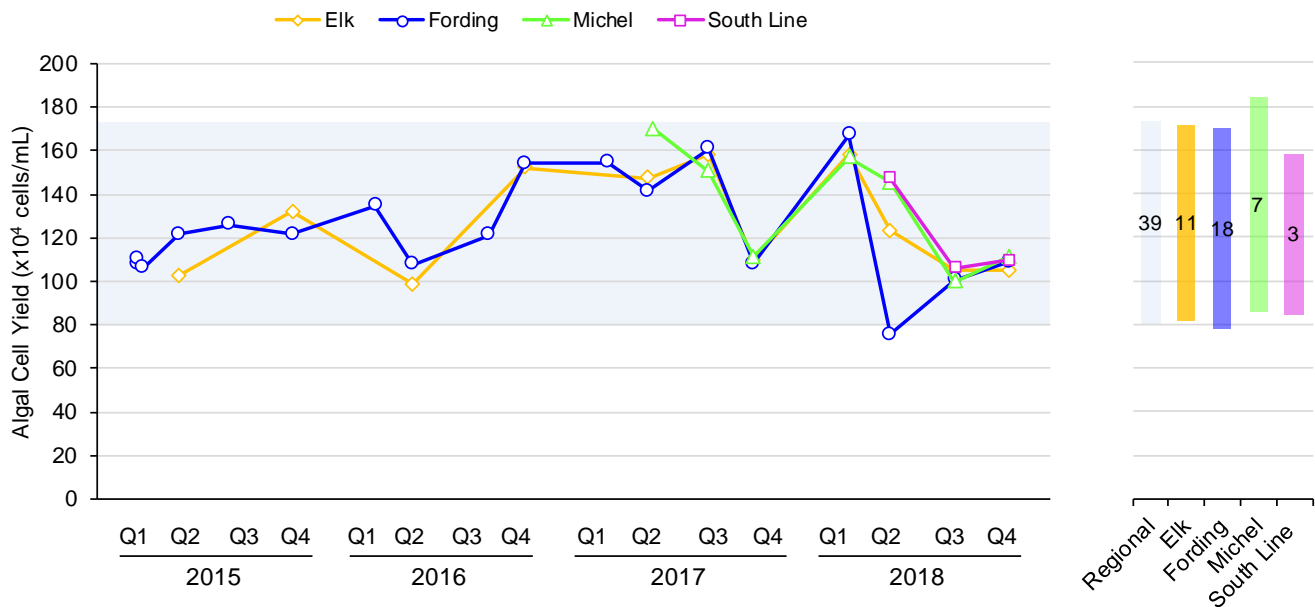


Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

3.2.3.2 *Pseudokirchneriella subcapitata*

Mean cell yield extended from 75 to 170 ×10⁴ cells/mL in reference tests (Figure 3.2-4). Mean cell yield was similar across references, except: (1) in Q2 2017 when cell yield in the Michel Creek reference was approximately 30% higher than the Elk and Fording references; and (2) in Q2 2018 when cell yield in the Elk, Michel, and South Line references were approximately 40% to 50% higher than the Fording reference. Higher cell yield in these quarters contributed to the local NR for Michel Creek (86 to 184 ×10⁴ cells/mL) extending above the local NR for the Elk (82 to 171 ×10⁴ cells/mL), the local NR for the Fording (78 to 170 ×10⁴ cells/mL), and the regional NR (80 to 173 ×10⁴ cells/mL). The local NR for South Line Creek (85 to 158 ×10⁴ cells/mL), shown on Figure 3.2-4, should be considered preliminary because only three values are available.

Figure 3.2-4: Mean results for *P. subcapitata* cell yield in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

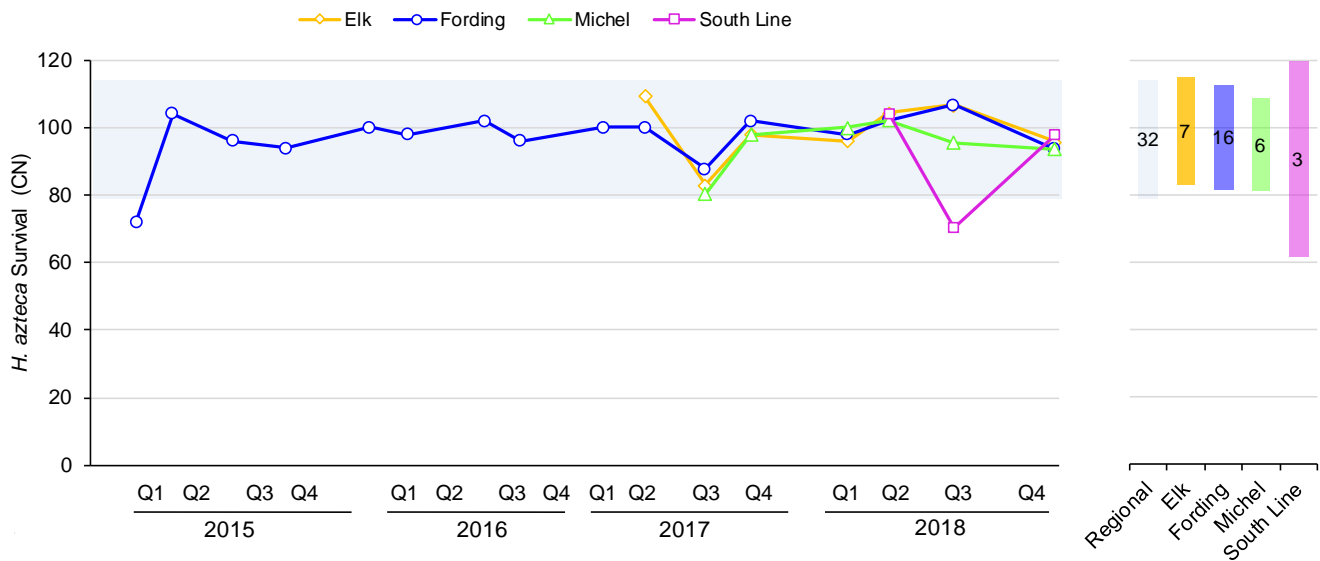
3.2.3.3 *Hyaella azteca*

Mean control-normalized responses for *H. azteca* tests in reference waters are plotted in Figure 3.2-5 (survival) and Figure 3.2-6 (dry weight). Results are as follows:

- Mean survival extended from 70% to 109% in reference tests (Figure 3.2-5). Mean survival was similar among references, which resulted in broad overlap in the regional NR (79% to 114%) and the local NRs for the Elk (83% to 115%), Fording (82% to 112%), and Michel (81% to 109%). In Q3 2018, survival for South Line Creek was approximately 30% lower than survival for Elk, Fording, and Michel references, which contributed to a local NR for South Line (62% to 120%) that extended below the other local NRs and regional NR. The local NR for South Line Creek should be considered preliminary because only three values are available.

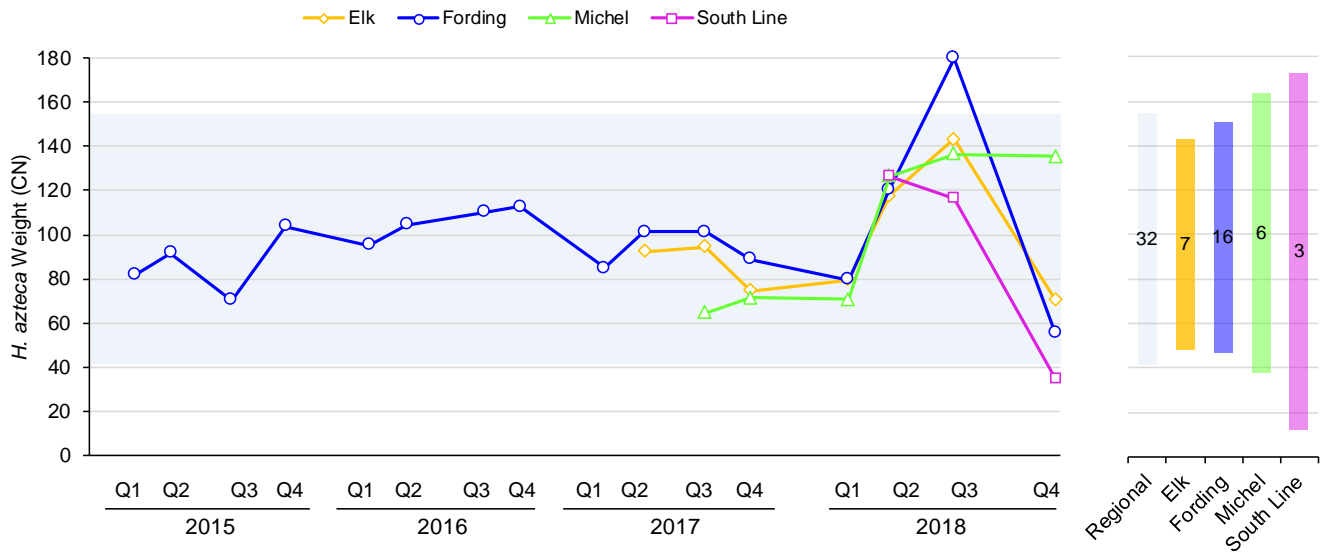
- Mean weight extended from 35% to 180% in reference tests (Figure 3.2-6). Except for Q3 and Q4 2018, mean weight was generally similar across references tested in the same quarter. In Q3 2018, mean weight in the Fording River reference was approximately 40% higher than the Elk and Michel references and approximately 60% higher than the South Line reference. In Q4 2018, mean weight in the Michel Creek reference was approximately 65% to 80% higher than the Elk and Fording River reference and approximately 100% higher than the South Line reference. The high variability in these quarters resulted in wide normal ranges for the regional NR (42% to 155%) and local NRs for the Elk (49% to 143%), Fording (47% to 151%), and Michel (38 to 164%). The local NR for South Line Creek (12% to 173%) should be considered preliminary because only three values are available.

Figure 3.2-5: Mean results for *H. azteca* survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

Figure 3.2-6: Mean results for *H. azteca* weight in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

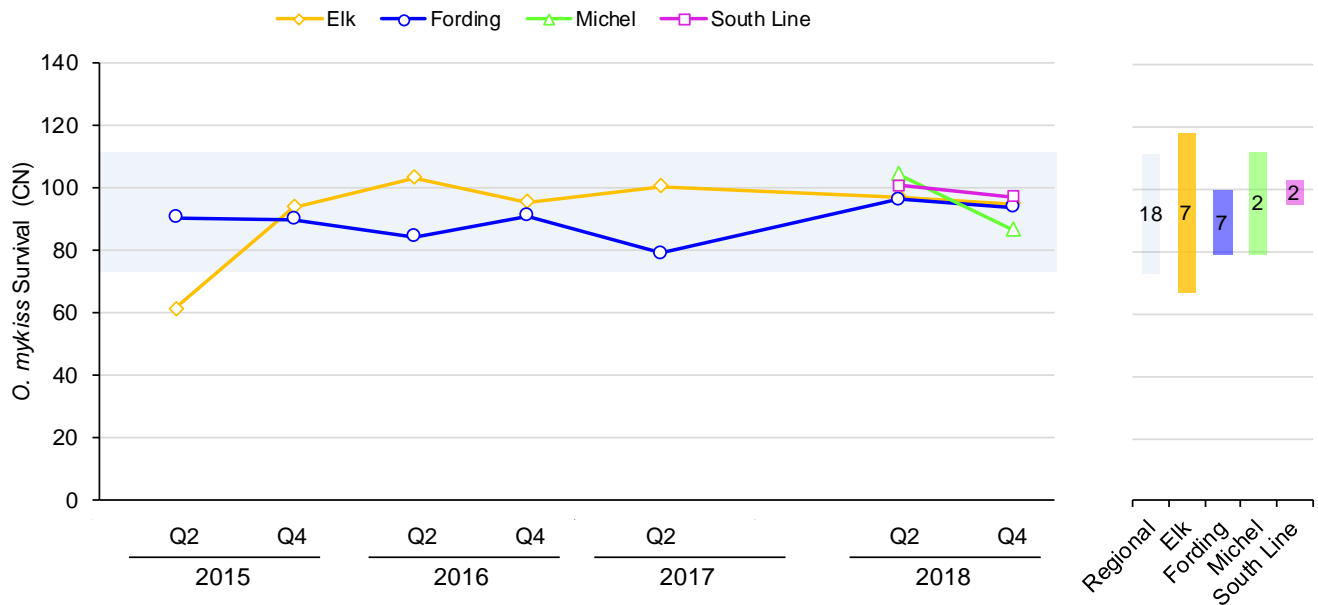
3.2.3.4 *Oncorhynchus mykiss*

Mean control-normalized responses for *O. mykiss* tests in reference waters are plotted in Figure 3.2-7 (survival), Figure 3.2-8 (viability), Figure 3.2-9 (length), and Figure 3.2-10 (weight). Results are as follows:

- Mean survival extended from 61% to 104% in reference tests (Figure 3.2-7). Although mean survival has previously been variable in reference waters tested in the same quarter (e.g., Q2 2015 to 2017), mean survival was similar in 2018 reference tests. The regional NR (73% to 111%) and local NRs for the Elk (67% to 118%), Fording (79% to 100%), Michel (79% to 112%), and South Line (95% to 103%) had broad overlap. The local NR for Michel Creek and South Line Creek should be considered preliminary because only two values are available for each reference site.
- Mean viability extended from 62% to 107% in reference tests (Figure 3.2-8). Although mean survival has previously been variable in reference waters tested in the same quarter (e.g., Q2 2015 to 2017), mean viability was similar in 2018 reference tests. The regional NR (74% to 114%) and local NRs for the Elk (68% to 121%), Fording (80% to 101%), Michel (83% to 115%), and South Line (100% to 104%) had broad overlap. The local NRs for Michel Creek and South Line Creek should be considered preliminary because only two values are available for each reference site.
- Mean length extended from 97% to 110% in reference tests (Figure 3.2-9). Mean length was similar across references, which resulted in broad overlap in the regional NR (97% to 108%) and the local NRs for the Elk (97% to 107%), Fording (95% to 109%), Michel (104% to 105%), and South Line (102% to 106%). The local NRs for Michel Creek and South Line Creek should be considered preliminary because only two values are available for each site.

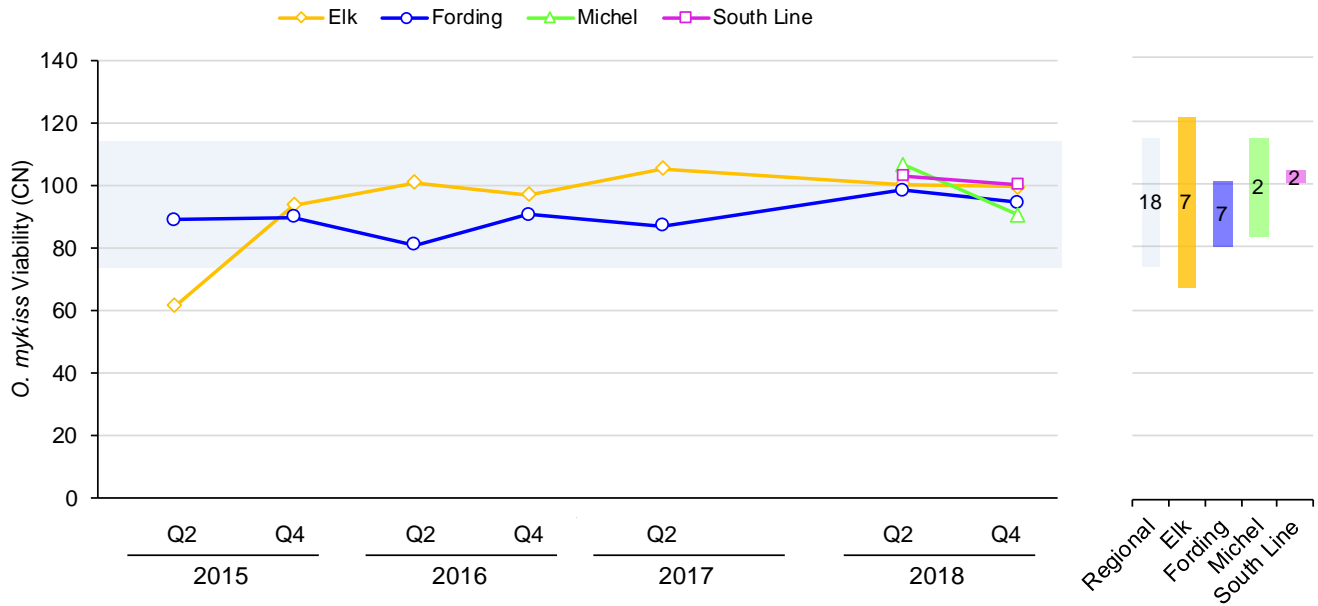
- Mean weight extended from 99% to 111% in reference tests (Figure 3.2-10). Mean weight was similar across references, which resulted in broad overlap in the regional NR (98% to 110%) and the local NRs for the Elk (98% to 109%), Fording (96% to 110%), Michel (102% to 106%), and South Line (99% to 111%). The local NRs for Michel Creek and South Line Creek should be considered preliminary because only two values are available for each site.

Figure 3.2-7: Mean results for *O. mykiss* survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



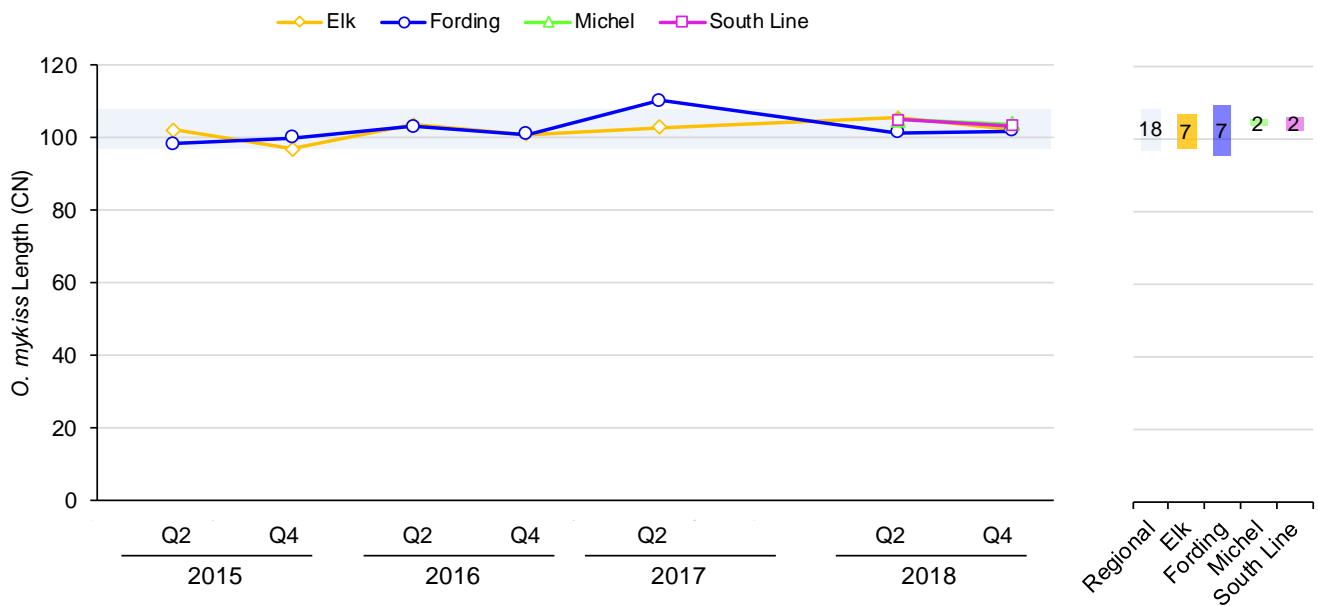
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2017 tests were removed from reference envelope calculations because microbial effects were observed in these tests. Sample size for each normal range is provided on the bar chart.

Figure 3.2-8: Mean results for *O. mykiss* viability in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



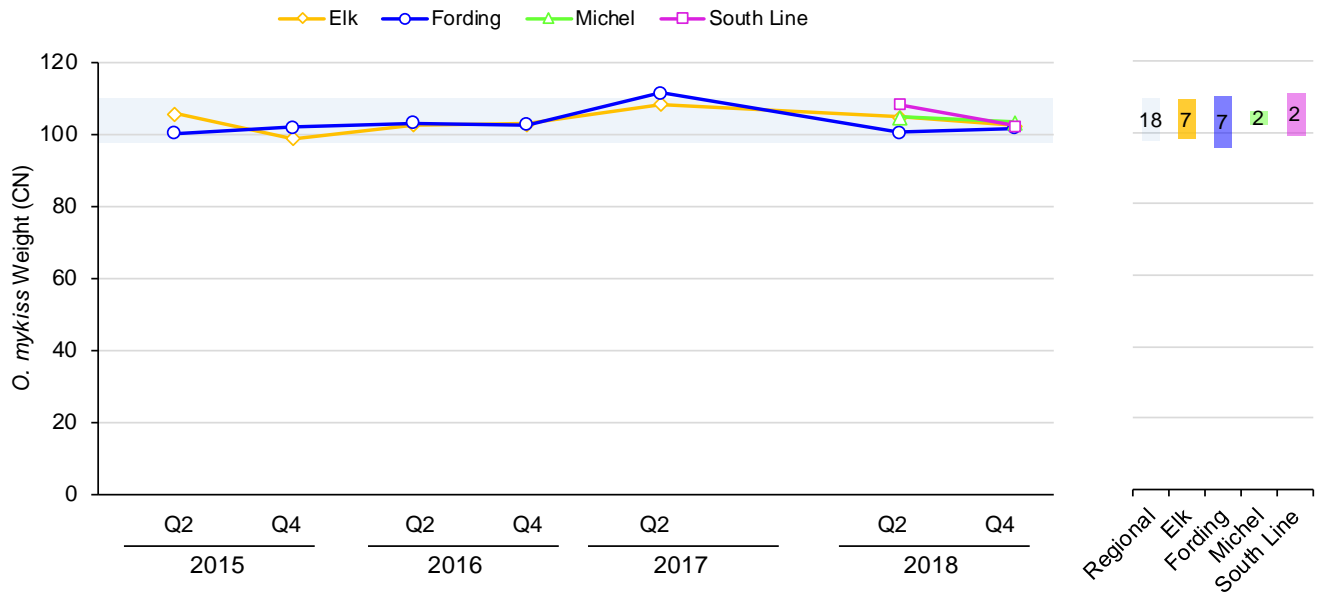
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2017 tests were removed from reference envelope calculations because microbial effects were observed in these tests. Sample size for each normal range is provided on the bar chart.

Figure 3.2-9: Mean results for *O. mykiss* length in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2017 tests were removed from reference envelope calculations because microbial effects were observed in these tests. Sample size for each normal range is provided on the bar chart.

Figure 3.2-10: Mean results for *O. mykiss* weight in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2017 tests were removed from reference envelope calculations because microbial effects were observed in these tests. Sample size for each normal range is provided on the bar chart.

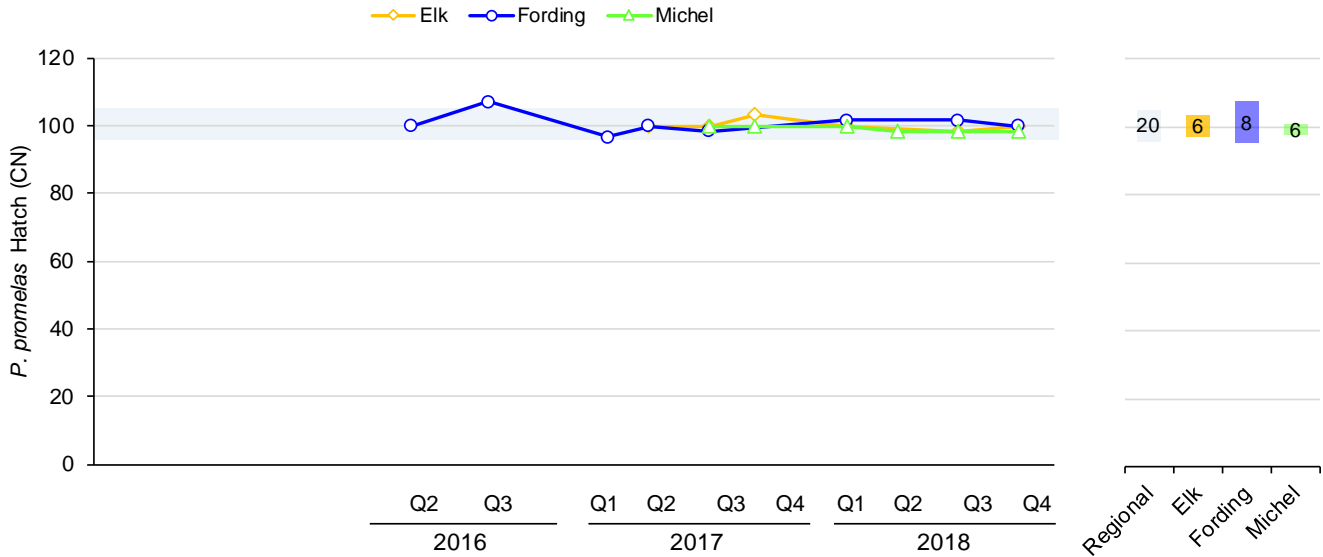
3.2.3.5 *Pimephales promelas*

Mean control-normalized responses for *P. promelas* tests in reference waters are plotted in Figure 3.2-11 (hatch), Figure 3.2-12 (survival), Figure 3.2-13 (biomass), Figure 3.2-14 (length), and Figure 3.2-15 (normal development). These figures show results of copper-amended tests only. Results are as follows:

- Mean hatch extended from 97% to 107% in reference tests (Figure 3.2-11). Mean hatch was similar across references, which resulted in broad overlap in the regional NR (96% to 105%) and the local NRs for the Elk (97% to 103%), Fording (95% to 107%), and Michel (98% to 101%).
- Mean survival extended from 69 to 116% in reference tests (Figure 3.2-12). Mean survival was similar in Fording River reference tests. Mean survival was lower in the Elk tests in Q3 2017, Q1 2018, and Q3 2018 and Michel tests in Q4 2017. Lower survival in Elk River tests contributed to the local NR for Elk (64% to 112%) extending below the regional NR (74% to 117%), the Fording NR (89% to 109%), and the Michel NR (74% to 121%).
- Mean biomass extended from 54% to 130% in reference tests (Figure 3.2-13). Mean biomass was lower in Q1 2018 and Q3 2018 Elk tests and in the Q4 2018 Michel test. Lower survival in these tests contributed to the local NR for Elk (48% to 139%) and Michel (65% to 126%) extending below the Fording NR (77% to 124%). The regional NR was 63% to 131%.
- Mean length extended from 82 to 109% in reference tests (Figure 3.2-14). Mean length was similar across references, which resulted in broad overlap in the regional NR (82% to 110%) and the local NRs for the Elk (81% to 114%), Fording (85% to 110%), and Michel (81% to 106%).

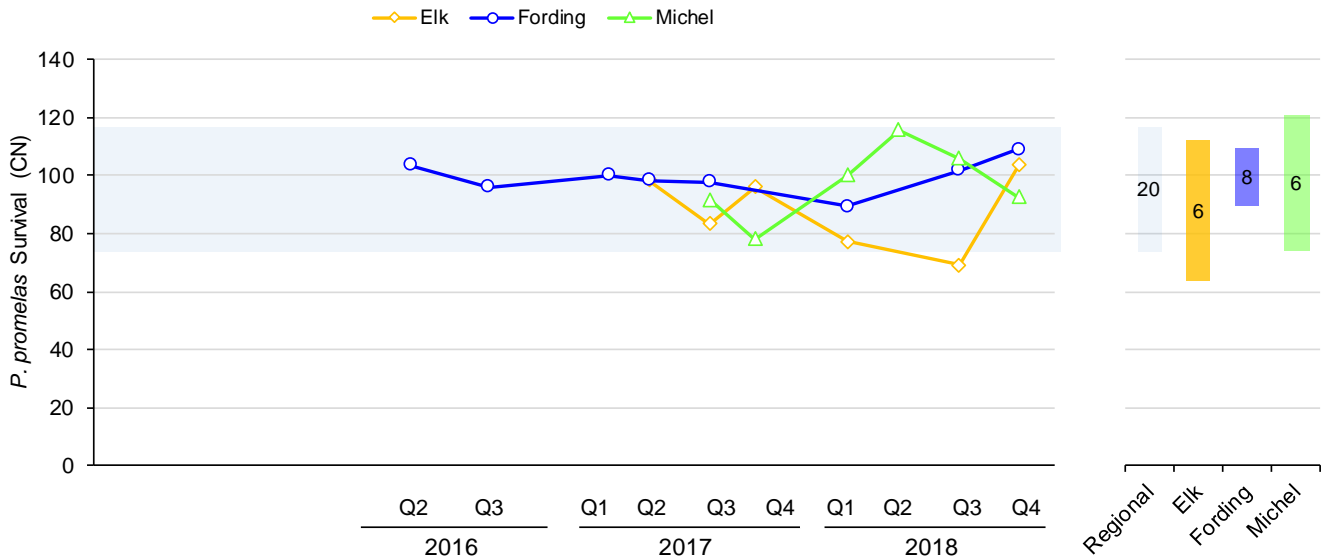
- Mean normal development ranged from 98 to 107% in reference tests (Figure 3.2-14). Mean normal development was similar across references, which resulted in broad overlap in the regional NR (97% to 104%) and the local NRs for the Elk (98% to 102%), Fording (98% to 101%), and Michel (96% to 107%).

Figure 3.2-11: Mean results for *P. promelas* hatch in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



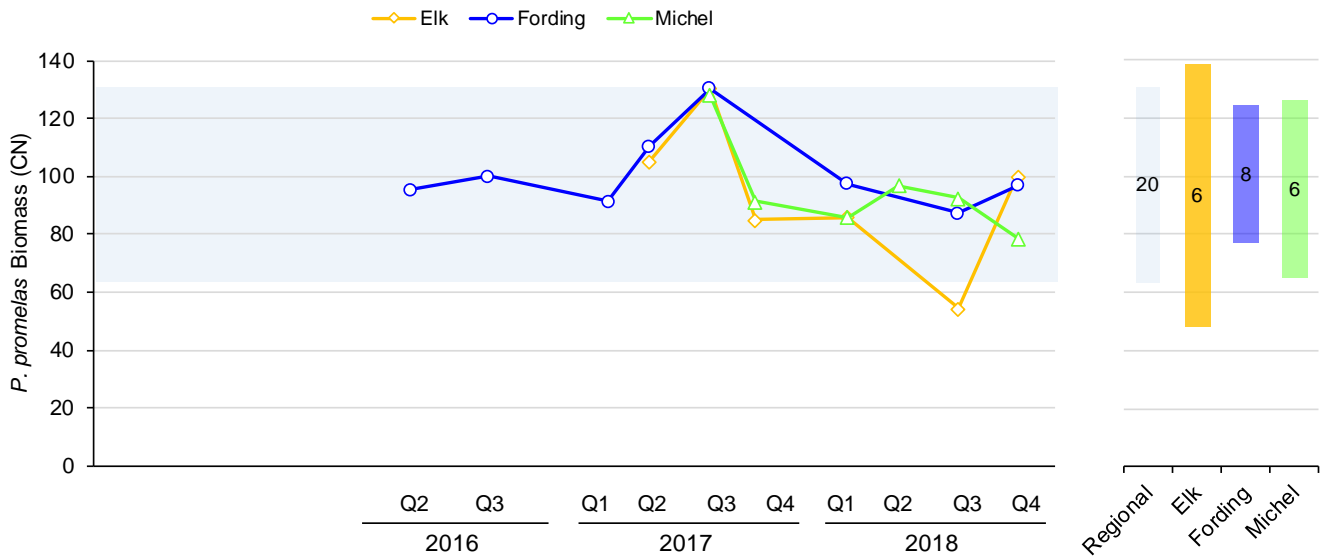
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The following tests were excluded from normal ranges: Q1 2016 (test waters were not amended with copper), Q4 2016 (dissolved oxygen concentrations fell below typical levels), and Q2 2018 for Fording and Elk (microbial effects were observed in these tests). Sample size for each normal range is provided on the bar chart.

Figure 3.2-12: Mean results for *P. promelas* survival in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



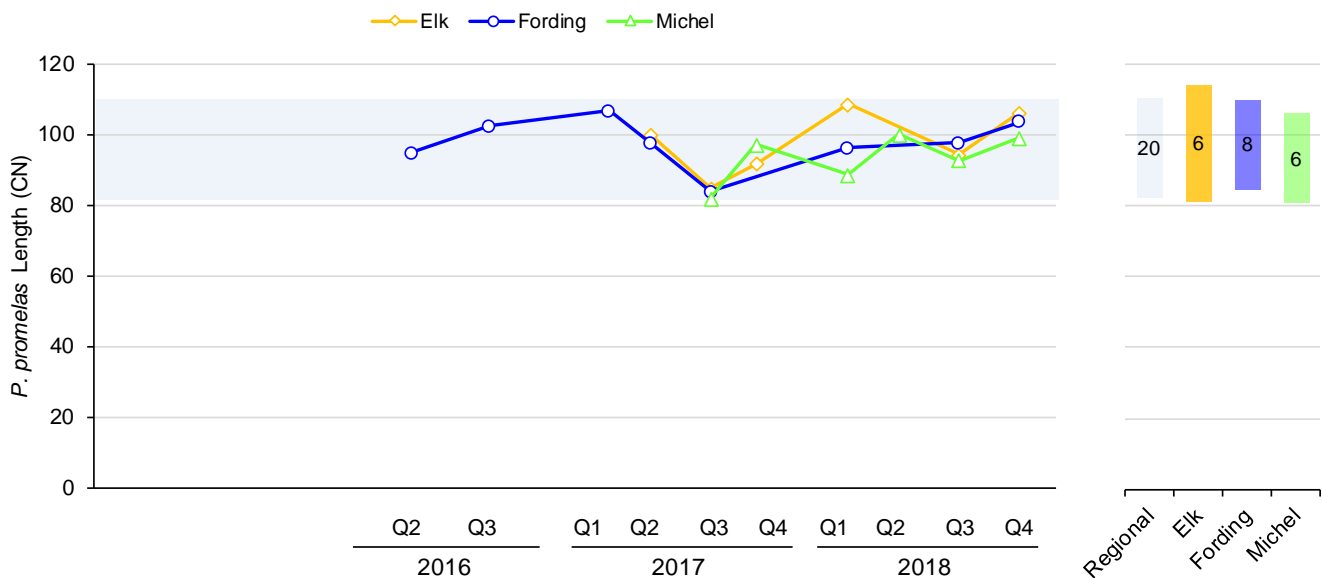
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The following tests were excluded from normal ranges: Q1 2016 (test waters were not amended with copper), Q4 2016 (dissolved oxygen concentrations fell below typical levels), and Q2 2018 for Fording and Elk (microbial effects were observed in these tests). Sample size for each normal range is provided on the bar chart.

Figure 3.2-13: Mean results for *P. promelas* biomass in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



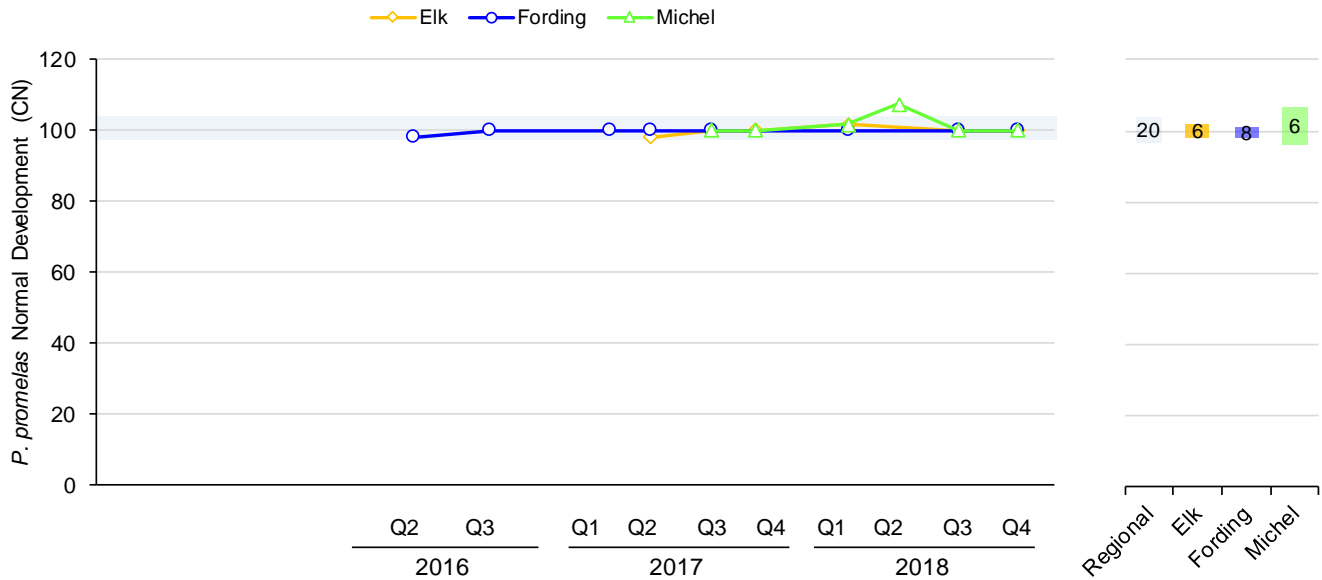
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The following tests were excluded from normal range calculations: Q1 2016 (test waters were not amended with copper), Q4 2016 (dissolved oxygen concentrations fell below typical levels), and Q2 2018 for Fording and Elk (microbial effects were observed in these tests). Sample size for each normal range is provided on the bar chart.

Figure 3.2-14: Mean results for *P. promelas* length in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The following tests were excluded from normal range calculations: Q1 2016 (test waters were not amended with copper), Q4 2016 (dissolved oxygen concentrations fell below typical levels), and Q2 2018 for Fording and Elk (microbial effects were observed in these tests). Sample size for each normal range is provided on the bar chart.

Figure 3.2-15: Mean results for *P. promelas* development in Elk River reference, Fording River reference, Michel Creek reference, and South Line Creek reference tests (left panel).



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The following tests were excluded from normal range calculations: Q1 2016 (test waters were not amended with copper), Q4 2016 (dissolved oxygen concentrations fell below typical levels), and Q2 2018 for Fording and Elk (microbial effects were observed in these tests). Sample size for each normal range is provided on the bar chart.

3.2.4 Variation in Concentrations of Toxicants (Coefficients of Variation)

Coefficients of variation are presented in Appendix C. CVs were below 0.25 for most constituents, indicating that variability in concentrations among weekly refresh samples is generally low. This finding is consistent with previous investigations of variance in water quality constituents, in which only minor variations have been observed over a few weeks duration (i.e., the duration of the longest toxicity test in the Permit-based test program) relative to the larger seasonal variations. When constituent concentrations were greater than BC WQGs or EVWQP benchmarks, CVs were either below 0.25 or comparable to CVs measured at reference locations for the same quarter and test.

This source of variance is not expected to affect the overall interpretation of the quarterly and semi-annual toxicity testing program because weekly refresh samples were screened individually against chronic BC WQGs and EVWQP benchmarks (see Section 2.3.4), so constituents potentially contributing to observed responses were captured in the overall concentration-response analysis.

3.3 Evaluation of 2018 Test Results

Raw results (mean and standard deviation) are presented in Table 3.3-1. Control-normalized results (mean and standard deviation for all species except *P. subcapitata*) are presented in Table 3.3-2. Categories for 2018 test results (no, possible, or likely adverse response) are discussed below by test species (Section 3.3.1) and by test site (Section 3.3.2). Also presented in this section are the results of supplemental tests initiated to investigate potential cause(s) of toxicity, as discussed in Section 2.2.2.

Table 3.3-1: Results of Quarterly and Semi-Annual Toxicity Tests—Raw Results^(a)

Quarter	Location	<i>C. dubia</i>			<i>P. subcapitata</i>	<i>H. azteca</i>		<i>P. promelas</i> ^(b)					<i>O. mykiss</i>			
		% Survival	Reproduction	Broods	Cell Yield [x 10 ⁴ cells/mL]	% Survival	Dry weight [mg]	% Hatch	% Survival	Biomass [mg]	Length [mm]	% Normal Development	% Survival	% Viability	Length [mm]	Wet Weight [mg]
Q1	Laboratory control	100.0	20.0 ± 3.7	2.9 ± 0.3	28.5 ± 2.2	100.0 ± 0.0	0.34 ± 0.06	10: 98.3 ± 3.3 20: 100.0 ± 0.0	10: 95.0 ± 6.4 20: 93.3 ± 0.0	10: 1.62 ± 0.22 20: 1.38 ± 0.09	10: 10.4 ± 0.6 20: 10.5 ± 0.3	10: 98.3 ± 3.3 20: 100.0 ± 0.0				
	Pooled Batch References	93.0 ± 0.3	15.5 ± 6.3	2.0 ± 0.7	161.0 ± 10.0	98.0 ± 4.1	0.26 ± 0.03	99.0 ± 2.0	87.0 ± 16.0	1.5 ± 0.1	10.0 ± 1.1	99 ± 3				
	Fording River reference	100.0	17.6 ± 4.8	2.1 ± 0.6	167.1 ± 9.4	98.0 ± 4.5	0.27 ± 0.02	100.0 ± 0.0	85.0 ± 8.4	1.58 ± 0.16	10.0 ± 0.6	98.3 ± 3.3				
	Elk River reference	80.0	13.6 ± 9.1	1.7 ± 1.1	158.3 ± 8.3	96.0 ± 5.5	0.27 ± 0.03	98.3 ± 3.3	73.3 ± 37.7	1.39 ± 0.14	11.3 ± 1.4	100.0 ± 0.0				
	Michel Creek reference	100.0	15.4 ± 3.4	2.2 ± 0.4	157.0 ± 9.0	100.0 ± 0.0	0.24 ± 0.04	98.3 ± 3.3	95.0 ± 3.3	1.39 ± 0.08	9.2 ± 0.7	100.0 ± 0.0				
	FR_FRCP1	80.0	4.1 ± 4.6	0.9 ± 0.9	66.5 ± 5.3	86.0 ± 26.1	0.13 ± 0.04	93.3 ± 5.4	78.3 ± 17.5	1.48 ± 0.11	10.5 ± 0.6	100.0 ± 0.0				
	GH_FR1	100.0	15.8 ± 2.4	2.3 ± 0.5	137.5 ± 2.4	96.0 ± 5.5	0.27 ± 0.06	93.3 ± 7.7	85.0 ± 14.8	1.41 ± 0.20	10.4 ± 0.4	100.0 ± 0.0				
	GH_ERC	100.0	14.6 ± 5.9	2.0 ± 0.8	167.8 ± 8.7	-	-	-	-	-	-	-				
	EV_MC2	100.0	11.2 ± 4.5	1.8 ± 0.6	167.3 ± 3.3	-	-	-	-	-	-	-				
	EV_HC1	100.0	11.9 ± 5.4	1.8 ± 0.6	154.5 ± 9.7	-	-	-	-	-	-	-				
	CM_MC2	100.0	9.5 ± 3.7	1.9 ± 0.3	145.0 ± 7.5	36.0 ± 35.8	0.05 ± 0.02	93.3 ± 3.3	91.7 ± 16.7	1.67 ± 0.35	10.1 ± 0.5	100.0 ± 0.0				
	CM_MC3	100.0	17.3 ± 4.0	2.6 ± 0.5	145.8 ± 7.3	98.0 ± 4.5	0.28 ± 0.03	-	-	-	-	-				
LC_LCDSSLCC	100.0	14.9 ± 3.8	2.0 ± 0.7	164.3 ± 10.3	-	-	-	-	-	-	-					
Q2	Laboratory control	100.0	17.6 ± 2.5	3.0 ± 0.0	33.8 ± 2.1	94.0 ± 5.5	0.34 ± 0.03	10: 100.0 ± 0.0 20: 100.0 ± 0.0	10: 82.1 ± 14.5 20: 80.0 ± 9.4	10: 2.58 ± 0.15 20: 2.49 ± 0.11	10: 11.0 ± 0.4 20: 11.0 ± 0.4	10: 93.1 ± 5.0 20: 97.5 ± 5.0	92.7 ± 6.6	88.7 ± 11.2	21.9 ± 0.8	114.8 ± 20.0
	Pooled Batch References ^(c)	98.0 ± 0.2	16.7 ± 6.9	2.5 ± 0.6	119.0 ± 31	97.0 ± 4.7	0.42 ± 0.03	98.0 ± 3.0	95.0 ± 3.0	2.5 ± 0.3	11.0 ± 0.4	100.0 ± 0.0	92.0 ± 6.0	91.0 ± 6.0	23.0 ± 0.6	120.0 ± 21.0
	Fording River reference	100.0	17.7 ± 7.3	2.5 ± 0.5	75.4 ± 5.6	96.0 ± 5.5	0.41 ± 0.02	100.0 ± 0.0	5.0 ± 6.4	0.48 ± 0.55	16.5 ± 2.1	100.0 ± 0.0	89.2 ± 8.7	87.5 ± 9.6	22.2 ± 0.3	115.2 ± 19.7
	Elk River reference	90.0	13.3 ± 6.1	2.2 ± 0.9	123.3 ± 6.5	98.0 ± 4.5	0.40 ± 0.03	96.7 ± 3.8	31.7 ± 6.4	1.51 ± 0.05	13.2 ± 1.0	89.6 ± 12.5	90.0 ± 3.8	89.2 ± 3.2	23.1 ± 0.5	120.1 ± 20.8
	Michel Creek reference	100.0	22.3 ± 6.7	2.8 ± 0.4	145.3 ± 8.4	96.0 ± 5.5	0.43 ± 0.03	98.3 ± 3.4	95.0 ± 3.3	2.50 ± 0.31	11.0 ± 0.4	100.0 ± 0.0	96.7 ± 0.0	95.0 ± 1.9	23.0 ± 0.8	120.3 ± 27.2
	South Line Creek reference	100.0	13.6 ± 3.5	2.3 ± 0.5	147.5 ± 3.1	98.0 ± 4.5	0.43 ± 0.02	-	-	-	-	-	93.4 ± 4.7	91.7 ± 6.4	23.0 ± 0.4	124.2 ± 22.7
	FR_FRCP1	100.0	11.2 ± 4.2	1.9 ± 0.7	94.0 ± 4.5	98.0 ± 4.5	0.44 ± 0.02	93.3 ± 5.4	83.3 ± 3.8	2.31 ± 0.19	10.7 ± 0.7	98.1 ± 3.8	84.9 ± 12.6	82.4 ± 11.0	22.6 ± 0.8	123.7 ± 21.2
	GH_FR1	100.0	12.6 ± 1.6	2.1 ± 0.3	121.5 ± 2.6	92.0 ± 13.0	0.50 ± 0.07	96.7 ± 3.8	75.0 ± 32.8	2.43 ± 0.59	11.6 ± 1.1	100.0 ± 0.0	88.1 ± 4.6	84.7 ± 6.7	23.2 ± 0.6	132.4 ± 16.0
	GH_ERC	100.0	10.9 ± 1.9	2.1 ± 0.3	122.8 ± 4.3	-	-	-	-	-	-	-	91.0 ± 7.2	90.1 ± 7.0	23.0 ± 0.4	122.5 ± 21.3
	EV_MC2	90.0	16.6 ± 2.9	2.6 ± 0.5	155.5 ± 5.3	-	-	-	-	-	-	-	98.3 ± 2.0	96.6 ± 4.7	23.1 ± 0.6	127.0 ± 25.1
	EV_HC1	100.0	17.0 ± 5.2	2.5 ± 0.5	122.3 ± 4.3	-	-	-	-	-	-	-	86.7 ± 8.2	85.0 ± 6.9	23.4 ± 1.0	129.2 ± 23.8
	CM_MC2	100.0	7.4 ± 4.2	1.7 ± 0.9	135.3 ± 6.2	52.0 ± 27.8	0.33 ± 0.04	100.0 ± 0.0	90.0 ± 12.8	2.61 ± 0.25	11.0 ± 0.6	100.0 ± 0.0	86.8 ± 7.8	83.4 ± 6.7	23.3 ± 0.4	129.4 ± 28.2
CM_MC3	100.0	12.2 ± 4.1	2.3 ± 0.5	-	96.0 ± 5.5	0.44 ± 0.05	-	-	-	-	-	-	-	-	-	
LC_LCDSSLCC	100.0	7.1 ± 2.0	2.2 ± 0.4	147.5 ± 4.8	90.0 ± 14.1	0.37 ± 0.12	-	-	-	-	-	94.2 ± 3.2	91.7 ± 1.9	22.7 ± 1.1	125.3 ± 18.0	
Q3	Laboratory control	100.0	18.3 ± 3.8	2.9 ± 0.3	29.6 ± 2.3	88.0 ± 8.4	0.30 ± 0.08	10: 98.3 ± 3.3 20: 100.0 ± 0.0	10: 86.7 ± 5.4 20: 93.3 ± 0.0	10: 3.63 ± 0.58 20: 4.0 ± 0.24	10: 12.3 ± 0.4 20: 12.1 ± 0.4	10: 100.0 ± 0.0 20: 100.0 ± 0.0				
	Pooled Batch References	93.0 ± 0.3	18.8 ± 6.6	2.7 ± 0.8	102.0 ± 8.0	83.5 ± 22.3	0.43 ± 0.16	98 ± 6.0	80.0 ± 28.0	2.8 ± 0.7	12.0 ± 1.1	100.0 ± 0.0				
	Fording River reference	90.0	20.3 ± 7.1	2.7 ± 0.7	100.4 ± 6.9	94.0 ± 5.5	0.54 ± 0.08	100.0 ± 0.0	88.3 ± 11.4	3.17 ± 0.26	12.0 ± 0.6	100.0 ± 0.0				
	Elk River reference	100.0	17.5 ± 5.0	2.6 ± 0.7	104.9 ± 8.9	94.0 ± 5.5	0.43 ± 0.03	96.7 ± 6.7	59.9 ± 42.4	1.97 ± 0.56	11.6 ± 1.8	100.0 ± 0.0				
	Michel Creek reference	80.0	17.7 ± 9.7	2.4 ± 1.3	99.9 ± 8.6	84.0 ± 19.5	0.41 ± 0.14	96.7 ± 6.7	96.7 ± 6.7	3.36 ± 0.34	11.4 ± 0.5	100.0 ± 0.0				
	South Line Creek reference	100.0	19.5 ± 3.5	3.0 ± 0.0	106.2 ± 8.1	62.0 ± 32.7	0.35 ± 0.27	-	-	-	-	-				
	FR_FRCP1	80.0	8.4 ± 5.1	2.1 ± 1.1	113.0 ± 5.9	98.0 ± 4.5	0.43 ± 0.05	100.0 ± 0.0	1.7 ± 3.3	0.23 ± 0.45	17.0 ± 0.0	100.0 ± 0.0				
	GH_FR1	90.0	18.3 ± 3.3	2.8 ± 0.4	108.8 ± 9.8	96.0 ± 5.5	0.39 ± 0.08	95.0 ± 3.3	86.2 ± 8.0	3.57 ± 0.19	12.5 ± 0.3	100.0 ± 0.0				
	GH_ERC	90.0	19.5 ± 7.2	2.6 ± 1.0	108.8 ± 6.8	-	-	-	-	-	-	-				
	EV_MC2	100.0	16.3 ± 4.7	2.8 ± 0.4	106.5 ± 4.2	-	-	-	-	-	-	-				
	EV_HC1	100.0	22.8 ± 6.1	2.5 ± 0.5	98.5 ± 12.4	-	-	-	-	-	-	-				
	CM_MC2	90.0	5.4 ± 2.1	1.6 ± 0.5	93.0 ± 6.6	26.0 ± 11.4	0.03 ± 0.02	100.0 ± 0.0	41.7 ± 14.8	2.46 ± 0.50	13.8 ± 1.0	100.0 ± 0.0				
CM_MC3	100.0	14.1 ± 4.0	2.5 ± 0.5	95.8 ± 7.4	68.0 ± 32.7	0.07 ± 0.02	-	-	-	-	-					
LC_LCDSSLCC	100.0	19.4 ± 3.3	3.0 ± 0.0	97.0 ± 12.2	96.0 ± 8.9	0.45 ± 0.09	-	-	-	-	-					

Table 3.3-1: Results of Quarterly and Semi-Annual Toxicity Tests—Raw Results^(a)

Quarter	Location	<i>C. dubia</i>			<i>P. subcapitata</i>	<i>H. azteca</i>		<i>P. promelas</i> ^(b)					<i>O. mykiss</i>			
		% Survival	Reproduction	Broods	Cell Yield [x 10 ⁴ cells/mL]	% Survival	Dry weight [mg]	% Hatch	% Survival	Biomass [mg]	Length [mm]	% Normal Development	% Survival	% Viability	Length [mm]	Wet Weight [mg]
Q4	Laboratory control	90.0	18.9 ± 4.1	2.9 ± 0.3	28.8 ± 2.1	94.0 ± 8.9	0.34 ± 0.20	10: 100.0 ± 0.0 20: 100.0 ± 0.0	10: 90.0 ± 11.6 20: 96.7 ± 3.8	10: 3.3 ± 0.1 20: 3.2 ± 0.1	10: 11.3 ± 0.6 20: 11.2 ± 0.3	10: 100.0 ± 0.0 20: 100.0 ± 0.0	92.4 ± 8.1	88.0 ± 10.5	20.6 ± 0.3	102.2 ± 4.3
	Pooled Batch References	98.0 ± 0.2	21.5 ± 6	2.9 ± 0.3	109.0 ± 7.0	89.5 ± 11.9	0.28 ± 0.16	99 ± 2.0	92 ± 10	3 ± 0.4	12 ± 0.5	100.0 ± 0.0	86.0 ± 6.0	85.0 ± 7.0	21.0 ± 0.3	105.0 ± 2.0
	Fording River reference	90.0	21.0 ± 7.1	2.9 ± 0.3	109.1 ± 6.8	88.0 ± 21.7	0.19 ± 0.08	100.0 ± 0.0	98.3 ± 3.3	3.2 ± 0.2	11.7 ± 0.2	100.0 ± 0.0	86.7 ± 3.3	83.3 ± 3.3	21.0 ± 0.2	103.8 ± 2.6
	Elk River reference	100.0	21.4 ± 7.4	2.8 ± 0.6	104.8 ± 6.0	90.0 ± 7.1	0.24 ± 0.11	100.0 ± 0.0	93.3 ± 5.4	3.3 ± 3.3	12.0 ± 0.1	100.0 ± 0.0	87.8 ± 9.7	87.8 ± 9.7	21.1 ± 0.0	104.7 ± 2.1
	Michel Creek reference	100.0	23.8 ± 5.4	3.0 ± 0.0	111.2 ± 8.1	88.0 ± 11.0	0.46 ± 0.17	98.3 ± 3.3	83.3 ± 13.9	2.6 ± 0.2	11.2 ± 0.6	100.0 ± 0.0	80.0 ± 0.0	80.0 ± 0.0	21.4 ± 0.4	105.6 ± 2.4
	South Line Creek reference	100.0	19.7 ± 3.7	3.0 ± 0.0	109.9 ± 8.2	92.0 ± 4.5	0.23 ± 0.12	-	-	-	-	100.0 ± 0.0	89.7 ± 6.0	88.6 ± 8.0	21.3 ± 0.2	104.7 ± 3.3
	FR_FRCP1	90.0	1.1 ± 1.9	0.4 ± 0.7	7.0 ± 1.8	16.0 ± 23.0	0.06 ± 0.02	98.3 ± 3.3	1.7 ± 3.3	0.1 ± 0.3	3.5 ± 7.0	100.0 ± 0.0	21.1 ± 21.7	16.7 ± 15.3	17.1 ± 0.1	88.8 ± 0.6
	FR_FRABCH	90.0	18.4 ± 6.3	2.7 ± 0.5	92.0 ± 5.6	88.0 ± 13.0	0.17 ± 0.14	100.0 ± 0.0	60.0 ± 23.7	1.9 ± 0.1	11.1 ± 1.2	100.0 ± 0.0	71.1 ± 19.5	70.0 ± 20.8	20.3 ± 0.8	100.9 ± 4.7
	GH_FR1	100.0	17.3 ± 6.8	2.7 ± 0.9	109.0 ± 8.6	86.0 ± 16.7	0.16 ± 0.06	100.0 ± 0.0	93.3 ± 7.7	2.6 ± 0.04	10.6 ± 0.1	100.0 ± 0.0	61.1 ± 19.5	60.0 ± 17.6	19.8 ± 0.1	99.6 ± 3.8
	GH_ERC	90.0	18.3 ± 5.4	2.8 ± 0.6	118.8 ± 1.7	80.0 ± 24.5	0.16 ± 0.07	-	-	-	-	100.0 ± 0.0	90.0 ± 0.0	86.7 ± 3.3	20.7 ± 0.4	98.6 ± 2.6
	EV_MC2	100.0	17.3 ± 5.9	2.9 ± 0.3	90.5 ± 5.3	92.0 ± 13.0	0.17 ± 0.02	-	-	-	-	100.0 ± 0.0	84.2 ± 14.1	84.2 ± 14.1	21.6 ± 0.1	107.9 ± 2.6
	EV_HC1	100.0	22.8 ± 3.9	3.0 ± 0.0	109.2 ± 2.6	88.0 ± 4.5	0.30 ± 0.12	-	-	-	-	100.0 ± 0.0	77.5 ± 14.0	77.5 ± 14.0	21.2 ± 0.8	105.2 ± 6.2
	CM_MC2	80.0	0.0 ± 0.0	0.0 ± 0.0	94.8 ± 7.8	66.0 ± 16.7	0.07 ± 0.02	100.0 ± 0.0	88.3 ± 3.3	2.9 ± 0.2	10.8 ± 0.4	100.0 ± 0.0	77.8 ± 13.9	76.7 ± 14.6	21.3 ± 0.2	111.0 ± 3.8
	CM_MC3	100.0	3.6 ± 2.1	1.3 ± 0.7	-	76.0 ± 23.0	0.22 ± 0.08	-	-	-	-	100.0 ± 0.0	-	-	-	-
LC_LCDSSLCC	90.0	11.9 ± 4.3	2.3 ± 0.8	87.8 ± 8.2	70.0 ± 28.3	0.12 ± 0.07	-	-	-	-	100.0 ± 0.0	92.0 ± 8.0	90.9 ± 10.0	21.7 ± 0.2	112.1 ± 4.2	

Notes:

- (a) Results presented as survival or mean ± standard deviation. Results are from laboratory reports in Appendix B. Control-normalized results are provided in Table 3.3-2.
- (b) Results for copper-amended samples are provided; reference site results are samples amended with 10 µg/L. Laboratory control results are provided for laboratory control + 10 µg/L copper (Cu) and laboratory control + 20 µg/L Cu.
- (c) *P. promelas* results for tests conducted with 20 µg/L Cu are shown.

- = not tested; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; ± = plus or minus.

Screening:

- Value** = result significantly lower than Fording River reference.
- Value = result significantly lower than Elk River reference.
- Value = result significantly lower than Michel Creek reference.
- Value** = result significantly lower than South Line Creek reference.

Table 3.3-2: Results of Quarterly and Semi-Annual Toxicity Tests—Control-Normalized Results^(a)

Quarter	Location	<i>C. dubia</i>			<i>H. azteca</i>		<i>P. promelas</i> ^(b)					<i>O. mykiss</i>			
		Survival	Reproduction	Broods	Survival	Dry Weight	Hatch	Survival	Biomass	Length	Normal Development	Survival	Viability	Length	Weight
Q1	Laboratory control	100 ± 0	100 ± 19	100 ± 11	100 ± 0	100 ± 19	10: 100 ± 3 20: 100 ± 0	10: 100 ± 7 20: 100 ± 0	10: 100 ± 14 20: 100 ± 6	10: 100 ± 5 20: 100 ± 3	10: 100 ± 4 20: 100 ± 0				
	Pooled Batch References	93 ± 25	78 ± 31	69 ± 26	98 ± 4	77 ± 9	101 ± 2	91 ± 17	91 ± 9	95 ± 10	101 ± 3				
	Fording River reference	100 ± 0	88 ± 24	72 ± 20	98 ± 4	79 ± 6	102 ± 0	89 ± 9	97 ± 10	96 ± 6	100 ± 5				
	Elk River reference	80 ± 42	68 ± 46	59 ± 37	96 ± 5	80 ± 8	100 ± 3	77 ± 40	86 ± 8	109 ± 13	102 ± 0				
	Michel Creek reference	100 ± 0	77 ± 17	76 ± 15	100 ± 0	72 ± 12	100 ± 3	100 ± 4	86 ± 5	88 ± 7	102 ± 0				
	FR_FRCP1	80 ± 42	21 ± 23	31 ± 30	86 ± 26	39 ± 13	95 ± 6	84 ± 19	107 ± 8	100 ± 6	100 ± 0				
	GH_FR1	100 ± 0	79 ± 12	79 ± 17	96 ± 5	81 ± 17	93 ± 8	91 ± 16	102 ± 15	99 ± 3	100 ± 0				
	GH_ERC	100 ± 0	73 ± 29	69 ± 28	-	-	-	-	-	-	-				
	EV_MC2	100 ± 0	56 ± 22	62 ± 22	-	-	-	-	-	-	-				
	EV_HC1	100 ± 0	60 ± 27	62 ± 22	-	-	-	-	-	-	-				
	CM_MC2	100 ± 0	48 ± 19	66 ± 11	36 ± 36	10 ± 10	98 ± 3	105 ± 4	110 ± 7	96 ± 4	93 ± 14				
	CM_MC3	100 ± 0	87 ± 20	90 ± 18	98 ± 4	83 ± 8	-	-	-	-	-				
LC_LCDSSLCC	100 ± 0	75 ± 19	69 ± 23	-	-	-	-	-	-	-					
Q2	Laboratory control	100 ± 0	100 ± 14	100 ± 0	100 ± 6	100 ± 10	10: 100 ± 0 20: 100 ± 0	10: 100 ± 23 20: 100 ± 12	10: 100 ± 14 20: 100 ± 4	10: 100 ± 4 20: 100 ± 3	10: 100 ± 5 20: 100 ± 5	100 ± 7	100 ± 13	100 ± 4	100 ± 17
	Pooled Batch References ^(c)	98 ± 16	95 ± 39	82 ± 21	103 ± 5	122 ± 9	98 ± 3	121 ± 4	102 ± 13	100 ± 4	107 ± 0	100 ± 6	102 ± 7	104 ± 3	104 ± 18
	Fording River reference	100 ± 0	101 ± 42	83 ± 18	102 ± 6	119 ± 6	100 ± 0	6 ± 8	39 ± 3	150 ± 19	107 ± 0	96 ± 9	99 ± 11	101 ± 1	100 ± 17
	Elk River reference	90 ± 32	76 ± 35	73 ± 31	104 ± 5	116 ± 9	97 ± 4	40 ± 8	62 ± 2	120 ± 9	96 ± 13	97 ± 4	101 ± 4	106 ± 2	105 ± 18
	Michel Creek reference	100 ± 0	127 ± 38	93 ± 14	102 ± 6	127 ± 9	98 ± 3	121 ± 4	102 ± 13	100 ± 4	107 ± 0	104 ± 0	107 ± 2	105 ± 4	105 ± 24
	South Line Creek reference	100 ± 0	77 ± 20	77 ± 16	104 ± 5	127 ± 7	-	-	-	-	-	101 ± 5	103 ± 7	105 ± 2	108 ± 20
	FR_FRCP1	100 ± 0	64 ± 24	63 ± 25	104 ± 5	127 ± 6	93 ± 5	104 ± 5	93 ± 8	97 ± 6	101 ± 4	92 ± 14	93 ± 12	103 ± 4	108 ± 18
	GH_FR1	100 ± 0	72 ± 9	70 ± 11	98 ± 14	146 ± 19	97 ± 4	94 ± 41	98 ± 24	105 ± 10	103 ± 0	95 ± 5	95 ± 8	106 ± 3	115 ± 14
	GH_ERC	100 ± 0	62 ± 11	70 ± 11	-	-	-	-	-	-	-	98 ± 8	102 ± 8	105 ± 2	107 ± 19
	EV_MC2	90 ± 32	94 ± 17	87 ± 17	-	-	-	-	-	-	-	106 ± 2	109 ± 5	105 ± 3	111 ± 22
	EV_HC1	100 ± 0	97 ± 30	83 ± 18	-	-	-	-	-	-	-	93 ± 9	96 ± 8	107 ± 4	113 ± 21
	CM_MC2	100 ± 0	42 ± 24	57 ± 32	55 ± 30	95 ± 11	100 ± 0	113 ± 16	105 ± 10	100 ± 6	103 ± 0	94 ± 8	94 ± 8	106 ± 2	113 ± 25
CM_MC3	100 ± 0	69 ± 23	77 ± 16	102 ± 6	129 ± 14	-	-	-	-	-	-	-	-	-	
LC_LCDSSLCC	100 ± 0	40 ± 12	73 ± 14	96 ± 15	108 ± 35	-	-	-	-	-	102 ± 3	103 ± 2	104 ± 5	109 ± 16	
Q3	Laboratory control	100 ± 0	100 ± 21	100 ± 11	100 ± 10	100 ± 25	10: 100 ± 3 20: 100 ± 0	10: 100 ± 6 20: 100 ± 0	10: 100 ± 16 20: 100 ± 6	10: 100 ± 3 20: 100 ± 3	10: 100 ± 0 20: 100 ± 0				
	Pooled Batch References	93 ± 27	102 ± 36	92 ± 27	95 ± 25	144 ± 54	100 ± 6	92 ± 32	78 ± 20	95 ± 9	100 ± 0				
	Fording River reference	90 ± 32	111 ± 39	93 ± 23	107 ± 6	180 ± 28	102 ± 0	102 ± 13	87 ± 7	97 ± 5	100 ± 0				
	Elk River reference	100 ± 0	96 ± 27	90 ± 24	107 ± 6	145 ± 8	100 ± 9	69 ± 49	54 ± 15	95 ± 15	100 ± 0				
	Michel Creek reference	80 ± 42	97 ± 53	83 ± 44	95 ± 22	136 ± 45	98 ± 7	106 ± 7	93 ± 9	93 ± 4	100 ± 0				
	South Line Creek reference	100 ± 0	107 ± 19	103 ± 0	70 ± 37	115 ± 92	-	-	-	-	-				
	FR_FRCP1	80 ± 42	46 ± 28	72 ± 38	111 ± 5	144 ± 18	100 ± 0	2 ± 4	23 ± 0	140 ± 0	100 ± 0				
	GH_FR1	90 ± 32	100 ± 18	97 ± 15	109 ± 6	130 ± 25	98 ± 3	92 ± 9	89 ± 5	103 ± 2	100 ± 0				
	GH_ERC	90 ± 32	107 ± 39	90 ± 33	-	-	-	-	-	-	-				
	EV_MC2	100 ± 0	89 ± 26	97 ± 15	-	-	-	-	-	-	-				
	EV_HC1	100 ± 0	125 ± 33	86 ± 18	-	-	-	-	-	-	-				
	CM_MC2	90 ± 32	30 ± 12	55 ± 18	30 ± 13	9 ± 7	100 ± 0	45 ± 16	61 ± 13	114 ± 9	100 ± 0				
CM_MC3	100 ± 0	77 ± 22	86 ± 18	77 ± 37	24 ± 7	-	-	-	-	-					
LC_LCDSSLCC	100 ± 0	106 ± 18	103 ± 0	109 ± 10	150 ± 30	-	-	-	-	-					

Table 3.3-2: Results of Quarterly and Semi-Annual Toxicity Tests—Control-Normalized Results^(a)

Quarter	Location	<i>C. dubia</i>			<i>H. azteca</i>		<i>P. promelas</i> ^(b)				<i>O. mykiss</i>				
		Survival	Reproduction	Broods	Survival	Dry Weight	Hatch	Survival	Biomass	Length	Normal Development	Survival	Viability	Length	Weight
Q4	Laboratory control	100 ± 35	100 ± 22	100 ± 11	100 ± 10	100 ± 60	10: 100 ± 0 20: 100 ± 0	10: 100 ± 13 20: 100 ± 4	10: 100 ± 4 20: 100 ± 3	10: 100 ± 5 20: 100 ± 2	10: 100 ± 0 20: 100 ± 0	100 ± 9	100 ± 12	100 ± 1	100 ± 4
	Pooled Batch References	108 ± 18	114 ± 32	101 ± 12	95 ± 13	83 ± 47	99 ± 2	102 ± 11	93 ± 12	102 ± 4	100 ± 0	93 ± 7	97 ± 8	103 ± 1	102 ± 2
	Fording River reference	100 ± 35	111 ± 37	100 ± 11	94 ± 23	57 ± 23	100 ± 0	109 ± 4	99 ± 5	103 ± 2	100 ± 0	94 ± 4	95 ± 4	102 ± 1	102 ± 3
	Elk River reference	111 ± 0	113 ± 39	97 ± 22	96 ± 8	71 ± 32	100 ± 0	104 ± 6	101 ± 10	106 ± 1	100 ± 0	95 ± 10	100 ± 11	103 ± 0	102 ± 2
	Michel Creek reference	111 ± 0	126 ± 29	103 ± 0	94 ± 12	136 ± 50	98 ± 3	93 ± 15	79 ± 6	98 ± 5	100 ± 0	87 ± 0	91 ± 0	104 ± 2	103 ± 2
	South Line Creek reference	111 ± 0	104 ± 20	103 ± 0	98 ± 5	68 ± 37	-	-	-	-	100 ± 0	97 ± 7	101 ± 9	104 ± 1	102 ± 3
	FR_FRCP1	100 ± 35	6 ± 10	14 ± 24	17 ± 24	19 ± 7	98 ± 3	2 ± 3	5 ± 9	31 ± 62	100 ± 0	23 ± 23	19 ± 17	55 ± 48	58 ± 50
	FR_FRABCH	100 ± 35	97 ± 33	93 ± 17	94 ± 14	51 ± 41	100 ± 0	62 ± 25	59 ± 3	99 ± 11	100 ± 0	77 ± 21	80 ± 24	99 ± 4	99 ± 5
	GH_FR1	111 ± 0	92 ± 36	93 ± 33	91 ± 18	47 ± 19	100 ± 0	97 ± 8	79 ± 1	94 ± 1	100 ± 0	66 ± 21	68 ± 20	96 ± 1	98 ± 4
	GH_ERC	100 ± 35	97 ± 28	97 ± 22	85 ± 26	46 ± 20	-	-	-	-	100 ± 0	97 ± 0	98 ± 4	101 ± 2	97 ± 3
	EV_MC2	111 ± 0	92 ± 31	100 ± 11	98 ± 14	51 ± 6	-	-	-	-	100 ± 0	91 ± 15	96 ± 16	105 ± 1	106 ± 3
	EV_HC1	111 ± 0	121 ± 21	103 ± 0	94 ± 5	88 ± 35	-	-	-	-	100 ± 0	84 ± 15	88 ± 16	103 ± 4	103 ± 6
	CM_MC2	89 ± 47	0 ± 0	0 ± 0	70 ± 18	19 ± 6	100 ± 0	91 ± 3	89 ± 7	96 ± 3	100 ± 0	84 ± 15	87 ± 17	103 ± 1	109 ± 4
	CM_MC3	111 ± 0	19 ± 11	45 ± 23	81 ± 24	67 ± 23	-	-	-	-	100 ± 0	-	-	-	-
LC_LCDSSLCC	100 ± 35	63 ± 23	79 ± 28	74 ± 30	35 ± 20	-	-	-	-	100 ± 0	100 ± 9	103 ± 11	106 ± 1	110 ± 4	

Notes:

- (a) Results presented as survival or mean ± standard deviation. As discussed in Section 2.3.2, results were normalized for all endpoints except *P. subcapitata* cell yield.
 - (b) Test site results for samples amended with 20 µg/L are provided; reference site results are samples amended with 10 µg/L. Laboratory control results are provided for laboratory control + 10 µg/L Cu and laboratory control + 20 µg/L Cu.
 - (c) *P. promelas* results for tests conducted with 20 µg/L Cu are shown.
- = not tested; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; ± = plus or minus.

Screening:

- Value** = result significantly lower than Fording River reference.
- Value = result significantly lower than Elk River reference.
- Value = result significantly lower than Michel Creek reference.
- Value** = result significantly lower than South Line Creek reference.

3.3.1 Results by Test Species

3.3.1.1 *Ceriodaphnia dubia*

Results of standard Permit-based testing are provided below, followed by results of the TIE conducted to evaluate adverse responses observed at CM_MC2 and FR_FRCP1 under the AMP Response Framework (see Section 2.2.2 for context).

Standard Permit-based Testing

Individual replicate results are provided in Figures 3.3-1 and 3.3-2. Mean test results are provided in Tables 3.3-1 and 3.3-2 and Figures 3.3-3 and 3.3-4.

There was no evidence of statistically significant adverse effects on mean *C. dubia* survival in any test (Figure 3.3-1; Figure 3.3-3). The few individual replicates for which mortality was observed in all quarters were insufficient to cause a statistically significant response. Replicate results for survival are binomial (either 0% or 100%) because each replicate consists of a single female. Results of other testing of Elk Valley waters, conducted with additional replication of the survival endpoint, confirmed that adult survival is a relatively insensitive test endpoint (Golder 2018a); the observation of an occasional mortality to an adult female (including in reference samples) is believed to occur due to random events not associated with chemical toxicity.

Reproduction was significantly reduced relative to one or more references in 18 of 33 tests (Figures 3.3-2; Figure 3.3-4; Table 3.3-1; Table 3.3-2), including:

- four FR_FRCP1 tests (Q1 to Q4)
- one GH_FR1 test (Q2)
- one GH_ERC test (Q2)
- two EV_MC2 tests (Q1, Q2)
- one EV_HC1 test (Q2)
- four CM_MC2 tests (Q1 to Q4)
- three CM_MC3 tests (Q2, Q3, Q4)
- two LC_LCDSSLCC tests (Q2, Q4).

In two of 18 tests with significant results, mean reproduction was within the local NR and the effect size was less than 20% compared to the mean response in batch-specific references (EV_MC2 [Q2 = 1%]; EV_HC1 [Q2 = -2%]), indicating no adverse response. In two of 18 tests with significant results, mean reproduction was within the local NR and the effect size was between 20% and 50% compared to the mean response in batch-specific references (GH_ERC [Q2 = 35%]; CM_MC3 [Q3 = 25%]). These results indicate a “possible” adverse response. There is uncertainty whether these results represent an adverse response to the test water or variance in test organism performance related to background water quality. In the remaining tests with significant results, mean reproduction was below the local and regional NRs (FR_FRCP1 [Q1 to Q4], GH_FR1 [Q2], EV_MC2 [Q1], CM_MC2 [Q1 to Q4], CM_MC3 [Q2, Q4], and LC_LCDSSLCC [Q2, Q4]). These results indicate a likely adverse response to the test site water. Compared to the mean response in batch-specific references, the effect size in tests categorized as likely ranged from 24% (GH_FR1 in Q2) to 100% (CM_MC2 in Q4).

Based on the results presented above, *C. dubia* tests were categorized as follows:

- **No adverse response (17 of 33 tests):** FR_FRABCH (Q4), GH_FR1 (Q1, Q3, Q4), GH_ERC (Q1, Q3, Q4), EV_MC2 (Q2, Q3, Q4), EV_HC1 (Q1 to Q4), CM_MC3 (Q1), and LC_LCDSSLCC (Q1, Q3)
- **Possible adverse response (2 of 33 tests):** GH_ERC (Q2) and CM_MC3 (Q3)
- **Likely adverse response (14 of 33 tests):** FR_FRCP1 (Q1 to Q4), GH_FR1 (Q2), EV_MC2 (Q1), CM_MC2 (Q1 to Q4), CM_MC3 (Q2, Q4), and LC_LCDSSLCC (Q2, Q4)

The concentration-response analysis for *C. dubia* reproduction is presented in Section 3.4.1.

Consideration of *Ceriodaphnia dubia* Broods

Results are summarized in Table 3.3-3.

Based on the approach used herein, the consideration of *C. dubia* broods does not change test categories for most tests categorized as possible or likely (10 of 16). For the remaining tests categorized as possible or likely, two of the 16 tests would change from likely to possible (Q2 FR_FRCP1 and Q4 LC_LCDSSLCC), two of 16 tests would change from possible to no (Q2 GH_ERC and Q3 CM_MC3), and two of 16 tests would change from likely to no (Q2 GH_FR1 and Q2 CM_MC3).

At this preliminary stage, it is not known whether the approach used herein (see Section 2.2) is a reasonable estimation of actual impacts of brood output on test categories. Per discussions during the February 2019 EMC conference call, the *C. dubia* test duration is being extended to eight days for 2019 testing. It is anticipated that the extended test duration will help to identify cases where there may be downward bias in reproductive output due to minor differences in brood output among tests.

Table 3.3-3: Brood Output in 2018 *C. dubia* Tests

Location	Q1			Q2			Q3			Q4		
	Reps with Two Broods ^(a)	Potential Bias on Overall Reprod. Output ^(b)	Adjusted Reprod. ^(c)	Reps with Two Broods ^(a)	Potential Bias on Overall Reprod. Output ^(b)	Adjusted Reprod. ^(c)	Reps with Two Broods ^(a)	Potential Bias on Overall Reprod. Output ^(b)	Adjusted Reprod. ^(c)	Reps with Two Broods ^(a)	Potential Bias on Overall Reprod. Output ^(b)	Adjusted Reprod. ^(c)
Pooled Batch References	7	-		4.8	-		0.75	-		0	-	
Fording reference	7	-		5	1%		1	1%		0	-	
Elk reference	5	-		5	1%		2	6%		0	-	
Michel reference	9	10%		2	-		0	-		0	-	
South Line reference	-			7	11%		0	-		0	-	
FR_FRCP1	5	-	21%	8	16%	76%	2	6%	49%	1	5%	6%
FR_FRABCH	Not tested ^(d)									3	15%	
GH_FR1	7	-		9	21%	91%	2	6%		0	-	
GH_ERC	6	-		9	21%	79%	2	6%		0	-	
EV_MC2	9	10%	62%	4	-		5	21%		0	-	
EV_HC1	9	10%		5	1%		2	6%		1	5%	
CM_MC2	9	10%	53%	7	11%	47%	6	26%	41%	0	-	0%
CM_MC3	4	-		7	11%	78%	5	21%	98%	4	20%	24%
LC_LCDSSLCC	6	-		8	16%	48%	0	-		4	20%	79%

Notes:

(a) Number of replicates (reps) at the end of the test with exactly two broods (Appendix B).

(b) Difference between number of replicates with exactly two broods for pooled batch references and corresponding site, multiplied by 5% (see Section 2.3.3.1 for details). '-' indicates no bias on brood output because number of replicates with exactly two broods for location was less than corresponding pooled batch references.

(c) Adjusted control-normalized reproduction, accounting for the potential bias on reproductive output (see Section 2.3.3.1 for details). '-' indicates reference test or test site categorized as no adverse response.

(d) Not tested in corresponding quarter. Station was added in Q4 because FR_FRABCH is being considered as a potential future compliance location (Section 2.1).

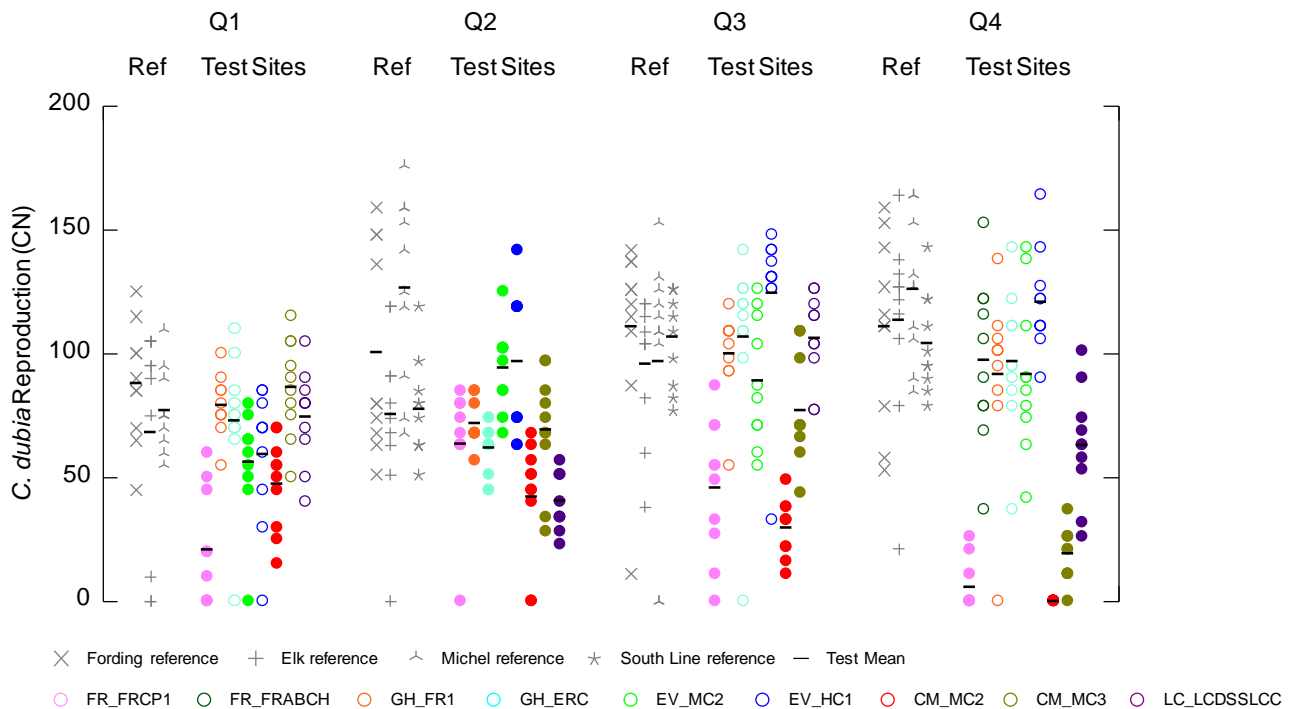
Shaded = estimated effect on brood output and measured effect size in test are within 10% for corresponding quarter and location.

Figure 3.3-1: Individual replicate and mean results for *C. dubia* survival in reference (Ref) and test site waters.



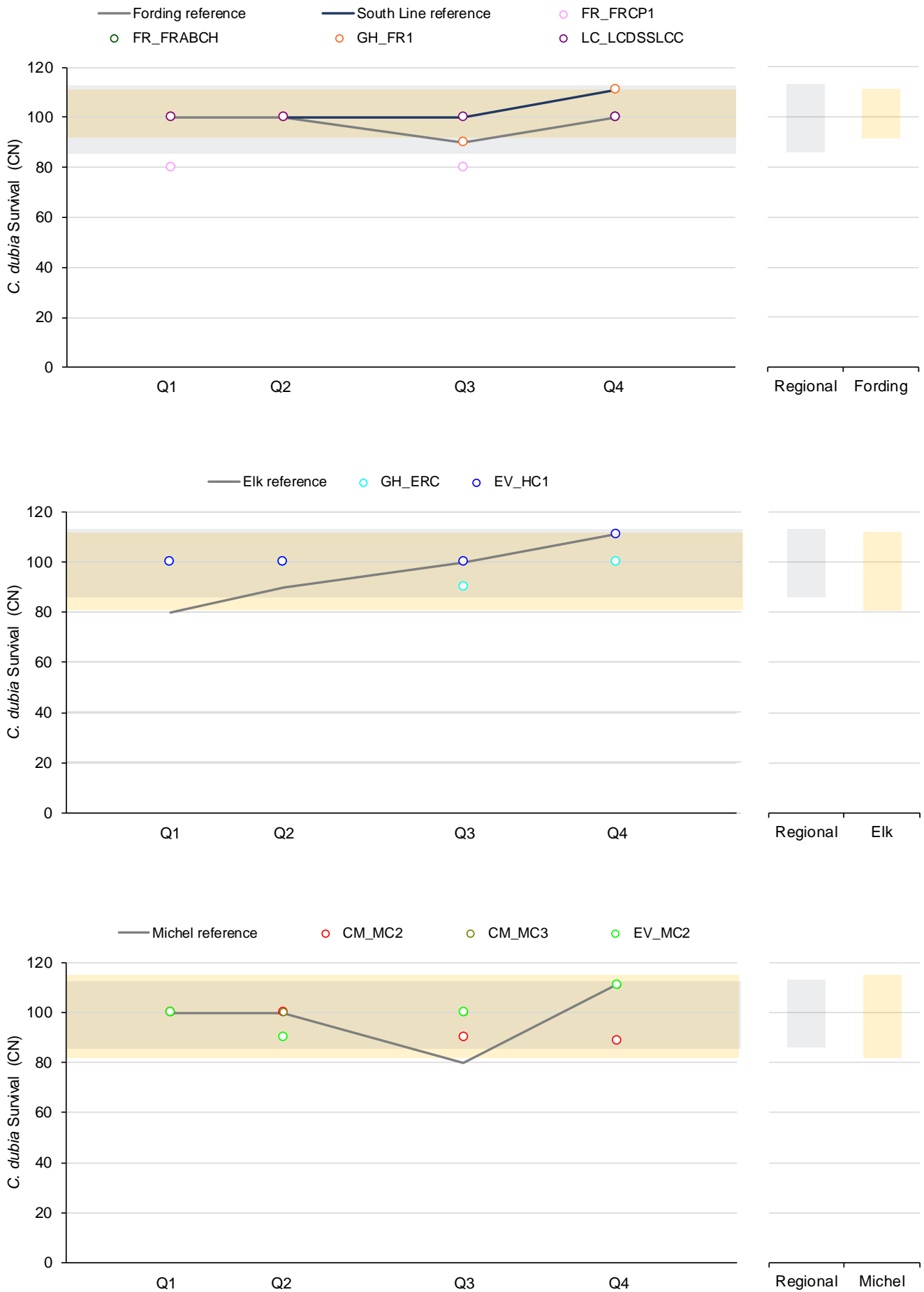
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-2: Individual replicate and mean results for *C. dubia* reproduction in reference (Ref) and test site waters.



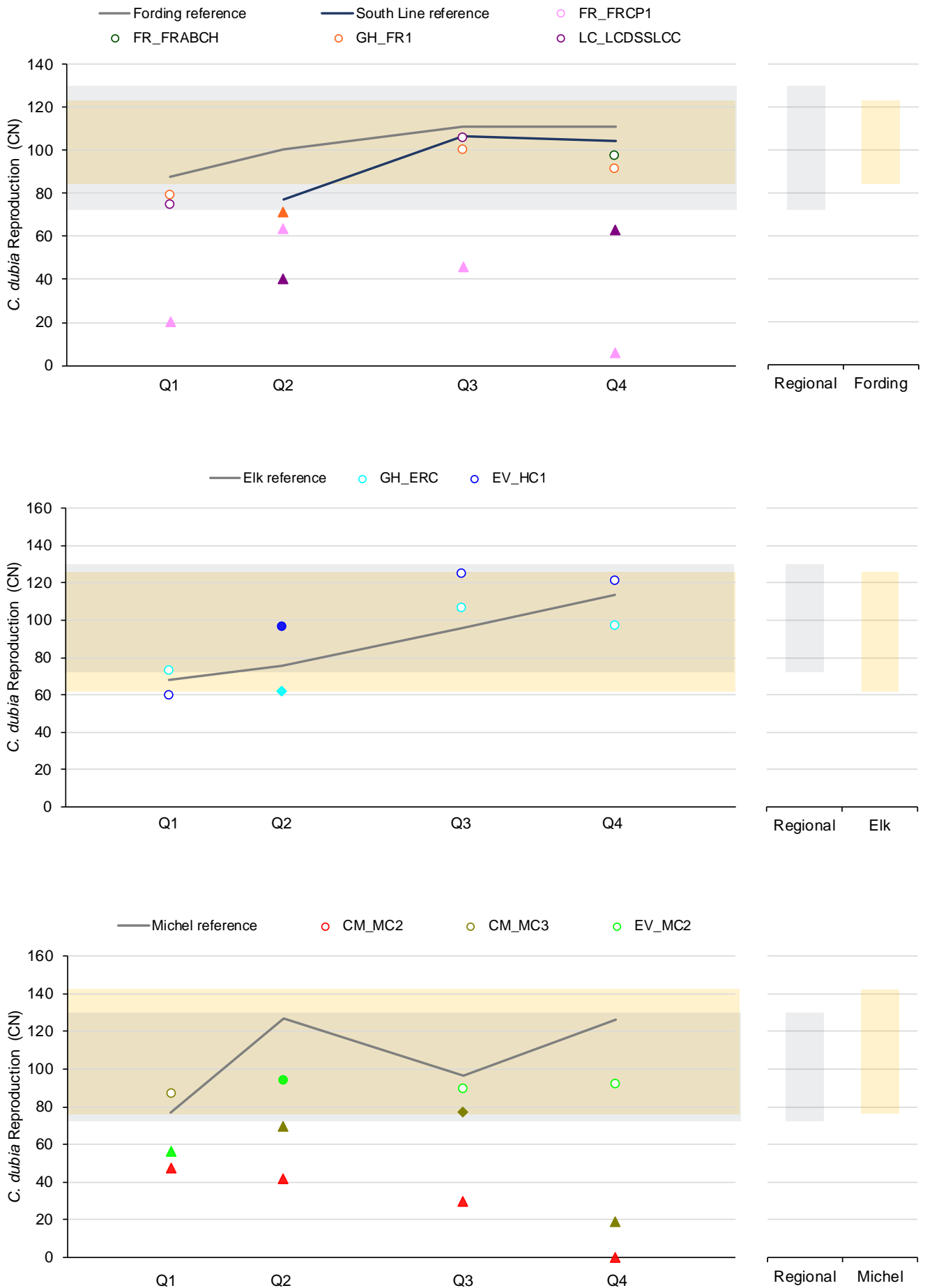
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-3: Mean results for *C. dubia* survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-4: Mean results for *C. dubia* reproduction in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters. Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Toxicity Identification Evaluation

Results for the Q4 FR_FRCP1 TIE are as follows (Appendix B-5):

- None of the TIE treatments substantially improved reproduction of *C. dubia*, although a small improvement in reproduction was observed in the pH 10 filtration treatment. Thus, the cause of toxicity did not appear to be an organic compound, a strong anion, a metal, or calcite formation (Appendix B-5).
- Review of water chemistry data indicated that sulphate and TDS concentrations were above thresholds for *C. dubia* reproduction. Sulphate concentrations ranged from 1,800 to 2,000 mg/L and TDS ranged from 3,000 to 3,500 mg/L, which exceeds thresholds for chronic toxicity for this species. Based on this comparison, reduced *C. dubia* reproduction in FR_FRCP1 water was most likely due to sulphate and TDS (Appendix B-5). This conclusion was supported by 1) similar toxicity and sulphate/TDS concentrations in weekly samples, and 2) the ineffectiveness of the TIE treatments which would not have reduced sulphate and TDS concentrations. As discussed in Appendix B-5, it should be noted that sulphate and its corresponding counter cation (predominantly calcium and magnesium in this case) are major components of TDS, and it is not possible to distinguish whether sulphate, or TDS as a whole is responsible for toxicity in cases where adverse effects due to these constituents are observed.
- The dilution series test resulted in an IC₅₀ of 32% v/v. The sulphate concentration at this level of dilution is 640 mg/L, which would not be expected to elicit a 50% effect (level 3 benchmark for sulphate = 1,135 mg/L; Teck 2014). Based on this comparison, it is possible that other constituents contributed to the observed response. However, toxicity in the sample can be explained at least in part by the concentration of sulphate and TDS in the sample (see previous bullet). It was not possible to distinguish whether other toxicants were also present to a lesser extent in the sample (Appendix B-5).

Results for the 2018 Michel Creek TIE are as follows (Appendix B-6):

- In tests with CM_MC2 water, treatment with EDTA improved performance of the test organisms in each case (i.e., reduced toxicity), although toxicity was not entirely removed by this treatment in all cases. Regardless, the data indicate that divalent metal cations, such as nickel, were a primary contributor to toxicity in the samples (Appendix B-6).
- In test with CM_MC3 water, reproduction was higher in the EDTA-treated CM_MC3 sample relative to the untreated sample, although the improvement was not statistically significant.

3.3.1.2 *Pseudokirchneriella subcapitata*

Cell yield was significantly reduced relative to one or more references in 14 of 31 tests (Figure 3.3-5; Figure 3.3-6; Table 3.3-1), including:

- three FR_FRCP1 tests (Q1, Q2, Q4)
- one FR_FRABCH test (Q4)
- two GH_FR1 test (Q1, Q2)
- one GH_ERC test (Q2)
- one EV_MC2 test (Q4)
- one EV_HC1 test (Q2)
- three CM_MC2 tests (Q1, Q2, Q4)

- one CM_MC3 test (Q1)
- one LC_LCDSSLCC test (Q4)

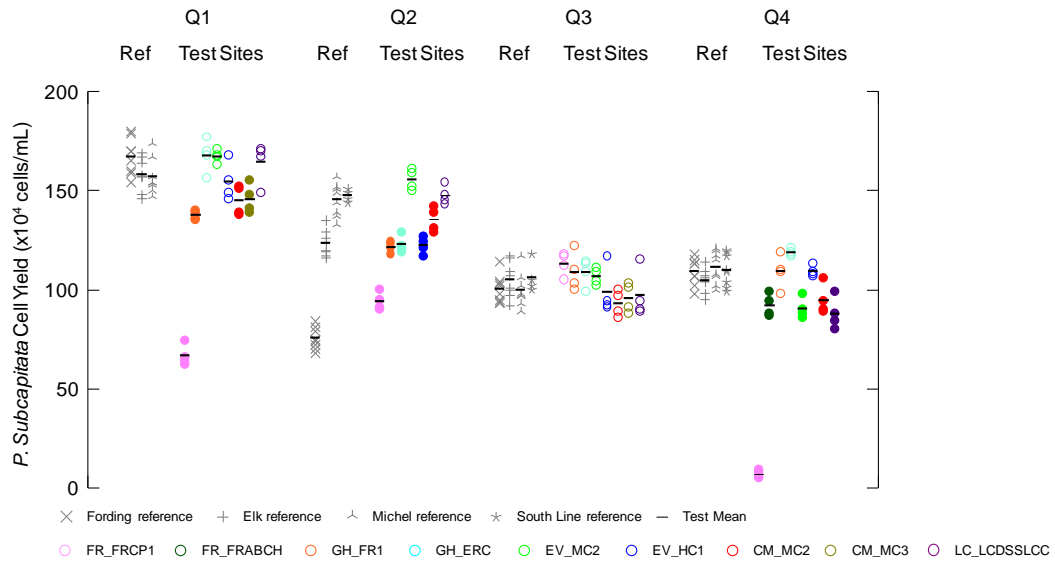
In 11 of 14 tests with significant results, mean cell yield was within the local NR and the effect size was less than 20% compared to the mean response in batch-specific references, indicating no adverse response (FR_FRABCH [Q4], GH_FR1 [Q1, Q2], GH_ERC [Q2], EV_MC2 [Q4], EV_HC1 [Q2], CM_MC2 [Q1, Q2, Q4], CM_MC3 [Q1], and LC_LCDSSLCC [Q4]). Compared to the mean response in batch-specific references, the effect size in tests categorized as no adverse response ranged from -14% (CM_MC2 in Q2) to 19% (LC_LCDSSLCC in Q4). In one of 14 tests with significant results (Q2 FR_FRCP1), mean cell yield was within the local NR and the effect size (21%) was between 20% and 50% compared to the mean response in batch-specific references, indicating a “possible” adverse response. There is uncertainty whether these results represent an adverse response to the test water or variance in test organism performance related to background water quality. In two of 14 tests with significant results, mean cell yield was below the local and regional NRs (FR_FRCP1 [Q1, Q4]). These results indicate a likely adverse response to the test water. Compared to the mean response in batch-specific references, the effect size in tests categorized as likely ranged from 59% (Q1) to 94% (Q4) in the FR_FRCP1 tests.

Based on the results presented above, *P. subcapitata* tests were categorized as follows:

- **No adverse response (28 of 31 tests).** FR_FRCP1 (Q3), FR_FRABCH (Q4), GH_FR1 (Q1 to Q4), GH_ERC (Q1 to Q4), EV_MC2 (Q1 to Q4), EV_HC1 (Q1 to Q4), CM_MC2 (Q1 to Q4), CM_MC3 (Q1, Q3), and LC_LCDSSLCC (Q1 to Q4). As shown in Figures 3.3-5 and 3.3-6, the few cases for which statistically significant differences were observed relative to one or more references yielded small effect sizes and results close to the range of reference performance. This endpoint yielded low variance among replicates, but high variance among batches. The few cases of statistically significant individual pairwise comparisons are considered to be false positives once the decision rules are applied.
- **Possible adverse response (1 of 31 tests):** FR_FRCP1 (Q2)
- **Likely adverse response (2 of 31 tests):** FR_FRCP1 (Q1, Q4)

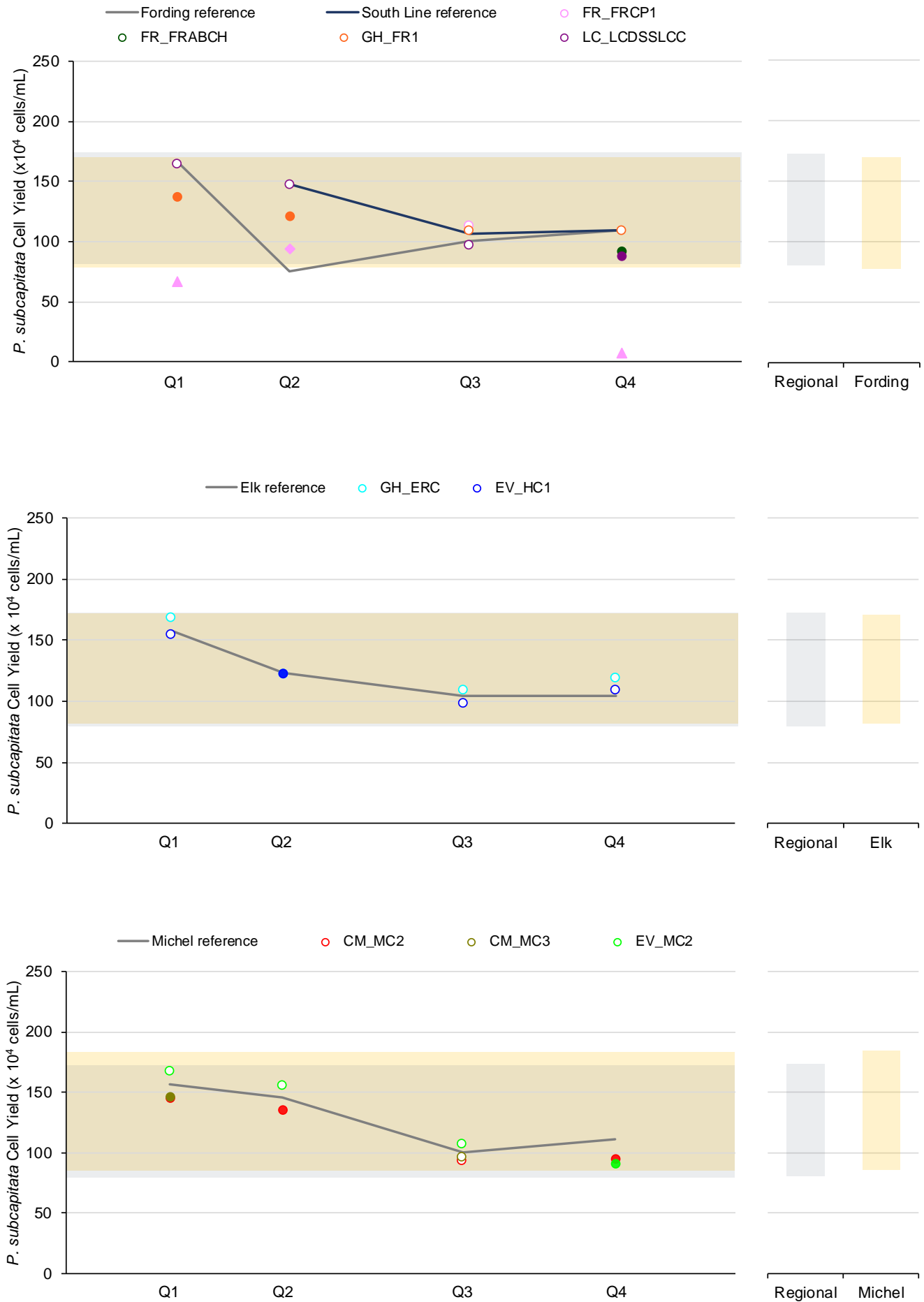
The concentration-response analysis for *P. subcapitata* cell yield is presented in Section 3.4.2.

Figure 3.3-5: Individual replicate and mean results for *P. subcapitata* cell yield in reference (Ref) and test site waters.



Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-6: Mean results for *P. subcapitata* cell yield in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th and 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

3.3.1.3 *Hyalella azteca*

Results of standard Permit-based testing are provided below, followed by results of the TIE conducted to evaluate adverse responses observed at CM_MC2 under the AMP Response Framework (see Section 2.2.2 for context).

Standard Permit-based Testing

Survival was significantly reduced in seven of 23 tests (Figure 3.3-7; Figure 3.3-9; Table 3.3-1; Table 3.3-2), including two FR_FRCP1 tests (Q1, Q4), four CM_MC2 tests (Q1 to Q4), and one CM_MC3 test (Q3). In one of seven tests with significant results (Q1 FR_FRCP1), mean survival was within the local NR and the effect size (12%) was less than 20% compared to the mean response in batch-specific references, indicating no adverse response. In the remaining tests, mean survival was below both the local and regional NRs. Compared to the mean response in batch-specific references, effect sizes in tests with significant results ranged from 19% (CM_MC3 [Q3]) to 82% (FR_FRCP1 [Q4]). These results indicate a likely adverse response to the test water.

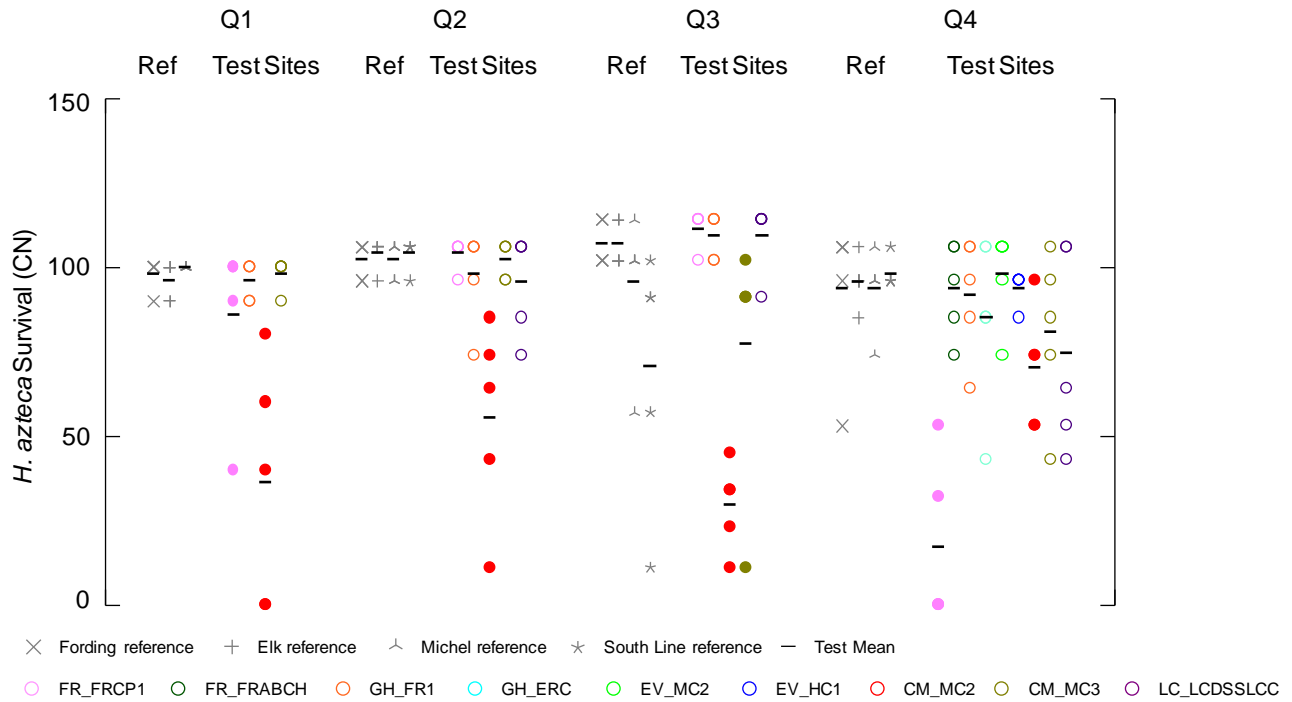
Dry weight was significantly reduced in nine of 23 tests (Figure 3.3-8; Figure 3.3-10; Table 3.3-1; Table 3.3-2), including two FR_FRCP1 tests (Q1, Q4), one FR_FRABCH test (Q4), four CM_MC2 tests (Q1 to Q4), one CM_MC3 test (Q3), and one LC_LCDSSLCC test (Q4). In two of nine tests with significant results, mean dry weight was within the local NR and the effect size was between 20% and 50% compared to the mean response in batch-specific references (CM_MC2 [Q2 = 22%]; FR_FRABCH [Q4 = 39%]). These results indicate a “possible” adverse response. There is uncertainty whether these results represent an adverse response to the test water or variance in test organism performance related to background water quality. In the remaining seven of nine tests with significant results, mean dry weight was below both the local and regional NRs. These results indicate a likely adverse response to the test water. Compared to the mean response in batch-specific references, effect size in tests categorized as likely ranged from 49% (Q1 FR_FRCP1) to 94% (Q3 CM_MC2).

Based on the results presented above, *H. azteca* tests were categorized as follows:

- **No adverse response (14 of 23 tests):** FR_FRCP1 (Q2, Q3), GH_FR1 (Q1 to Q4), CM_MC3 (Q1, Q2, Q4), LC_LCDSSLCC (Q2, Q3), and Q4 tests with GH_ERC, EV_MC2, and EV_HC1.
- **Possible adverse response (1 of 23 tests):** FR_FRABCH (Q4).
- **Likely adverse response (8 of 23 tests):** FR_FRCP1 (Q1, Q4), CM_MC2 (Q1 to Q4), CM_MC3 (Q3), and LC_LCDSSLCC (Q4).

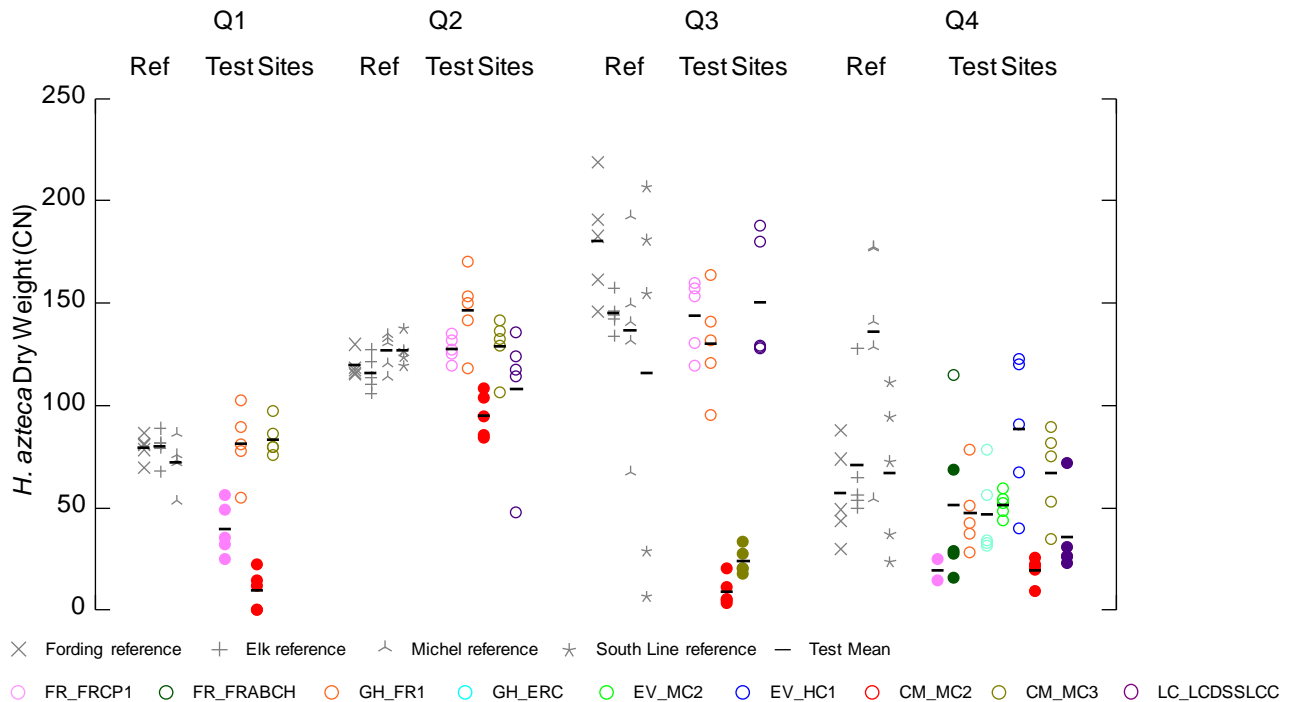
The concentration-response analysis for *H. azteca* survival and dry weight is presented in Section 3.4.3.

Figure 3.3-7: Individual replicate and mean results for *H. azteca* survival in reference (Ref) and test site waters.



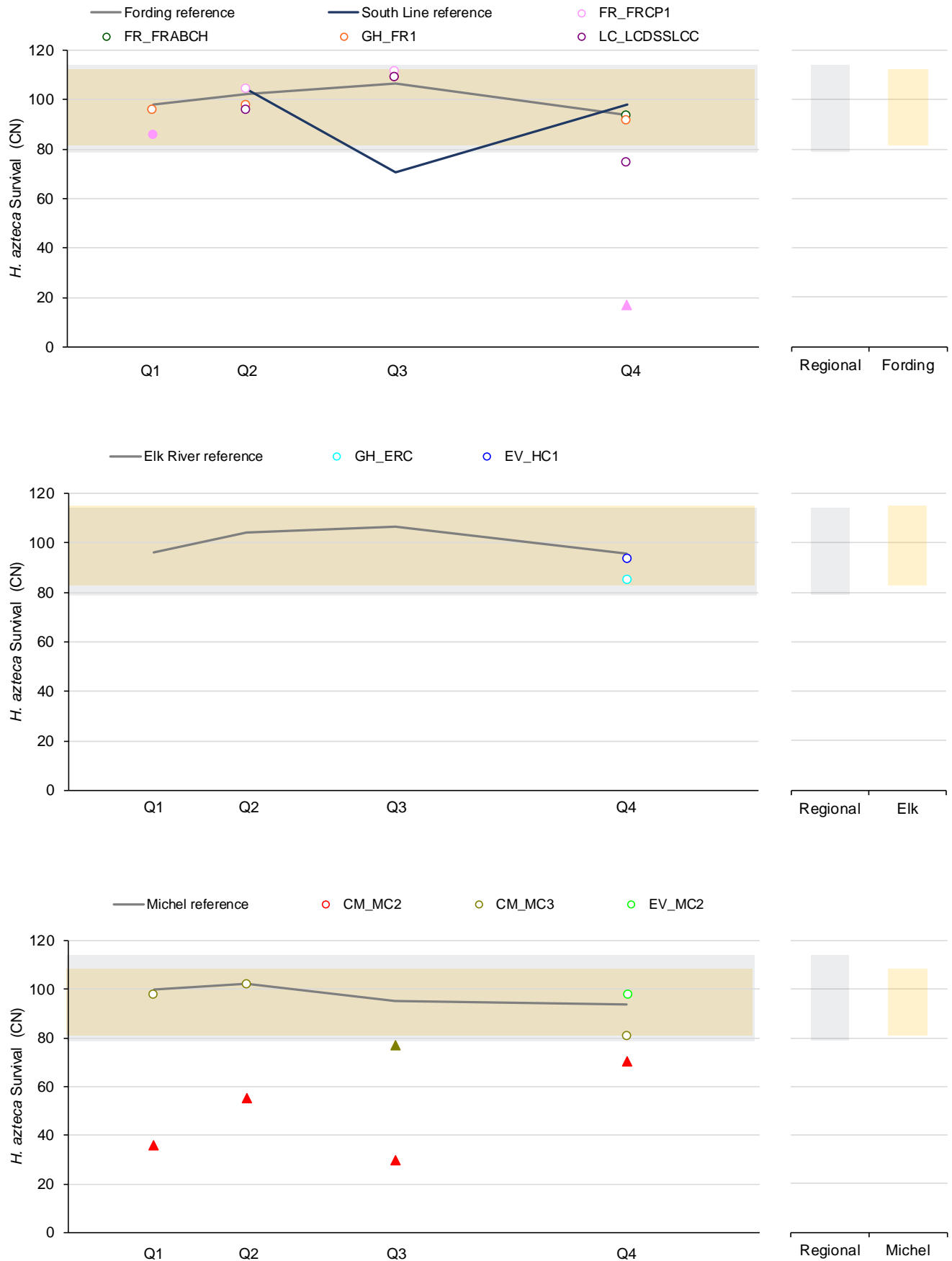
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-8: Individual replicate and mean results for *H. azteca* dry weight in reference (Ref) and test site waters.



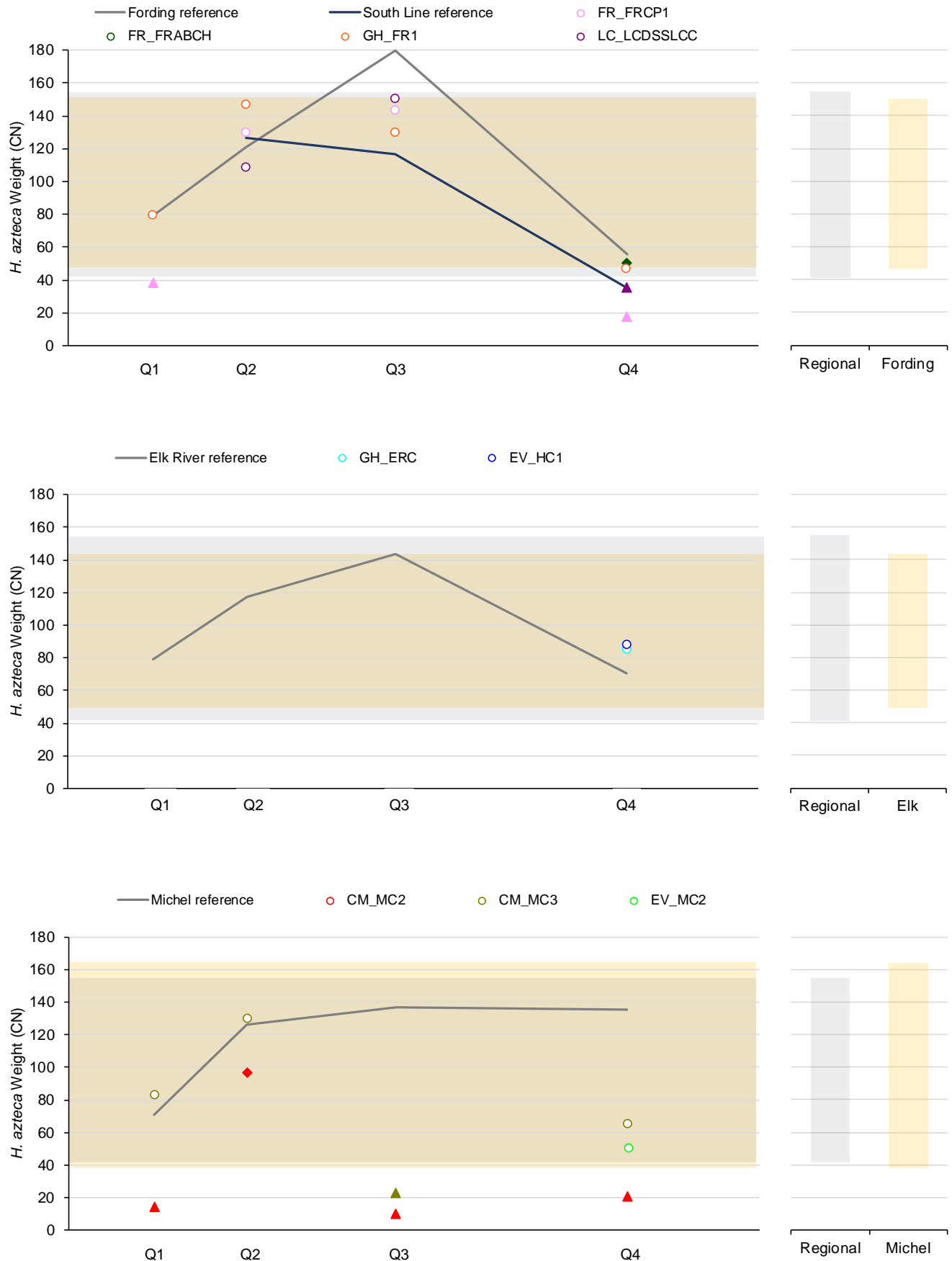
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-9: Mean results for *H. azteca* survival in the Fording River reference and its test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-10: Mean results for *H. azteca* dry weight in the Fording River reference and its test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Toxicity Identification Evaluation

In 2017, a TIE using Michel Creek water from CM_MC2 downstream of CMO was initiated to investigate the cause of adverse responses observed in CM_MC2 tests. Based on the results of EDTA treatments and subsequent spiking studies, Nautilus (2018) concluded that nickel was the likely cause of observed responses in 2017 CM_MC2 tests with *H. azteca*. It should be noted that there is uncertainty in the Nautilus (2018) thresholds for adverse effects of nickel to *H. azteca*. Specifically, the calculated thresholds may understate toxicity (i.e., the IC_x may be lower). The exposure to nickel concentrations were in good agreement with the target concentrations for the first 14 days of exposure, but the test organisms were exposed to a ten-fold lower dose of nickel during the subsequent 14 days of the 28-day exposure (Nautilus 2018). The potential for the chemistry variation to influence interpretations about causation is discussed in the concentration-response analysis for *H. azteca* (Section 3.4.3). A repeat of the nickel spiking test with *H. azteca* is planned for Q2 2019, with preliminary results anticipated by the June 2019 EMC meeting.

In 2018, a TIE using Michel Creek water from CM_MC2 downstream of CMO was designed to further support the interpretation of the suspected cause of toxicity (nickel) by using EDTA treatments only. Treatment with EDTA improved performance of the test organisms in each case (i.e., reduced toxicity), although in the fourth quarter, the treated sample remained lower than the control performance. Regardless, the data indicate that divalent metal cations, such as nickel, were a primary contributor to toxicity in the samples (Appendix B-6).

3.3.1.4 *Oncorhynchus mykiss*

Results of standard Permit-based testing are provided below, followed by results of additional copper- and argentine-amended tests.

Standard Permit-based Testing

There were no adverse behavioral responses of *O. mykiss* in any test. The survival and viability endpoint responses were numerically similar, indicating a low rate of deformities in all samples (Appendix B).

Survival and viability were significantly reduced relative to one or more references in six of 15 tests (Figure 3.3-11; Figure 3.3-12; Figure 3.3-15; Figure 3.3-16; Table 3.3-1; Table 3.3-2), including Q2 tests with FR_FRCP1, EV_HC1 (survival only), and CM_MC2, and Q4 tests with FR_FRCP1, FR_FRABCH, and GH_FR1. In the Q2 tests with significant results, mean survival and viability were within the local NR and the effect size was less than 20% compared to the mean response in batch-specific references (FR_FRCP1 [survival = 8%, viability = 9%], EV_HC1 [survival = 7%], CM_MC2 [survival = 6%, viability = 8%]), indicating no adverse response. In the Q4 FR_FRABCH test, mean responses were below the local NR, but within the regional NR indicating a “possible” adverse response. The effect sizes for this test were 17% for survival and 18% for viability. There is uncertainty whether these results represent an adverse response to the test water or variance in test organism performance related to background water quality. In the remaining Q4 tests with significant results, mean survival and viability were below the local and regional NRs. These results indicate a likely adverse response to the test water. Compared to the mean response in batch-specific references, effect size in tests categorized as likely ranged from 29% (GH_FR1 for survival) to 80% (FR_FRCP1 for viability). The potential effects of microbes on *O. mykiss* responses is provided in the following section.

Length and weight were significantly reduced relative to one or more references in the Q4 FR_FRCP1 test (Figure 3.3-13; Figure 3.3-14; Figure 3.3-17; Figure 3.3-18; Table 3.3-1; Table 3.3-2). Mean length and weight were below the local and regional NRs in this test, indicating a likely adverse response to the test water. Compared to the mean response in batch-specific references, the effect size for Q4 FR_FRCP1 was 47% for length and 43% for weight. Length was significantly reduced relative to one or more references in two additional

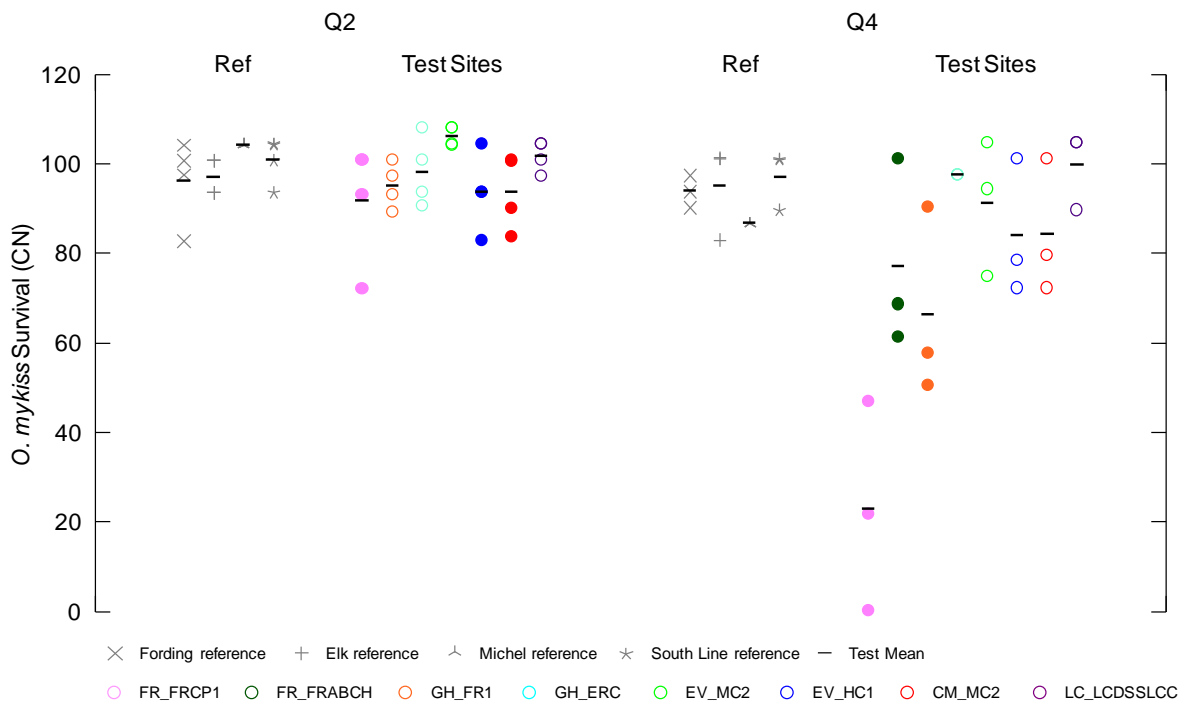
tests in Q4 (FR_FRABCH and GH_FR1). For both tests, mean length was within the local NR and the effect sizes were less than 20% compared to the mean response in batch-specific references (FR_FRABCH = 4%, GH_FR1 = 7%), indicating no adverse response.

Based on the results presented above, *O. mykiss* tests (without amendment) were categorized as follows:

- **No adverse response (12 of 15 tests):** all Q2 tests, and Q4 tests with GH_ERC, EV_HC1, EV_MC2, CM_MC2, and LC_LCDSSLCC.
- **Possible adverse response (1 of 15 tests):** Q4 test with FR_FRABCH.
- **Likely adverse response (2 of 15 tests):** Q4 tests with FR_FRCP1 and GH_FR1.

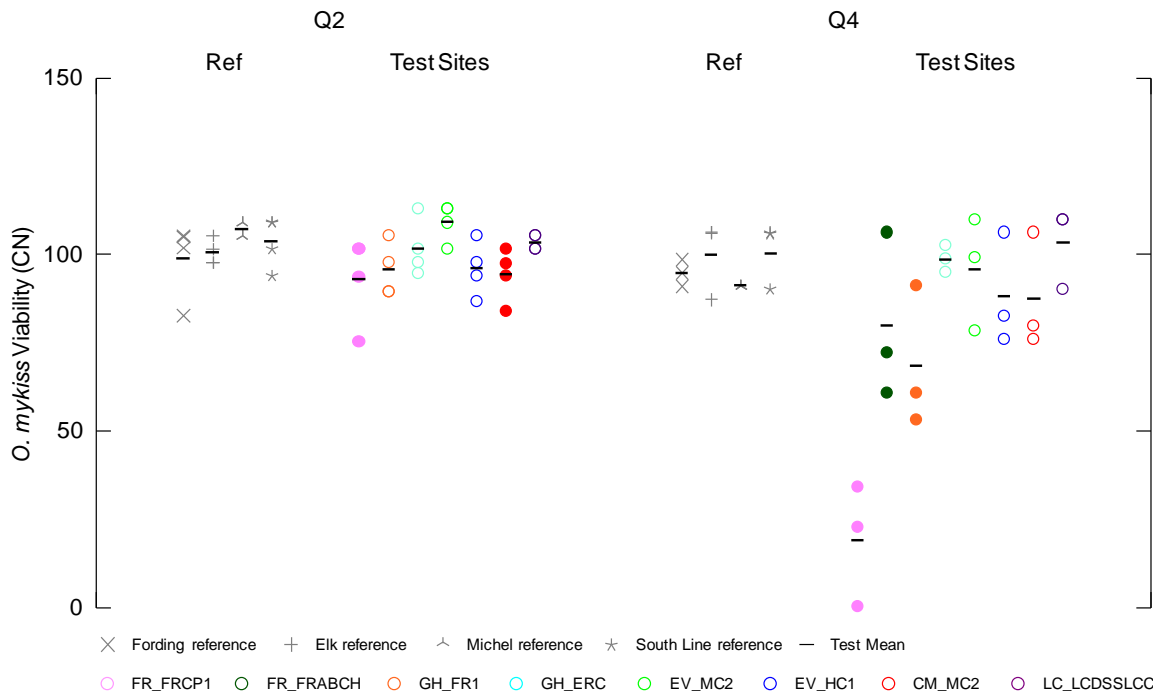
The concentration-response analysis for *O. mykiss* survival, viability, length, and weight is presented in Section 3.4.4. As discussed in the following section, copper- and argentine-treated tests were conducted in 2018 to evaluate potential effects of microbes on *O. mykiss* responses.

Figure 3.3-11: Individual replicate and mean results for *O. mykiss* survival in reference (Ref) and test site waters.



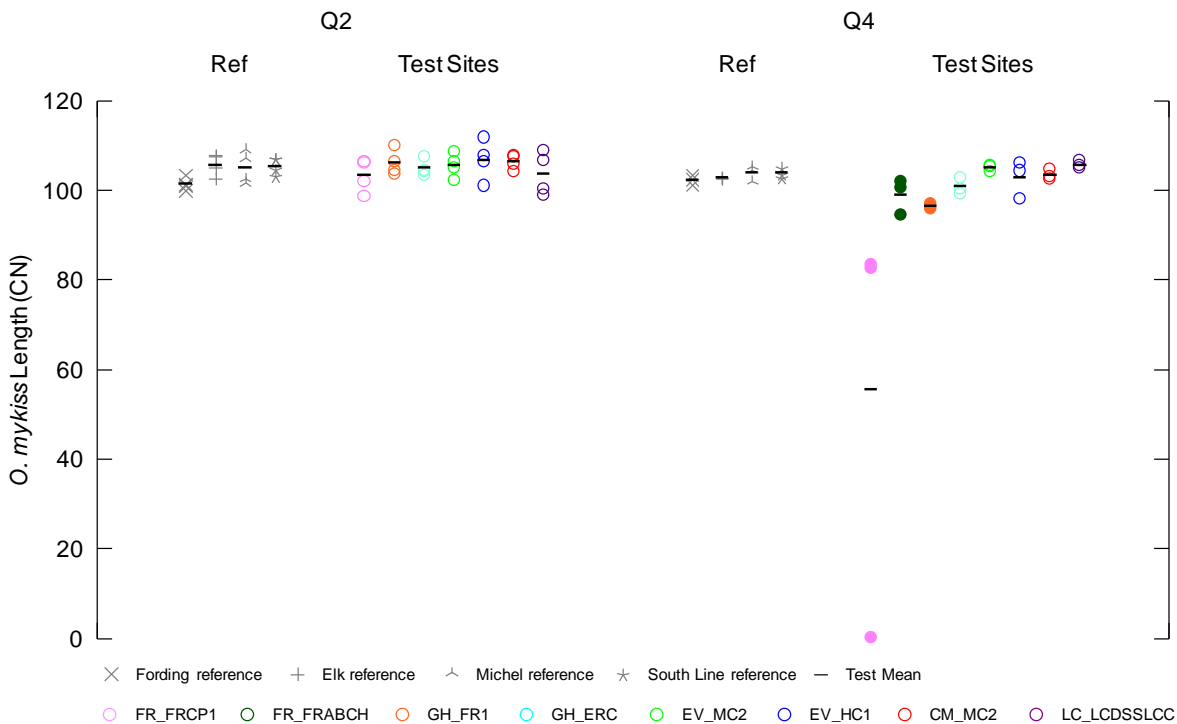
Note: See Figure 2.3-2 for description of lines and symbols. Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-12: Individual replicate and mean results for *O. mykiss* viability in reference (Ref) and test site waters.



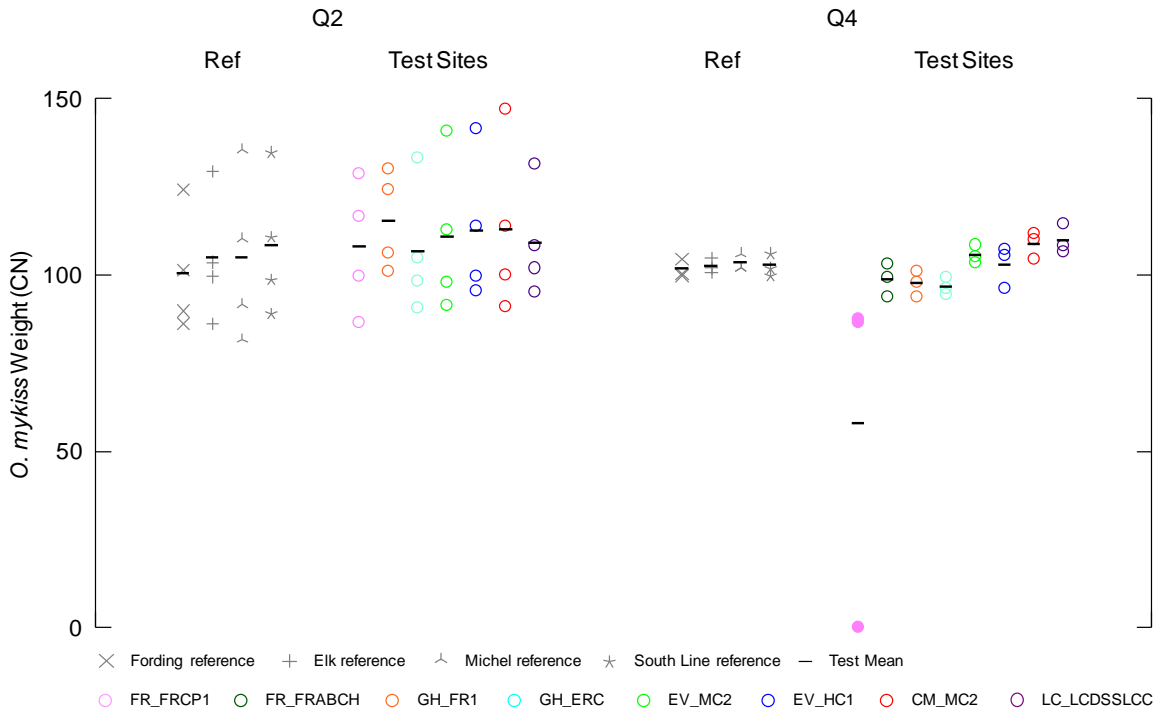
Note: See Figure 2.3-2 for description of lines and symbols. Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-13: Individual replicate and mean results for *O. mykiss* length in reference (Ref) and test site waters.



Note: See Figure 2.3-2 for description of lines and symbols. Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-14: Individual replicate and mean results for *O. mykiss* weight in reference (Ref) and test site waters.



Note: See Figure 2.3-2 for description of lines and symbols. Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-15: Mean results for *O. mykiss* survival in the Fording River reference and its test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



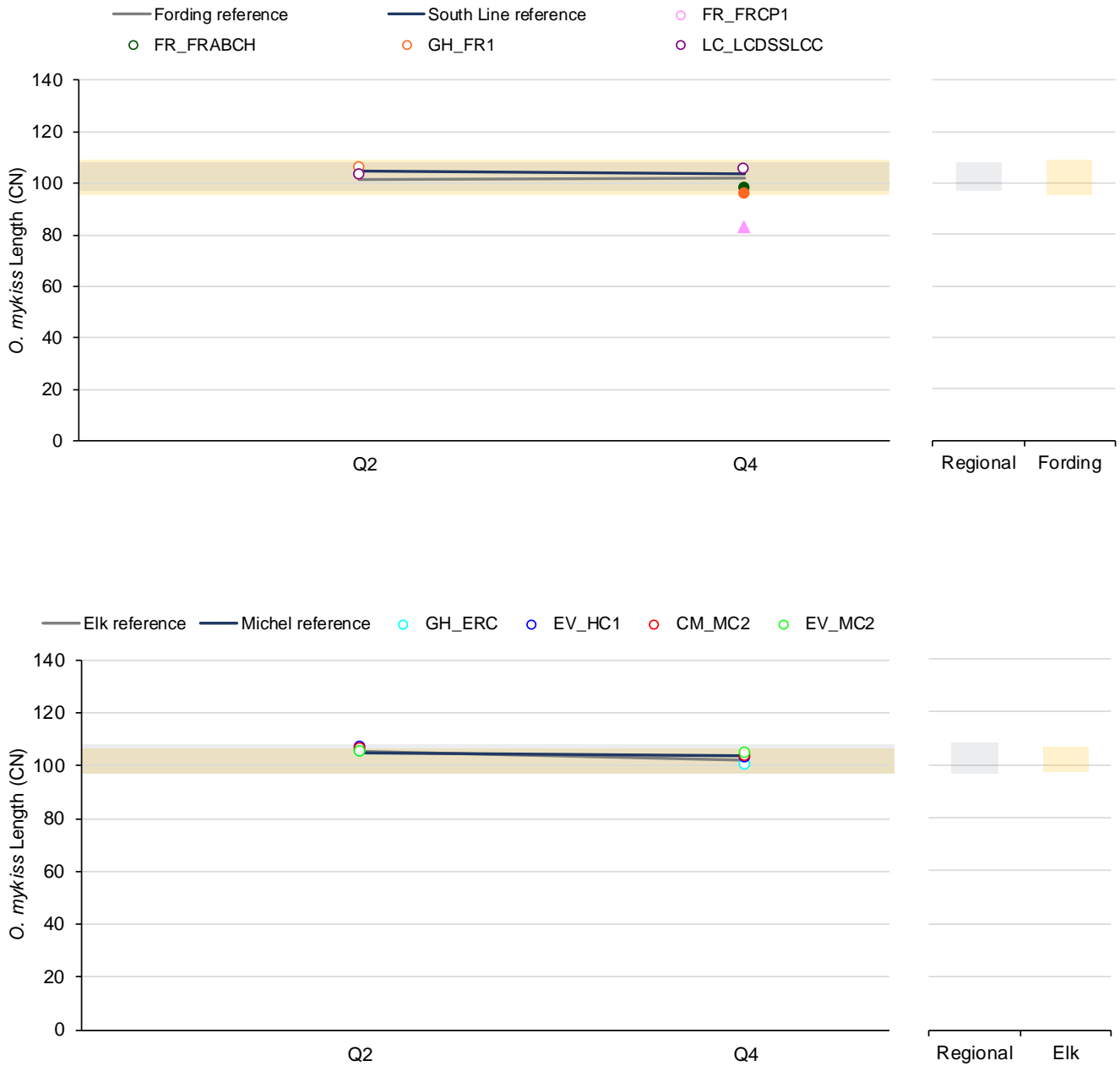
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3). Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-16: Mean results for *O. mykiss* viability in the Fording River reference and its test site waters (top left panel), and Elk River and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3). Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-17: Mean results for *O. mykiss* length in the Fording River reference and its test site waters (top left panel), and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3). Results are for unamended samples (no copper or argentine supplementation).

Figure 3.3-18: Mean results for *O. mykiss* weight in the Fording River reference and its test site waters (top left panel), and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3). Results are for unamended samples (no copper or argentine supplementation).

Copper- and Argentine-Treated Tests: Preliminary Findings

Methods and findings from treated *O. mykiss* tests have yet to be formally reported, but an overview was provided at the October 2018 EMC meeting (Teck 2018a) and February 2019 EMC conference call (Teck 2019b).

Untreated and treated test results are provided in Table 3.3-4. Individual replicate results are plotted on Figures 3.3-19 to 3.3-22.

In Q2, there was no evidence of adverse effects in either untreated or copper-treated tests. This means that the efficacy of copper (or other chemical agent) for controlling microbes could not be assessed using results for that quarter. However, the results for amended samples provide useful information regarding the potential for toxicity introduced through sample amendment. In the argentine-treated tests, significant reductions were observed for survival and viability in the Fording River reference with argentine, GH_FR1 with argentine, and GH_FR1 with argentine and 20 µg/L copper (survival only). These results indicate that argentine is a less appropriate agent for controlling microbial responses.

In Q4, there was evidence of adverse effects on survival, viability, and length in all GH_FR1 tests (untreated, treated with 20 µg/L copper, and treated with 40 µg/L copper) and on length and weight in the Fording River reference treated with 40 µg/L copper.

In both Q2 and Q4, mean results were statistically similar in untreated tests and treated tests, except for:

- In Q2, length in the untreated Fording River reference which was significantly lower than the reference treated with argentine and with argentine plus 20 µg/L copper.
- In Q4, length in the untreated GH_FR1 test which was significantly lower than GH_FR1 treated with 20 µg/L copper.

The Q4 results, on their own, could be interpreted either as: (1) an indication that microbes were present but not effectively controlled even at the high copper dose, or (2) that responses in GH_FR1 test occurred independently from any microbial effect.

Overall, preliminary findings from the copper- and argentine-treated tests in 2018 indicated the following:

- There was a lack of microbial effects in 2018 testing relative to previous years. There was high survival in most unamended tests in Q2 and Q4 (see previous section), with a low degree of inter-replicate variability. These results suggest a lack of microbial effect relative to previous testing. These findings are positive in terms of having less confounding of rainbow trout toxicity data in 2018, but prevented detailed assessment of candidate copper amendments for future testing.
- Where survival reductions were observed (GH_FR1 in Q4), they were not ameliorated by copper (Figure 3.3-19). At this preliminary stage, it is not known whether 40 µg/L copper was insufficient to ameliorate microbial responses or whether additional copper would assist in improving test responses for rainbow trout early life stage endpoint. However, given the weight of evidence indicating a lack of microbial effect in Q4 testing, this finding is more likely to be another line of evidence to support a lack of microbes in test waters. The lack of microbial effects made it challenging to evaluate the efficacy of the treatments, but the amendment results are still useful to evaluate direct toxicity of the treatment site waters (see next bullet).

- Copper amendments are preferred to argentine amendments to avoid direct toxicity of the treatment itself. Argentine amendments in Q2 resulted in up to 15% effect on survival and viability (Figure 3.3-19; Figure 3.3-20). This level of effect is not desirable for the chronic toxicity testing program, so argentine amendments were discontinued in Q4. In comparison, there was no significant effect of 20 µg/L or 40 µg/L copper in the Fording River reference or GH_FR1 test site, except for length and weight in the Fording River reference treated with 40 µg/L.

Table 3.3-4: Summary of Untreated and Treated Tests with *O. mykiss* (a)

Sample ID	Raw (Mean ± SD)				Control-Normalized (Mean ± SD)			
	% Survival	% Viability	Length (mm)	Weight (mg)	Survival	Viability	Length	Weight
Q2 Untreated								
Laboratory Control	96.6 ± 4.9	94.0 ± 8.1	21.7 ± 0.6	119.9 ± 20.9	100 ± 5	100 ± 9	100 ± 3	100 ± 17
Fording River reference	89.2 ± 8.7	87.5 ± 9.6	22.2 ± 0.3§+	115.2 ± 19.7	92 ± 9	93 ± 10	102 ± 1§+	96 ± 16
GH_FR1	88.1 ± 4.6	84.7 ± 6.7	23.2 ± 0.6	132.4 ± 16.0	91 ± 5	90 ± 7	107 ± 3	110 ± 13
Q2 Cu-Treated								
Laboratory Control + 20 µg/L Cu	84.8 ± 17.6	82.3 ± 18.3	21.8 ± 1.0	110.9 ± 22.2	88 ± 18	88 ± 19	100 ± 5	92 ± 19
Laboratory Control + 40 µg/L Cu	5.1 ± 7.9	3.4 ± 4.7	16.2 ± 2.5	86.5 ± 9.2	5 ± 8	4 ± 5	75 ± 11	72 ± 8
Fording River reference + 20 µg/L Cu	90.1 ± 6.6	89.2 ± 7.5	22.5 ± 0.7	118.9 ± 16.2	93 ± 7	95 ± 8	104 ± 3	99 ± 13
Fording River reference + 40 µg/L Cu	91.7 ± 4.2	90.9 ± 5.0	22.8 ± 0.5	115.7 ± 16.2	95 ± 4	97 ± 5	105 ± 2	97 ± 14
GH_FR1 + 20 µg/L Cu	86.0 ± 7.8	83.4 ± 3.9	23.3 ± 0.4	127.9 ± 22.8	89 ± 8	89 ± 4	108 ± 2	107 ± 19
GH_FR1 + 40 µg/L Cu	88.4 ± 11.0	86.8 ± 9.4	23.0 ± 1.1	129.6 ± 22.3	92 ± 11	92 ± 10	106 ± 5	108 ± 19
Q2 Argentine-Treated								
Laboratory Control + Arg	89.2 ± 10.0	86.7 ± 11.2	22.6 ± 0.8	120.5 ± 19.1	92 ± 10	92 ± 12	104 ± 4	101 ± 16
Laboratory Control + Arg + 20 µg/L Cu	77.0 ± 13.6	74.5 ± 13.2	21.8 ± 1.3	128.3 ± 37.7	80 ± 14	79 ± 14	101 ± 6	107 ± 31
Fording River reference + Arg	76.1 ± 13.1	73.6 ± 15.9	23.4 ± 0.8	123.0 ± 21.1	79 ± 14	78 ± 17	108 ± 4	103 ± 18
Fording River reference + Arg + 20 µg/L Cu	84.4 ± 6.4	80.4 ± 7.7	23.4 ± 0.5	124.9 ± 16.5	87 ± 7	86 ± 8	108 ± 2	104 ± 14
GH_FR1 + Arg	76.3 ± 17.1	72.8 ± 17.6	23.0 ± 1.0	125.2 ± 23.8	79 ± 18	77 ± 19	106 ± 4	104 ± 20
GH_FR1 + Arg + 20 µg/L Cu	77.7 ± 7.9	76.0 ± 9.6	23.1 ± 0.5	126.0 ± 21.2	81 ± 8	81 ± 10	107 ± 2	105 ± 18
Q4 Untreated								
Laboratory Control	87.6 ± 7.3	87.6 ± 7.3	21.4 ± 0.3	107.6 ± 1.4	100 ± 8	100 ± 8	100 ± 1	100 ± 1
Fording River reference	86.7 ± 3.3	83.3 ± 3.3	20.9 ± 0.2	103.8 ± 2.6	99 ± 4	95 ± 4	98 ± 1	96 ± 2
GH_FR1	61.1 ± 19.5	60.0 ± 17.6	19.8 ± 0.1*	99.6 ± 3.8	70 ± 22	69 ± 20	93 ± 1*	93 ± 3
Q4 Cu Treated								
Laboratory Control + 20 µg/L Cu	91.1 ± 3.8	88.9 ± 5.1	21.0 ± 0.1	104.2 ± 2.2	104 ± 4	102 ± 6	98 ± 1	97 ± 2
Laboratory Control + 40 µg/L Cu	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Fording River reference + 20 µg/L Cu	85.5 ± 8.3	84.3 ± 6.8	21.0 ± 0.3	107.0 ± 3.7	98 ± 9	96 ± 8	98 ± 1	99 ± 3
Fording River reference + 40 µg/L Cu	89.1 ± 12.9	85.6 ± 11.2	19.4 ± 0.8	95.3 ± 1.6	102 ± 15	98 ± 13	91 ± 4	89 ± 1
GH_FR1 + 20 µg/L Cu	62.9 ± 25.8	60.8 ± 26.0	20.4 ± 0.2	104.5 ± 2.4	72 ± 29	69 ± 30	95 ± 1	97 ± 2
GH_FR1 + 40 µg/L Cu	62.2 ± 21.8	61.1 ± 23.2	19.2 ± 0.4	102.1 ± 3.5	71 ± 25	70 ± 27	90 ± 2	95 ± 3

Notes:

(a) Results presented mean ± standard deviation (SD).

Arg = argentine; Cu= copper; µg/L = micrograms per litre; mg = milligrams; mm = millimetres; % = percent; ± = plus or minus.

Screening:

Value = result significantly lower than untreated Fording River reference.

§ = Result was significantly lower than the corresponding ARG treated sample.

+ = Result was significantly lower than the corresponding ARG + 20 µg/L copper (Cu) treated sample.

* = Result was significantly lower than the corresponding 20 µg/L copper (Cu) treated sample.

3.3.1.5 *Pimephales promelas*

There was no evidence of adverse effects on hatch rate (Figure 3.3-23; Figure 3.3-28), or development (Figure 3.3-27; Figure 3.3-32) in any test.

Survival was significantly reduced relative to one or more references in six of 13 tests (Figure 3.3-24; Figure 3.3-29), including three FR_FRCP1 tests (Q2, Q3, Q4), two CM_MC2 tests (Q3, Q4), and one FR_FRABCH test (Q4). In two of six tests with significant results, mean survival was within the local NR and the effect size was less than 20% compared to the mean response in batch-specific references (FR_FRCP1 [Q2 = 14%], CM_MC2 [Q4 = 11%]), indicating no adverse response. In the remaining tests with significant results, mean survival was below the local and regional NRs. These results indicate a likely adverse response to the test water. Compared to the mean response in batch-specific references, effect size in tests categorized as likely for survival ranged from 39% (Q4 FR_FRABCH) to 98% (Q3 and Q4 FR_FRCP1).

As discussed in the Q2 laboratory report (Appendix B-2), microbial growth was noted in Q2 tests with Fording and Elk reference water amended with 10 µg/L copper. As with previous test events in which microbial growth was observed, the mortalities occurred predominantly between days 6 and 12 of exposure, which is consistent with the conclusion that the adverse responses were associated with microbial growth. Due to this microbial growth, the Q2 Fording and Elk references were excluded from statistical analyses conducted herein. The Michel Creek reference was used to calculate effect sizes in Q2. It appears that 10 µg/L copper was not sufficient to curtail microbial growth in a subset of the samples. Previous copper toxicity modelling work has indicated that copper bioavailability is lower in Q2, primarily due to elevated dissolved organic carbon. This is one potential explanation for the higher incidence of microbial responses in Q2.

Biomass was significantly reduced relative to one or more references in four of 13 tests (Figure 3.3-25; Figure 3.3-30), including two FR_FRCP1 tests (Q3, Q4), one GH_FR1 test (Q4), and one FR_FRABCH test (Q4). In the Q4 GH_FR1 test, mean biomass was within local NR and the effect size (15%) was less than 20% compared to the mean response in batch-specific references, indicating no adverse response. In the remaining tests with significant results, mean biomass was below the local and regional NRs. These results indicate a likely adverse response to the test water. Compared to the mean response in batch-specific references, effect size in tests categorized as likely for biomass ranged from 37% (Q4 FR_FRABCH) to 95% (Q4 FR_FRCP1).

Length was significantly reduced relative to one or more references in six of 13 tests (Figure 3.3-26; Figure 3.3-31), including Q2 and Q4 tests from FR_FRCP1, GH_FR1, and CM_MC2. In five of six tests with significant results, mean length was within local NR and the effect size was less than 20% compared to the mean response in batch-specific references, indicating no adverse response. Compared to the mean response in batch-specific references, the effect size in tests categorized as no adverse response for length ranged from -5% (GH_FR1 in Q2) to 8% (GH_FR1 in Q4). In the Q4 FR_FRCP1 test, mean length was below the local and regional NRs, indicating a likely adverse response to the test water. Compared to the mean response in batch-specific references, the effect size for Q4 FR_FRCP1 was 70%.

Based on the results presented above, *P. promelas* tests were categorized as follows:

- **No adverse response (9 of 13 tests):** FR_FRCP1 (Q1, Q2), GH_FR1 (Q1 to Q4), and CM_MC2 (Q1, Q2, Q4).
- **Possible adverse response (0 of 13 tests):** No tests were in this category.
- **Likely adverse response (4 of 13 tests):** FR_FRCP1 (Q3, Q4), FR_FRABCH (Q4), and CM_MC2 (Q3).

The concentration-response analysis for *P. promelas* survival, biomass, and length is presented in Section 3.4.5.

Figure 3.3-23: Individual replicate and mean results for *P. promelas* hatch in reference (Ref) and test site waters.



Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-24: Individual replicate and mean results for *P. promelas* survival in reference (Ref) and test site waters.



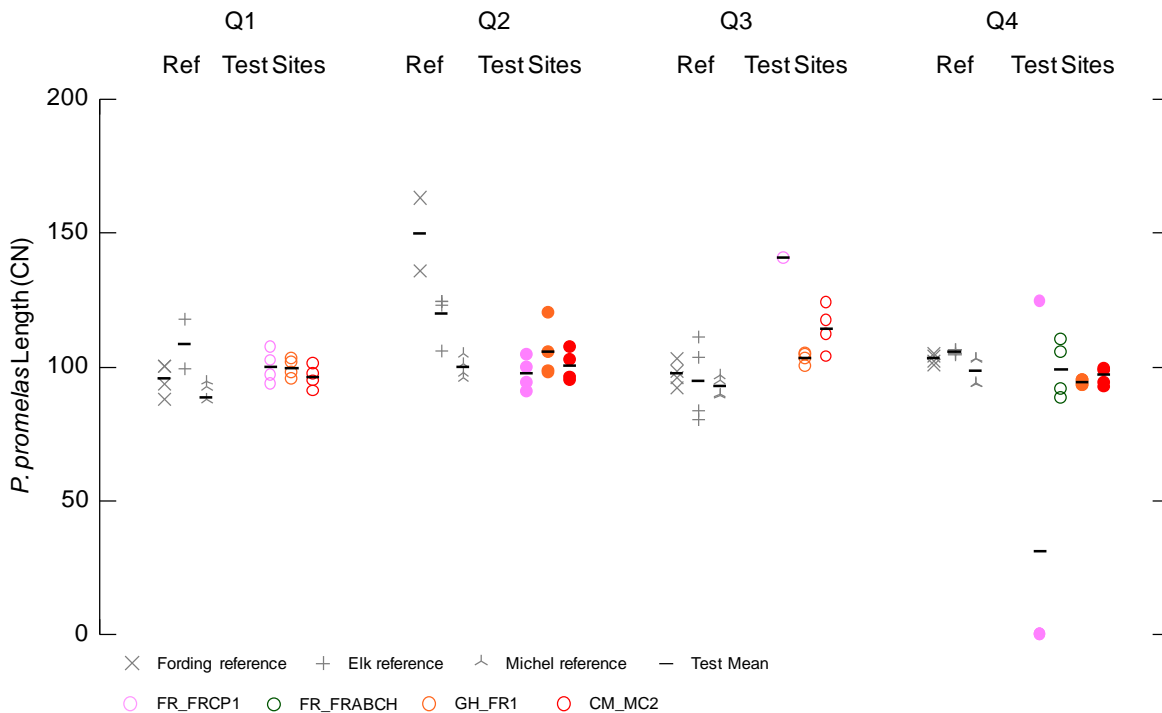
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-25: Individual replicate and mean results for *P. promelas* biomass in reference (Ref) and test site waters.



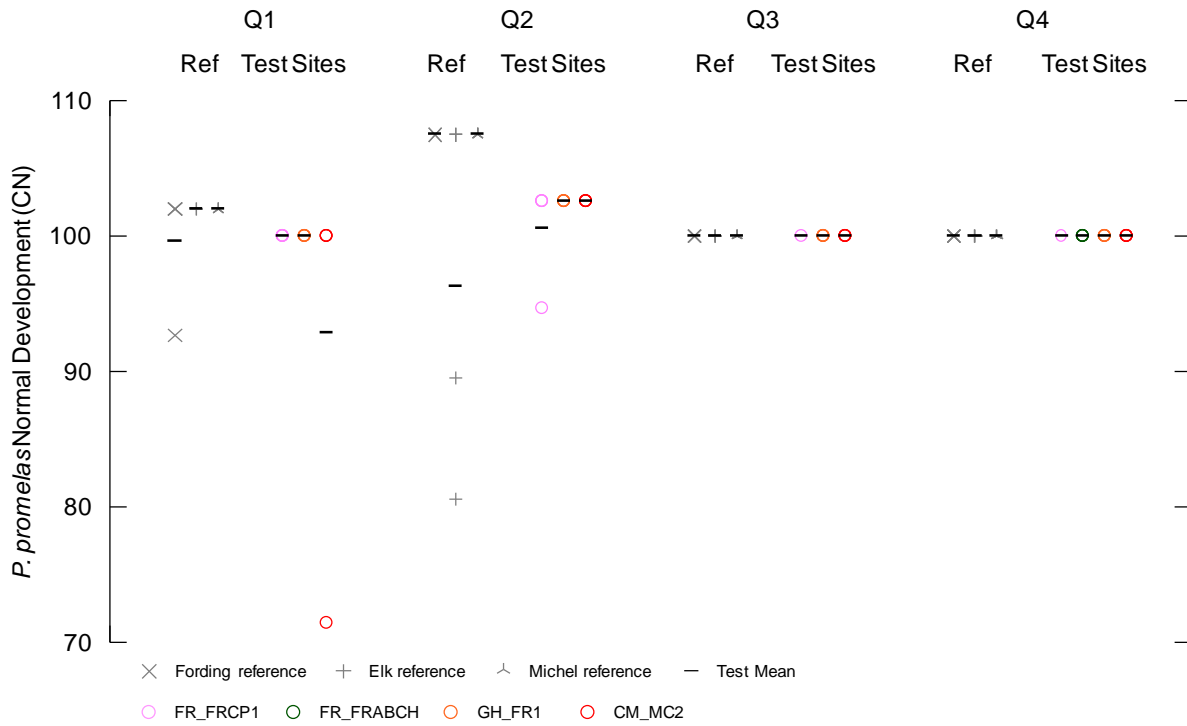
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-26: Individual replicate and mean results for *P. promelas* length in reference (Ref) and test site waters.



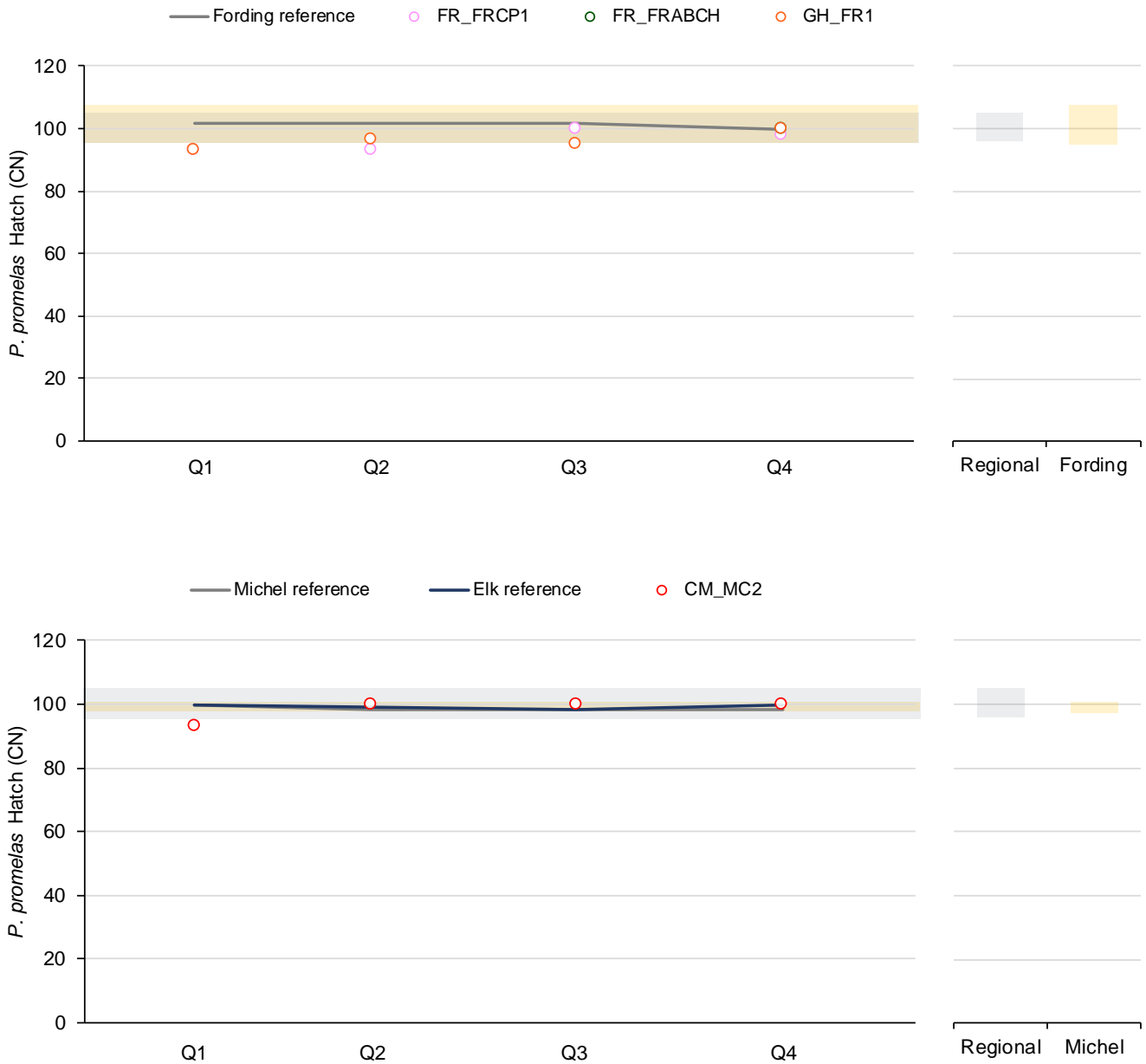
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-27: Individual replicate and mean results for *P. promelas* normal development in reference (Ref) and test site waters.



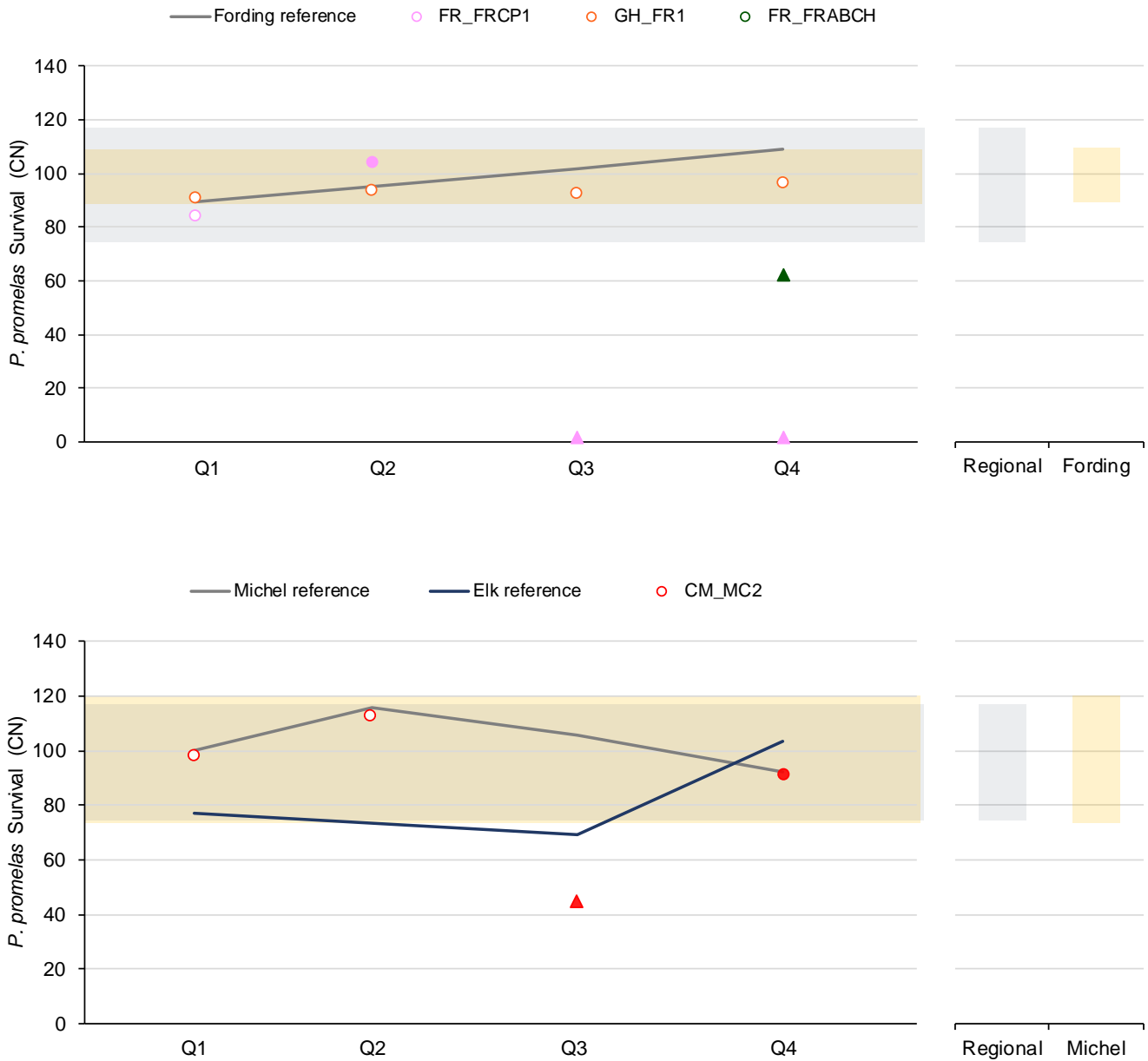
Note: See Figure 2.3-2 for description of lines and symbols.

Figure 3.3-28: Mean results for *P. promelas* hatch in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



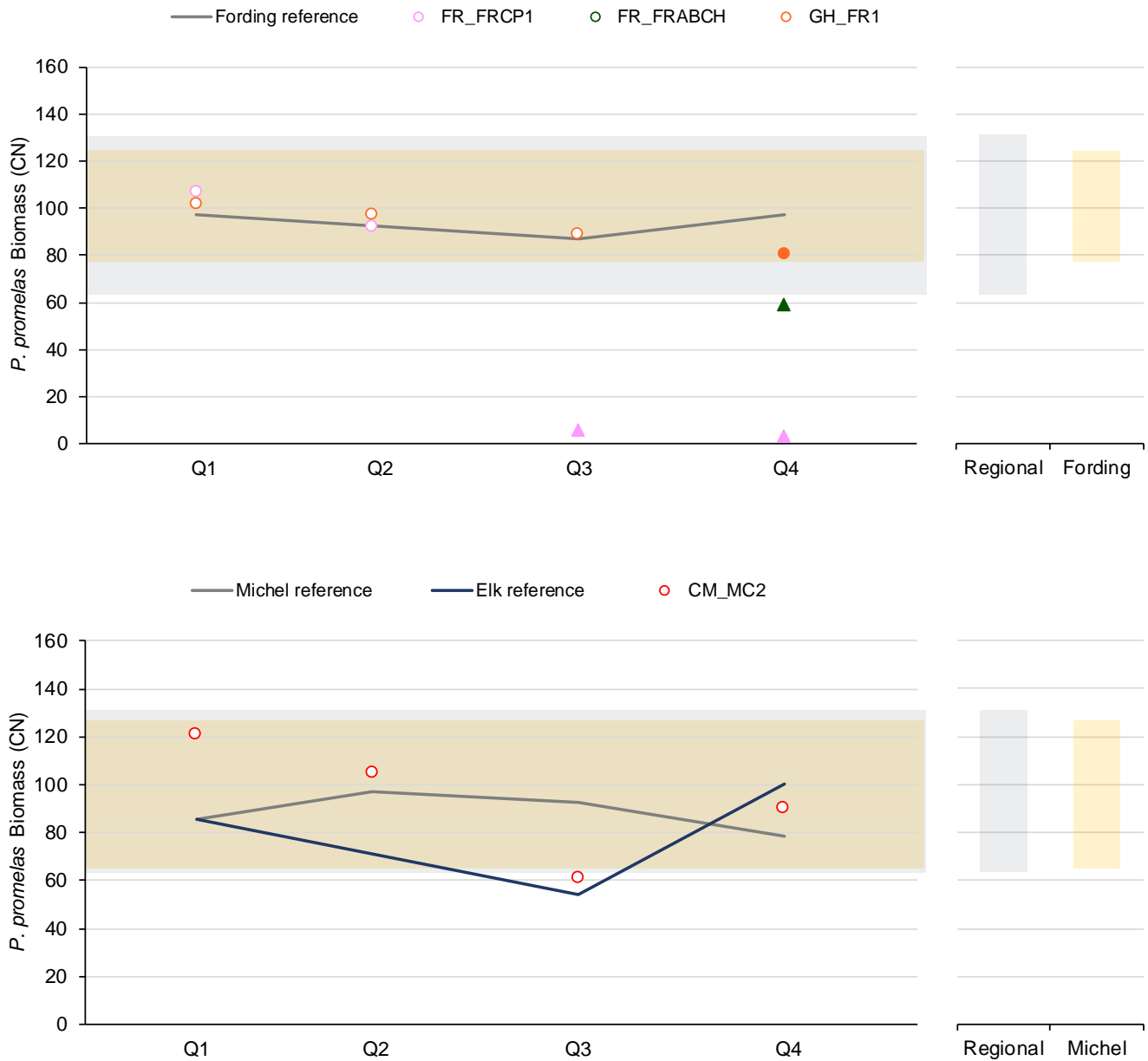
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-29: Mean results for *P. promelas* survival in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



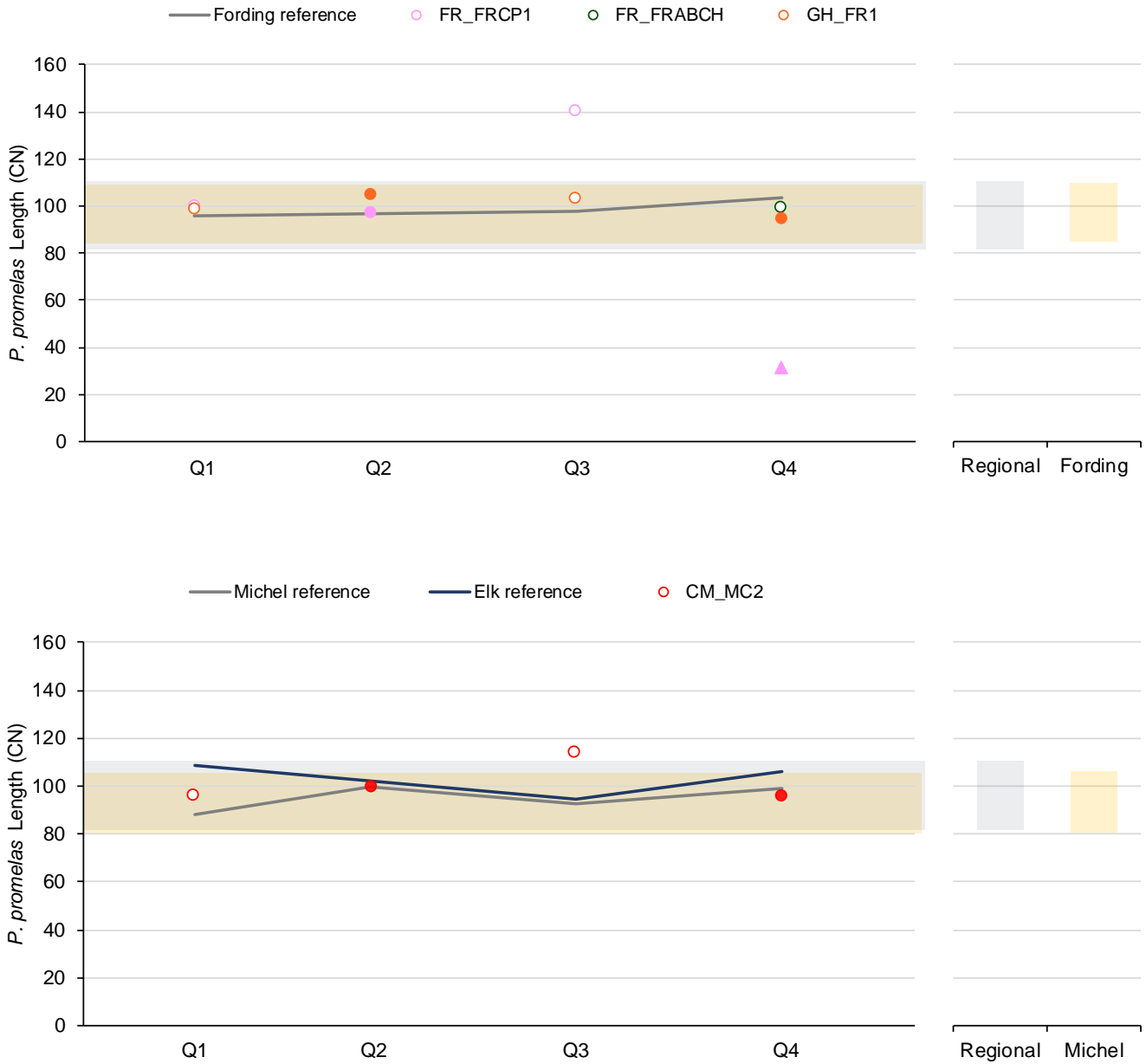
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-30: Mean results for *P. promelas* biomass in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



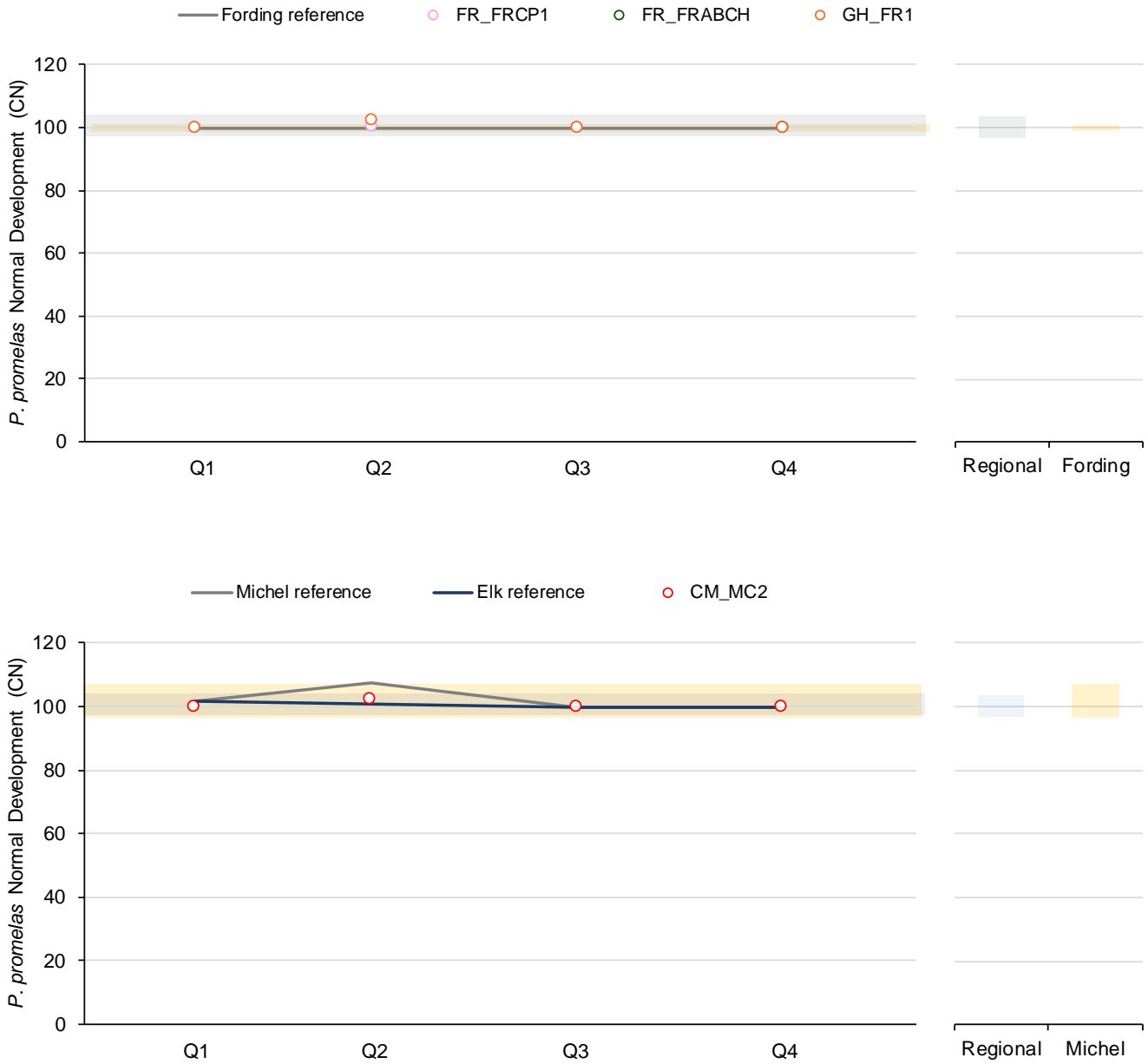
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-31: Mean results for *P. promelas* length in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.3-32: Mean results for *P. promelas* normal development in the Fording River reference and its test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

3.3.2 Results by Test Site

Presentation of the combined results of chronic toxicity tests at each test site provides a means of assessing the strength of evidence for toxicity, including consistency of responses across sampling quarters. The presentation formats in this section were developed in consultation with the EMC and are intended to provide a high-level synthesis of the results for each test site.

Results are summarized by test site in Figure 3.3-33 (FR_FRCP1), Figure 3.3-34 (FR_FRABCH), Figure 3.3-35 (GH_FR1), Figure 3.3-36 (GH_ERC), Figure 3.3-37 (EV_HC1), Figure 3.3-38 (CM_MC2), Figure 3.3-39 (CM_MC3), Figure 3.3-40 (EV_MC2), and Figure 3.3-41 (LC_LCDSSLCC). Results were as follows:

- **FR_FRCP1.** No adverse responses were observed in three of 14 endpoints: *C. dubia* survival and *P. promelas* hatch and development. One possible adverse response was observed in Q2 for *P. subcapitata* cell yield. Likely adverse responses were observed in ten of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *P. subcapitata* cell yield (Q1 and Q4), *H. azteca* survival (Q4) and dry weight (Q1 and Q4), *O. mykiss* survival, viability, length, and weight (Q4), and *P. promelas* survival (Q3 and Q4), biomass (Q3 and Q4), and length (Q4).
- **FR_FRABCH.** No adverse responses were observed for most test endpoints (9 of 14). Possible adverse responses were observed in three of 14 endpoints: *H. azteca* dry weight and *O. mykiss* survival and viability. Likely adverse responses were observed in two of 14 endpoints: *P. promelas* survival and biomass.
- **GH_FR1.** No adverse responses were observed for most test endpoints (11 of 14). Likely adverse responses were observed in three of 14 endpoints: *C. dubia* reproduction (Q2) and *O. mykiss* survival and viability (Q4).
- **GH_ERC.** No adverse responses were observed for most test endpoints (8 of 9). One possible adverse response was observed in Q2 for *C. dubia* reproduction.
- **EV_HC1.** No adverse responses were observed for all nine endpoints in all quarters.
- **CM_MC2.** No adverse responses were observed for most test endpoints (10 of 14). One possible adverse response was observed in Q2 for *H. azteca* dry weight. Likely adverse responses were observed for four of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* survival (Q1 to Q4), *H. azteca* dry weight (Q1, Q3, and Q4), and *P. promelas* survival (Q3).
- **CM_MC3.** No adverse responses were observed in two of five endpoints: *C. dubia* survival and *P. subcapitata* cell yield. One possible adverse response was observed in Q3 for *C. dubia* reproduction. Likely adverse responses were observed for three of five endpoints: *C. dubia* reproduction (Q2 and Q4) and *H. azteca* survival and dry weight (Q3).
- **EV_MC2.** No adverse responses were observed for most test endpoints (8 of 9). One likely adverse response was observed in Q1 for *C. dubia* reproduction.
- **LC_LCDSSLCC.** No adverse responses were observed for most test endpoints (7 of 9). Likely adverse responses were observed for *C. dubia* reproduction (Q2 and Q4) and *H. azteca* dry weight (Q4).

Figure 3.3-33: Summary of test results by category at FR_FRCP1.

		Q1	Q2	Q3	Q4
<i>C. dubia</i>	Survival	●	●	●	●
	Reproduction	▲	▲	▲	▲
<i>P. subcapitata</i>	Cell Yield	▲	◆	●	▲
<i>H. azteca</i>	Survival	●	●	●	▲
	Dry Weight	▲	●	●	▲
<i>O. mykiss</i>	Survival		●		▲
	Viability		●		▲
	Length		●		▲
<i>P. promelas</i>	Weight		●		▲
	Hatch	●	●	●	●
	Survival	●	●	▲	▲
	Biomass	●	●	▲	▲
	Length	●	●	●	▲
	Development	●	●	●	●

● No
◆ Possible
▲ Likely

Note: Test results are categorized in Section 3.3.1.

Figure 3.3-34: Summary of test results by category at FR_FRABCH.

		Q1	Q2	Q3	Q4
<i>C. dubia</i>	Survival				●
	Reproduction				●
<i>P. subcapitata</i>	Cell Yield				●
<i>H. azteca</i>	Survival				●
	Dry Weight				◆
<i>O. mykiss</i>	Survival				◆
	Viability		Not tested		◆
	Length				●
<i>P. promelas</i>	Weight				●
	Hatch				●
	Survival				▲
	Biomass				▲
	Length				●
	Development				●

● No
◆ Possible
▲ Likely

Note: Test results are categorized in Section 3.3.1. Not tested = no testing conducted at this station in Q1 to Q3, as station is not currently part of Permit requirements (station added to evaluate mainstem Fording River conditions).

Figure 3.3-35: Summary of test results by category at GH_FR1.

		Q1	Q2	Q3	Q4
<i>C. dubia</i>	Survival	●	●	●	●
	Reproduction	●	▲	●	●
<i>P. subcapitata</i>	Cell Yield	●	●	●	●
<i>H. azteca</i>	Survival	●	●	●	●
	Dry Weight	●	●	●	●
<i>O. mykiss</i>	Survival		●		▲
	Viability		●		▲
	Length		●		●
	Weight		●		●
<i>P. promelas</i>	Hatch	●	●	●	●
	Survival	●	●	●	●
	Biomass	●	●	●	●
	Length	●	●	●	●
	Development	●	●	●	●

● No
 ◆ Possible
 ▲ Likely

Note: Test results are categorized in Section 3.3.1.

Figure 3.3-36: Summary of test results by category at GH_ERC.

		Q1	Q2	Q3	Q4
<i>C. dubia</i>	Survival	●	●	●	●
	Reproduction	●	◆	●	●
<i>P. subcapitata</i>	Cell Yield	●	●	●	●
<i>H. azteca</i>	Survival				●
	Dry Weight				●
<i>O. mykiss</i>	Survival		●		●
	Viability		●		●
	Length		●		●
<i>P. promelas</i>	Weight		●		●
	Hatch				
	Survival				
	Biomass		Not tested		
	Length				
	Development				

● No
 ◆ Possible
 ▲ Likely

Note: Test results are categorized in Section 3.3.1. Not tested = no testing required at this station for *P. promelas*, consistent with Permit requirements.

Figure 3.3-37: Summary of test results by category at EV_HC1.

		Q1	Q2	Q3	Q4	
<i>C. dubia</i>	Survival	●	●	●	●	<div style="border: 1px solid black; padding: 5px;"> <p>● No</p> <p>◆ Possible</p> <p>▲ Likely</p> </div>
	Reproduction	●	●	●	●	
<i>P. subcapitata</i>	Cell Yield	●	●	●	●	
<i>H. azteca</i>	Survival				●	
	Dry Weight				●	
<i>O. mykiss</i>	Survival		●		●	
	Viability		●		●	
	Length		●		●	
	Weight		●		●	
<i>P. promelas</i>	Hatch					
	Survival					
	Biomass		Not tested			
	Length Development					

Note: Test results are categorized in Section 3.3.1. Not tested = no testing required at this station for *P. promelas*, consistent with Permit requirements.

Figure 3.3-38: Summary of test results by category at CM_MC2.

		Q1	Q2	Q3	Q4	
<i>C. dubia</i>	Survival	●	●	●	●	<div style="border: 1px solid black; padding: 5px;"> <p>● No</p> <p>◆ Possible</p> <p>▲ Likely</p> </div>
	Reproduction	▲	▲	▲	▲	
<i>P. subcapitata</i>	Cell Yield	●	●	●	●	
<i>H. azteca</i>	Survival	▲	▲	▲	▲	
	Dry Weight	▲	◆	▲	▲	
<i>O. mykiss</i>	Survival		●		●	
	Viability		●		●	
	Length		●		●	
	Weight		●		●	
<i>P. promelas</i>	Hatch	●	●	●	●	
	Survival	●	●	▲	●	
	Biomass	●	●	●	●	
	Length Development	●	●	●	●	

Note: Test results are categorized in Section 3.3.1.

Figure 3.3-39: Summary of test results by category at CM_MC3.

		Q1	Q2	Q3	Q4	
<i>C. dubia</i>	Survival	●	●	●	●	<div style="border: 1px solid black; padding: 5px;"> <p>● No</p> <p>◆ Possible</p> <p>▲ Likely</p> </div>
	Reproduction	●	▲	◆	▲	
<i>P. subcapitata</i>	Cell Yield	●		●		
<i>H. azteca</i>	Survival	●	●	▲	●	
	Dry Weight	●	●	▲	●	
<i>O. mykiss</i>	Survival					
	Viability		Not tested			
	Length					
<i>P. promelas</i>	Weight					
	Hatch					
	Survival					
	Biomass		Not tested			
	Length					
	Development					

Note: Test results are categorized in Section 3.3.1. Not tested = no testing conducted for *O. mykiss* or *P. promelas*, as station is not currently part of Permit requirements. Station was assessed for sensitive invertebrate species to characterize spatial extent of effects.

Figure 3.3-40: Summary of test results by category at EV_MC2.

		Q1	Q2	Q3	Q4	
<i>C. dubia</i>	Survival	●	●	●	●	<div style="border: 1px solid black; padding: 5px;"> <p>● No</p> <p>◆ Possible</p> <p>▲ Likely</p> </div>
	Reproduction	▲	●	●	●	
<i>P. subcapitata</i>	Cell Yield	●	●	●	●	
<i>H. azteca</i>	Survival				●	
	Dry Weight				●	
<i>O. mykiss</i>	Survival		●		●	
	Viability		●		●	
	Length		●		●	
<i>P. promelas</i>	Weight		●		●	
	Hatch					
	Survival					
	Biomass		Not tested			
	Length					
	Development					

Note: Test results are categorized in Section 3.3.1. Not tested = no testing required at this station for *P. promelas*, consistent with Permit requirements.

Figure 3.3-41: Summary of test results by category at LC_LCDSSLCC.

		Q1	Q2	Q3	Q4
<i>C. dubia</i>	Survival	●	●	●	●
	Reproduction	●	▲	●	▲
<i>P. subcapitata</i>	Cell Yield	●	●	●	●
<i>H. azteca</i>	Survival		●	●	●
	Dry Weight		●	●	▲
<i>O. mykiss</i>	Survival		●		●
	Viability		●		●
	Length		●		●
	Weight		●		●
<i>P. promelas</i>	Hatch				
	Survival				
	Biomass		Not tested		
	Length Development				

● No
 ◆ Possible
 ▲ Likely

Note: Test results are categorized in Section 3.3.1. Not tested = no testing required at this station for *P. promelas*, consistent with Permit requirements.

3.4 Concentration-Response Analysis

Concentration-response analyses were conducted for *C. dubia* reproduction, *H. azteca* growth and survival, *P. subcapitata* cell yield, *O. mykiss* survival, viability, length, and weight, and *P. promelas* survival, biomass, and length. These are the test endpoints for which possible or likely toxicity responses were observed for one or more test site waters in 2018. The following appendices have supporting information for the analyses:

- Appendix C provides water chemistry data screened against BC WQGs for all 2018 tests conducted with reference and test site waters. Sum of toxic units (Σ TUs) and coefficient of variation for multi-week tests are also provided in this appendix.
- Appendix D provides response data paired with water chemistry data and other explanatory variables (i.e., PCs and Σ TUs).
- Appendix E provides PCA component loadings and percent of variance explained by each component.
- Appendix F provides Spearman rank order correlations.

Results of the concentration-response analyses are provided in the following sections.

3.4.1 *Ceriodaphnia dubia* Reproduction

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-1), along with 22 additional constituents¹⁵ with statistically significant Spearman rank correlations that did not screen out when compared to water quality guidelines, were all carried through to graphical analysis (Figure 3.4-2 to Figure 3.4-7; Table F-1). The following PC scores had statistically significant Spearman rank correlations:

- **PC1 (combined dataset).** This component accounted for 31.2% of the variance (Table E-1). PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (dissolved cadmium, sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC2 (combined dataset).** This component accounted for 15.7% of the variance (Table E-1). PC2 had strong positive loadings for DOC, TOC, total suspended solids (TSS), turbidity, and several metals (e.g., lead, iron, arsenic, aluminum, copper).
- **PC3 (combined dataset).** This component accounted for 9.4% of the variance (Table E-1). PC3 had strong negative loadings for total tin, total bismuth, and several dissolved metals (e.g. lead, silver, vanadium).
- **PC1 (2018 only dataset).** This component accounted for 33.8% of the variance (Table E-1). Similar to the combined dataset, PC1 for the 2018 dataset had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC3 (2018 only dataset).** This component accounted for 10.7% of the variance (Table E-1). Similar to the combined dataset, PC3 for the 2018 dataset had strong negative loadings for total tin, total bismuth, and several dissolved metals (e.g. lead, silver, vanadium).

Most of the evaluated explanatory variables did not exhibit a consistent exposure-response relationship across all tests (Figure 3.4-1 to Figure 3.4-7). However, a few variables exhibited a consistent relationship between explanatory variable and magnitude of adverse response; these included nickel, Σ TUs (when calculated using BC WQGs and EVWQP benchmarks), and PC1 (using the combined dataset and 2018 only dataset). The potential for these variables to explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-1), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with nonsignificant results, and that were greater than a chronic BC WQG (when such exists) are discussed below.

- **CM_MC2 (Q1 to Q4):** Concentrations of cobalt, nickel, strontium, TDS (Q3 only), and several components related to TDS (e.g., sodium) were higher in these tests than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks for these constituents did not support a conclusion of causation for most constituents. The nickel concentration in Q1 (14 µg/L), Q2 (22 µg/L), Q3 (57 µg/L), and Q4 (46 µg/L) were greater than the IC₂₅ for nickel in Michel Creek water (10.8 µg/L; Nautilus 2018). Nickel concentrations in Q3 and Q4 were approximately 1.9- to 2.3-fold greater

¹⁵ The 22 constituents were DOC, total chromium, total cobalt, total iron, total lithium, total nickel, phosphorus, total strontium, TDS, TKN, TOC, TSS, turbidity, total uranium, total vanadium, Σ TUs (calculated using WQGs only and WQGs and EVWQP benchmarks), PC1 scores (combined dataset and 2018 dataset), PC2 score (combined dataset only), and PC3 scores (combined dataset and 2018 dataset).

than the IC₅₀ for nickel in Michel Creek water (24.6 µg/L) (Nautilus 2018). The identification of nickel as a causal factor aligns with the 2018 *C. dubia* TIE testing conducted with Q1 to Q4 CM_MC2 waters, which indicated that divalent metals, particularly nickel, were the probable cause of *C. dubia* toxicity (Section 3.3.1.1). These results indicate that nickel likely contributed to observed responses in CM_MC2 tests. Other exposure constituents exhibited lack of evidence for potential causation:

- The cobalt concentrations in CM_MC2 tests (0.87 to 7.5 µg/L) were below effect concentrations from Michel Creek TIE testing (IC₂₅ >32.7 µg/L) (Nautilus 2018), indicating that it is not likely contributing to toxicity.
- Strontium concentrations in these tests (0.37 to 0.61 mg/L) were more than an order of magnitude lower than the reported IC₂₀ of 11 mg/L for *C. dubia* (McPherson et al. 2014), indicating that it is not likely contributing to toxicity.
- TDS in Q3 (830 mg/L) was lower than the IC₂₀ for TDS in alkalinity-supplemented Fording River water (1,322 mg/L) (Golder 2013), indicating that it is not likely contributing to toxicity.

In addition to the constituents discussed above, the Σ TUs were also higher in Q3 and Q4 CM_MC2 tests than in reference waters and/or test site waters categorized as no adverse response. However, the Σ TU values for these tests were largely driven by the hazard quotient for nickel. For example, in the Σ TUs calculated using BC WQGs (except for nickel, for which 5 µg/L was used [Section 2.3.4]) and EVWQP benchmarks, the hazard quotient for nickel accounted for between 66% and 76% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced reproduction in CM_MC2 tests is largely driven by nickel, which was identified above as the probable cause of adverse effects. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs for these tests would be within the range observed in reference waters and test sites categorized as no adverse response. This analysis indicates that mixture-related effects (as evaluated by Σ TUs) are not necessary to explain observed toxicity, and reinforces that nickel was the only constituent identified as having strong evidence for causing adverse responses in these tests.

- **CM_MC3 (Q2, Q3, and Q4):** Concentrations of nickel and strontium (Q3 only) were higher in tests with adverse responses relative to reference waters and test site waters categorized as no adverse response. The strontium concentration in Q3 (0.36 mg/L) was more than an order of magnitude lower than the reported IC₂₀ of 11 mg/L for *C. dubia* (McPherson et al. 2014), indicating that it is not likely contributing to toxicity. The nickel concentration in Q3 (18 µg/L), and Q4 (13 µg/L) were greater than the IC₂₅ for nickel in Michel Creek water (10.8 µg/L) (Nautilus 2018). In Q2, the nickel concentration (9.2 µg/L) was slightly below the IC₂₅ for nickel in Michel Creek water. Overall, these results indicate that nickel likely contributed to observed responses, particularly for Q3 and Q4 tests.
- **EV_MC2 (Q1):** No water quality constituent was identified as exceeding concentrations in reference waters and/or test site waters categorized as no adverse response, and/or the chronic BC WQG. Concentrations of all constituents in this test were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-1), and/or were lower than the chronic BC WQG (Appendix C).
- **FR_FRCP1 (Q1):** Several constituents were identified as potentially contributing to the observed response in this test, including nitrate, TDS, and nickel. Concentrations of lithium, nitrate, selenium, sulphate, TDS, and several components related to TDS (e.g., calcium) were higher in this test than reference waters and test site waters categorized as no adverse response. The nickel concentration in this test was lower than in

reference waters and test site waters categorized as no adverse response, but higher than the interim screening value of 5 µg/L. The concentration of nitrate in this test (20 mg/L NO₃-N) was approximately equal to the level 2 benchmark from the EVWQP (21 mg/L NO₃-N at hardness >500 mg/L as CaCO₃). The level 2 benchmark is associated with 20% effect on *C. dubia* reproduction, indicating that nitrate may have contributed to the observed response in this test. The concentration of TDS (1,280 mg/L) was approximately equal to the IC₂₀ value for TDS in alkalinity-supplemented Fording River water (1,322 mg/L) (Golder 2013), indicating that TDS may have contributed to the observed response in this test. The nickel concentration (9.6 µg/L) was slightly below the IC₂₅ for nickel in Michel Creek water (10.8 µg/L) (Nautilus 2018), indicating that nickel may have contributed to toxicity in this test. Other exposure constituents exhibited no strong evidence for potential causation:

- The lithium concentration in this test (0.056 mg/L) was lower than the reported IC₂₅ of 0.32 mg/L for *C. dubia* (Kszos et al. 2003)¹⁶, indicating that it is not likely contributing to toxicity.
 - The concentration of sulphate in this test (613 mg/L) was lower than the level 1 threshold for *C. dubia* reproduction (10% effect level) from the EVWQP (625 mg/L), indicating that it is not likely contributing to toxicity.
 - The selenium concentration in this test (170 µg/L) was slightly higher than the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013), so it cannot be ruled out that selenium may have also contributed to the observed response in this test.
- **FR_FRCP1 (Q4):** Concentrations of lithium, nickel, nitrate, selenium, sulphate, total Kjeldahl nitrogen (TKN), uranium, TDS, and several components related to TDS (e.g., sodium) were higher in this test than reference waters and test site waters categorized as no adverse response. The nickel concentration in this test (46 µg/L) was approximately two times greater than the IC₅₀ for nickel in Michel Creek water (24.6 µg/L) (Nautilus 2018), indicating that nickel may have contributed to the observed response. The concentration of nitrate in this test (29 mg/L NO₃-N) was greater than the level 2 benchmark from the EVWQP (21 mg/L NO₃-N at hardness >500 mg/L as CaCO₃). The level 2 benchmark is associated with 20% effect on *C. dubia* reproduction, indicating that nitrate may have contributed to the observed response in this test. Concentrations of TDS (3,260 mg/L) and sulphate (1,940 mg/L) were higher than the approximate IC₅₀ value for TDS (45% effect in the highest concentration tested [2,386 mg/L]) and sulphate (45% effect in the highest concentration tested [1,630 mg/L]) in alkalinity-supplemented Fording River water (Golder 2013), indicating that these constituents may have contributed to the observed response in this test. This interpretation aligns with the Q4 TIE testing with *C. dubia*, which indicated that major ions (i.e., sulphate and TDS) were the probable cause of toxicity (see Section 3.3.1.1 or Appendix B-5). Other exposure constituents exhibited no strong evidence for potential causation:
- The lithium concentration (0.087 mg/L) was lower than the reported IC₂₅ of 0.32 mg/L for *C. dubia* (Kszos et al. 2003)¹⁷, indicating that it is not likely contributing to toxicity.

¹⁶ Sodium has been shown to ameliorate lithium toxicity (Kszos et al. 2003). The sodium concentrations in the Q1 FR_FRCP1 test (2.3 mg/L) was similar to conditions in which the IC₂₅ was derived (2.8 mg/L), making the effect concentration from Kszos et al. (2003) relevant to the FR_FRCP1 test.

¹⁷ Sodium has been shown to ameliorate lithium toxicity (Kszos et al. 2003). The sodium concentrations in the Q4 FR_FRCP1 test (2.2 mg/L) was similar to conditions in which the IC₂₅ was derived (2.8 mg/L), making the effect concentration from Kszos et al. (2003) relevant to the FR_FRCP1 test.

- The concentration of TKN was higher in Q4 than in both reference waters and test site waters categorized as no adverse response. Although not expected to occur, TKN could not be ruled out as a potential contributor to the observed response.
- The uranium concentration in this test (0.023 mg/L) was lower than the IC₁₀ of 0.073 mg/L for *C. dubia* (CCME 2011), indicating that it is likely not contributing to toxicity.
- The selenium concentration in this test (630 µg/L) was 4.2 times the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013), so it cannot be ruled out that selenium may have also contributed to the observed response in this test.

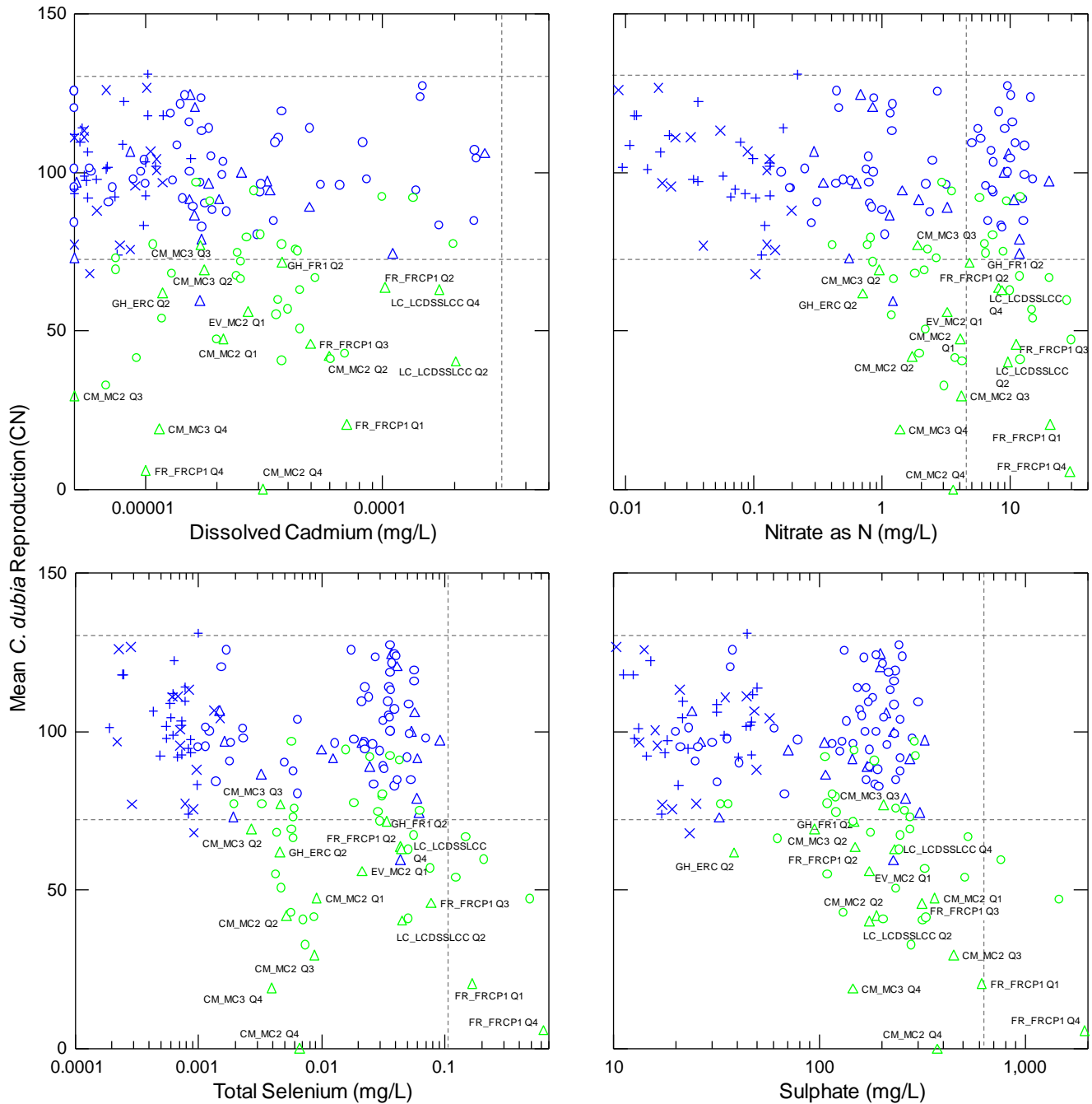
In addition to the constituents discussed above, the Σ TUs were also higher in Q4 than in reference waters and/or test site waters categorized as no adverse response. The Σ TU values for these tests were largely driven by the hazard quotients for nickel, nitrate, and sulphate, which were identified above as potentially contributing to observed effects. When calculated using BC WQGs benchmarks (except for nickel, for which 5 µg/L was used [Section 2.3.4]), the nickel, nitrate, and sulphate hazard quotients accounted for 34%, 36%, and 17% of the Σ TU value. When calculated using BC WQGs and EVWQP benchmarks, the nickel, nitrate, and sulphate hazard quotients accounted for 48%, 10%, and 21% of the Σ TU value in this test. These results could indicate a mixture-related effect. However, given that the Q4 FR_FRCP1 TIE results identified major ions only, mixture-related effects (as evaluated by Σ TUs) are not expected to have contributed to toxicity.

- **FR_FRCP1 (Q2 and Q3) and LC_LCDSSLCC (Q2 and Q4):** Overall, no water quality constituent was identified as a likely cause of the observed response in these tests. Concentrations of all constituents in this test were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response and/or were lower than the chronic BC WQG. Although concentrations of nickel exceeded the interim screening value of 5 µg/L, concentrations in these tests (5.4 to 6.7 µg/L) were below the IC₂₅ for nickel in Michel Creek water (10.8 µg/L) (Nautilus 2018). Toxicity-modifying factors may have differed between these test waters and the Michel Creek test water, which may have resulted in a different IC₂₅ for nickel. Therefore, it is uncertain whether nickel may have contributed to the observed responses in these tests.
- **GH_FR1 (Q2):** Overall, no water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of total iron, phosphorus, TOC, TSS, turbidity, and total vanadium were higher in these tests than reference waters and test site waters categorized as no adverse response. Nickel was lower in this test relative to test site waters categorized as no adverse response, but higher than the interim screening value of 5 µg/L. The nickel concentration (6.5 µg/L) was below the IC₂₅ for nickel in Michel Creek water (10.8 µg/L) (Nautilus 2018), indicating that nickel did not contribute to the observed response. Other exposure constituents exhibited no strong evidence for potential causation:
 - The iron concentration in this test (1.1 mg/L) was lower than the NOEC of 5.3 mg/L for *D. magna* (BC MoE 2008); providing that the crustaceans *C. dubia* and *D. magna* have a similar sensitivity than iron, it is likely not contributing to toxicity.
 - Phosphorus is a constituent that may result in ecological changes in the receiving environment under long-term discharge conditions but would not be expected to cause direct aquatic toxicity at the concentration observed in this sample (0.064 mg/L).
 - The concentration of total organic carbon (TOC) was higher than in both reference waters and test site waters categorized as no adverse response, but the magnitude of the difference was small (13%).

Furthermore, TOC is considered a toxicity-modifying factor rather than a toxicant, indicating that this constituent is not likely contributing to toxicity.

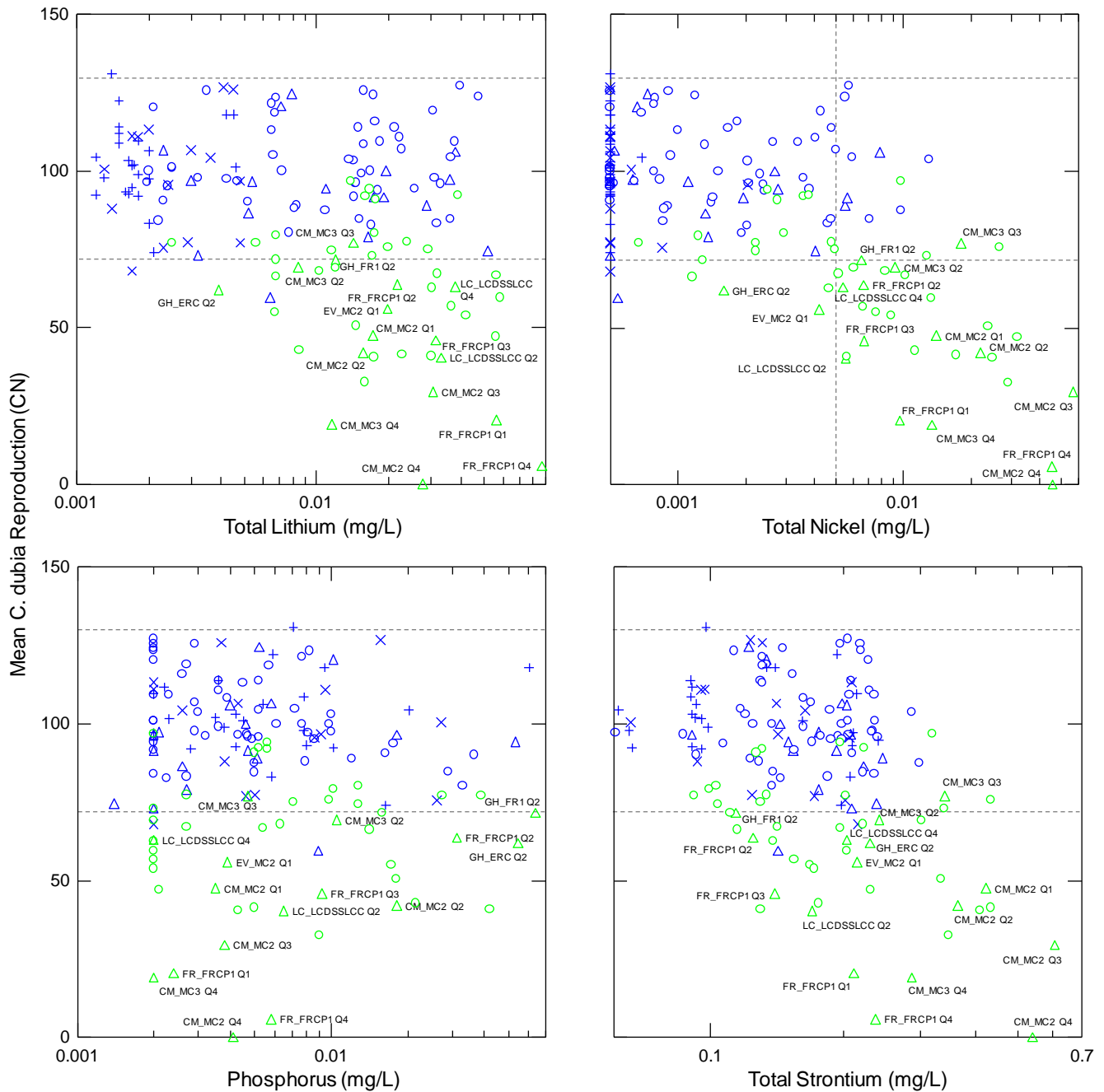
- The vanadium concentration in this test (3.8 µg/L) is below the federal water quality guideline of 120 µg/L (Environment Canada 2016); therefore, vanadium is not expected to have contributed to the observed response.
- Turbidity (47 Nephelometric Turbidity Units [NTU]) and TSS (52 mg/L) in this test were higher than concentrations in reference waters and/or test site waters with non-significant results. Turbidity, or some factor associated with the turbid sample condition, could not be ruled out as contributing to the response in this test.
- **GH_ERC (Q2):** Overall, no water quality constituent was identified as a potential cause of the observed response in this test. The concentration of TSS was higher than in both reference waters and test site waters categorized as no adverse response, but the magnitude of the difference was small (14%), indicating that it is not likely contributing to toxicity. Concentrations of all other constituents in this test were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-1), and/or were lower than the chronic BC WQG (Appendix C).

Figure 3.4-1: Mean *C. dubia* reproduction versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



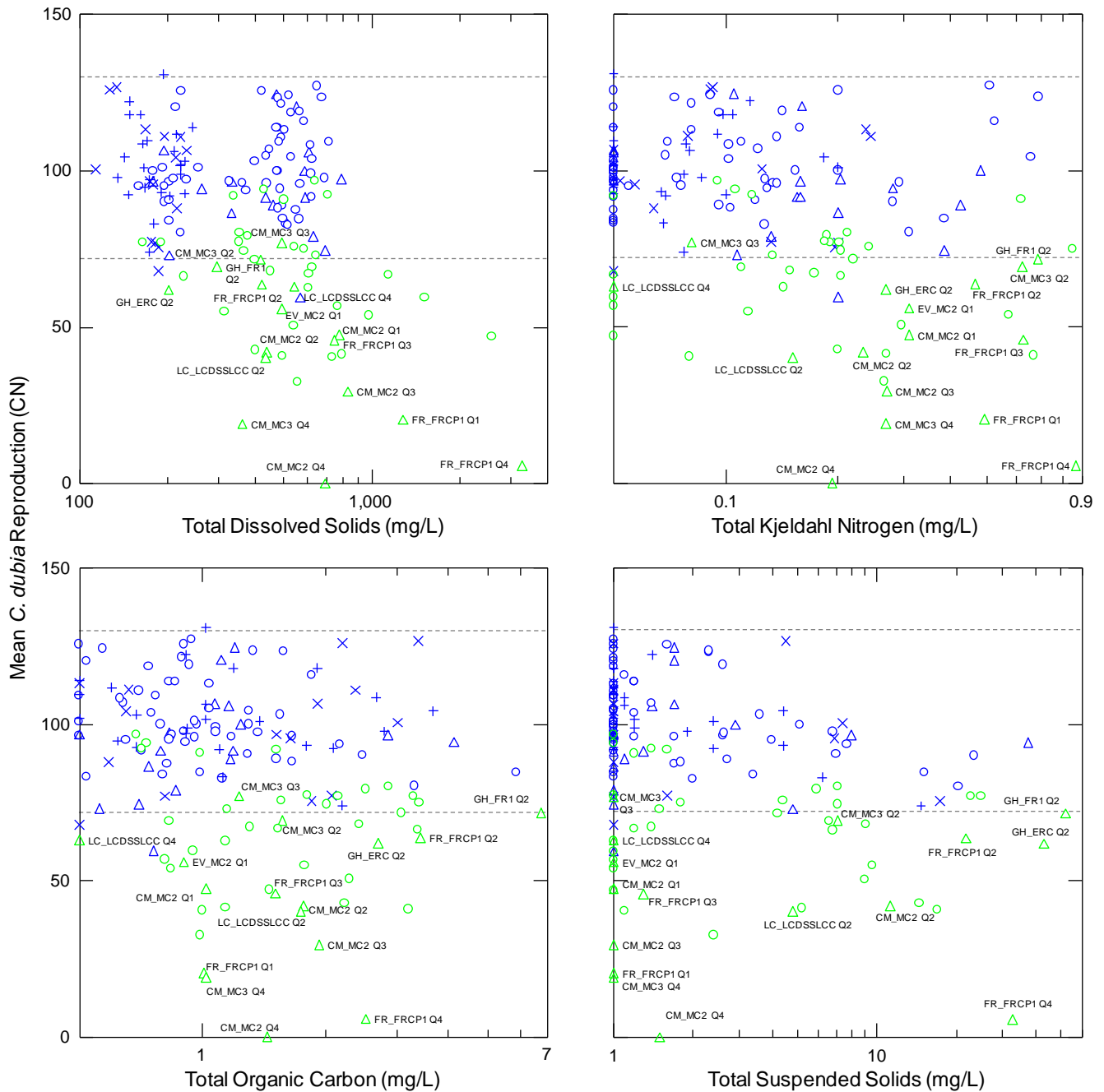
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are invertebrate level 1 benchmarks from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-3: Mean *C. dubia* reproduction versus concentrations of total lithium (top left), total nickel (top right), phosphorus (bottom left), and total strontium (bottom right).



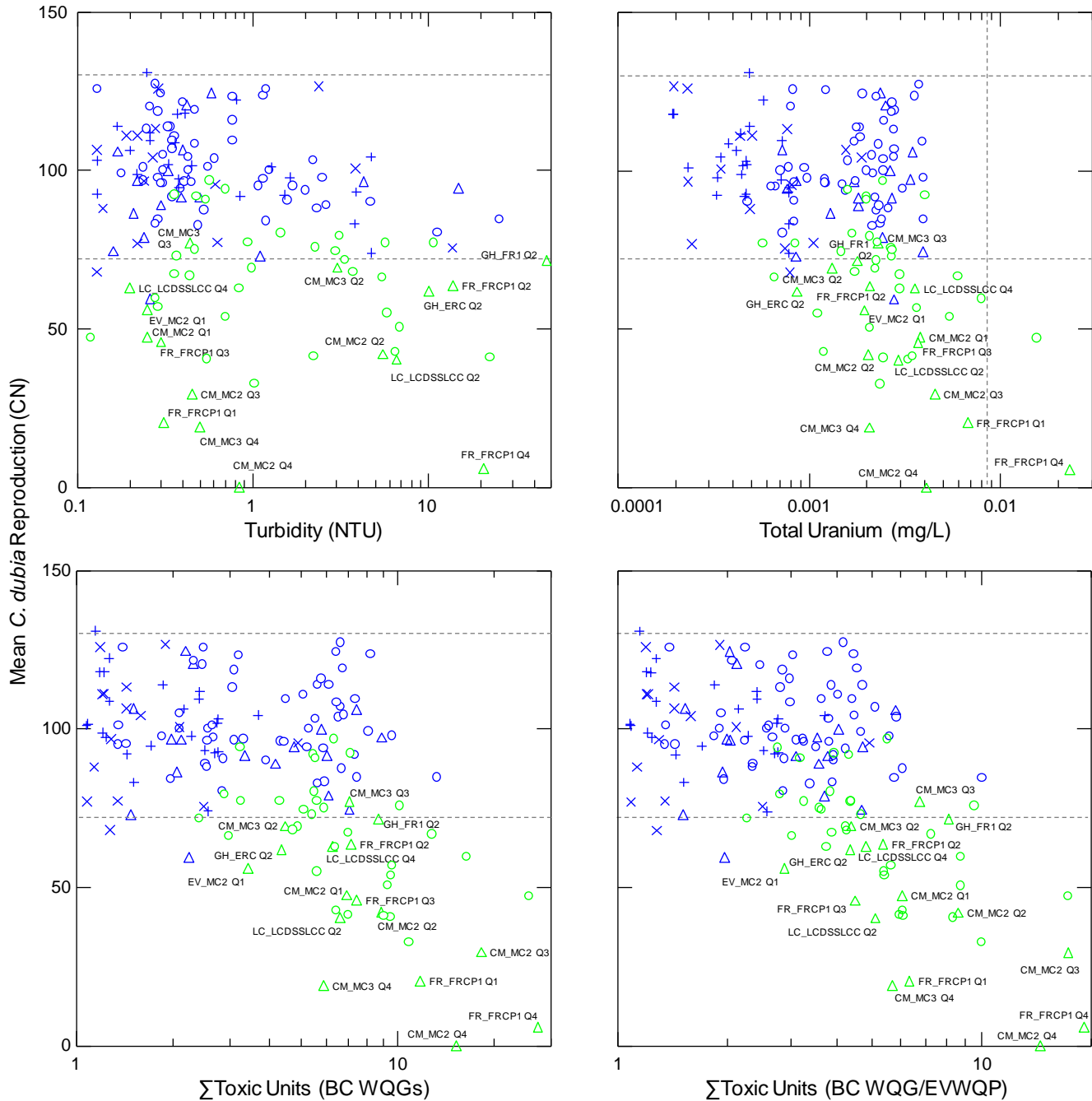
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical line for nickel is the interim screening value (see Section 2.3.4).

Figure 3.4-4: Mean *C. dubia* reproduction versus concentrations of total dissolved solids (top left), total Kjeldahl nitrogen (top right), total organic carbon (bottom left), and total suspended solids (bottom right).



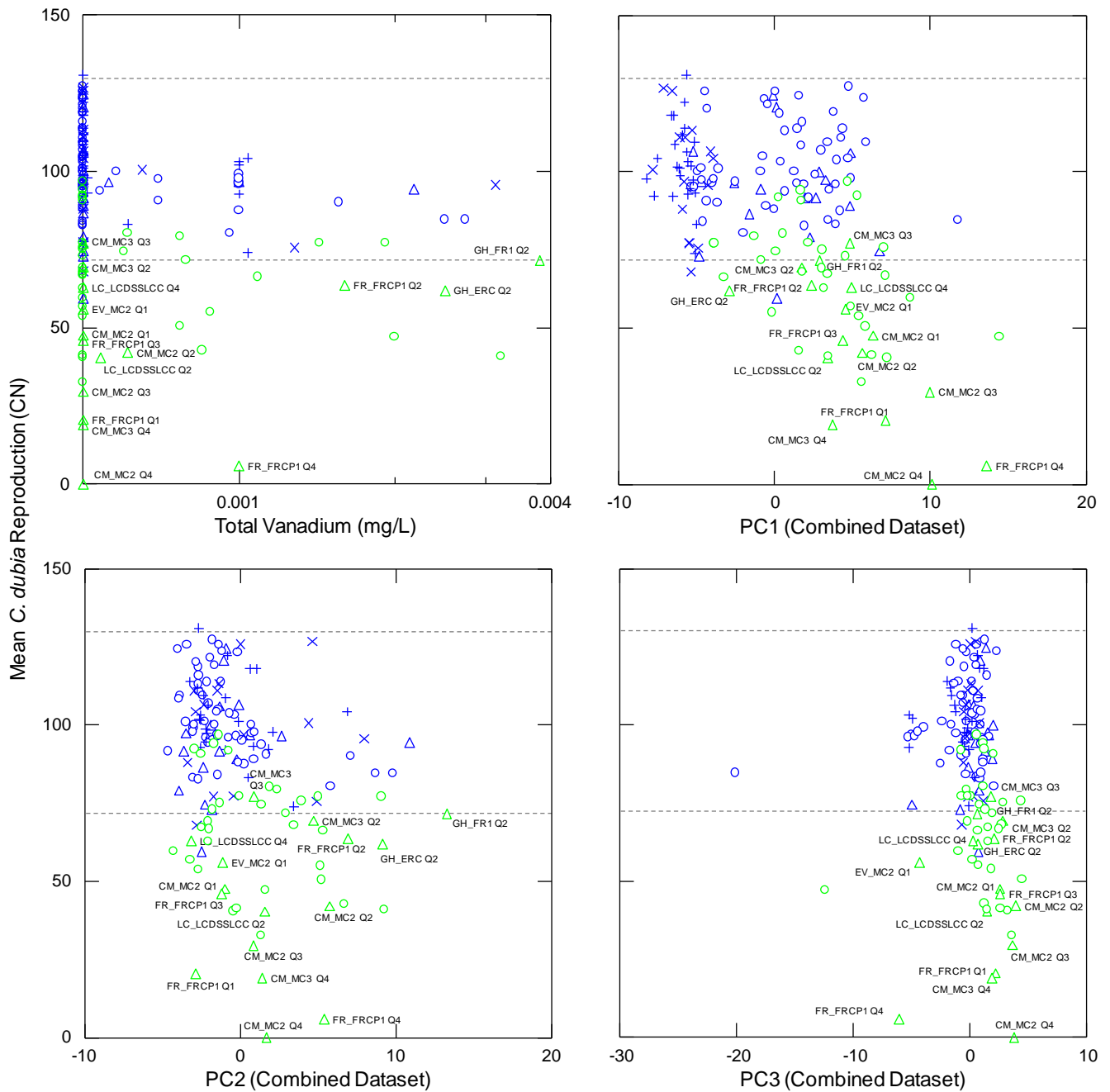
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical line for nickel is the interim screening value (see Section 2.3.4).

Figure 3.4-5: Mean *C. dubia* reproduction versus concentrations of turbidity (top left), total uranium (top right), sum of toxic units calculated using BC WQGs only (bottom left), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom right).



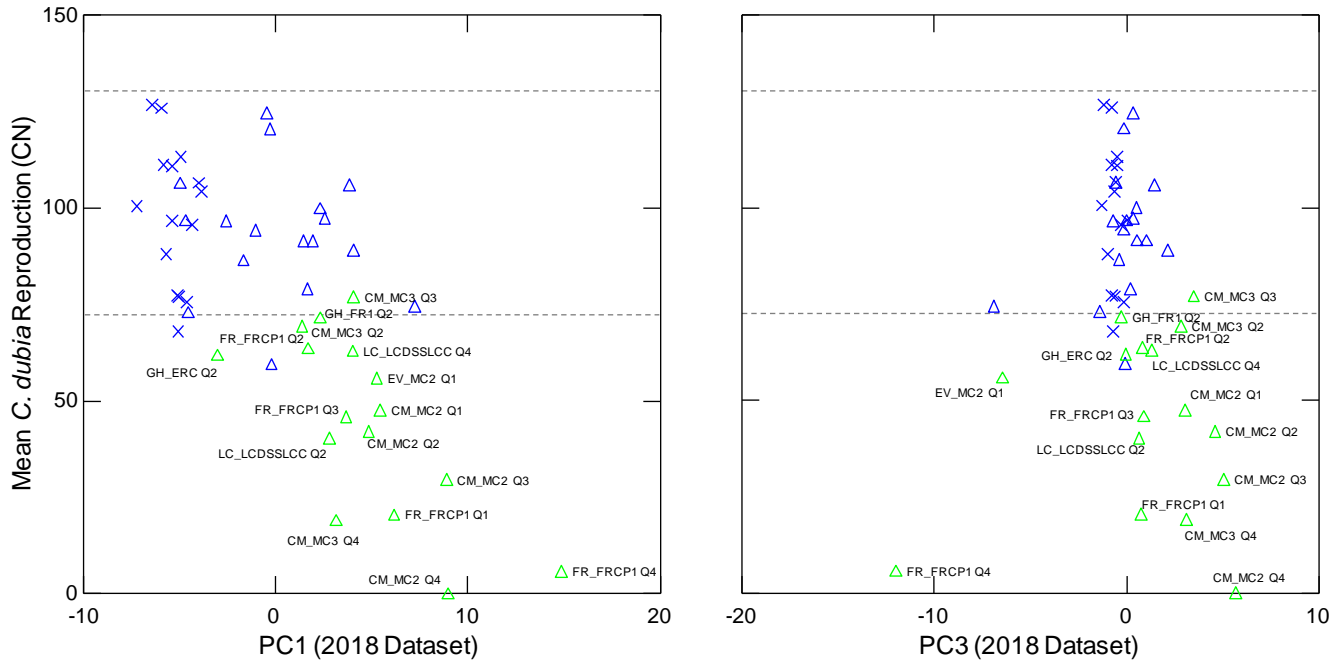
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs.

Figure 3.4-6: Mean *C. dubia* reproduction versus concentrations of total vanadium (top left), PC1 (top right), PC2 (bottom left), and PC3 (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-7: Mean *C. dubia* reproduction versus PC1 for the 2018 dataset (left) and PC3 for the 2018 dataset (right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

3.4.2 *Pseudokirchneriella subcapitata* Cell Yield

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-8) and 10 additional constituents were carried through to graphical analysis (Table F-2). The latter were constituents with statistically significant Spearman rank correlations (dissolved organic compound [DOC], total lithium, total nickel, TDS, total uranium, total vanadium, ΣTU [calculated using WQGs only and WQGs and EVWQP benchmarks], PC1 [combined dataset], PC3 [2018 dataset only]; Figure 3.4-9 to Figure 3.4-11) that did not screen out when compared to water quality guidelines. Although total bismuth and bromide had significant negative correlations, they were not included in graphical analysis because of low detection frequency¹⁸.

The PC1 score for the combined dataset (which accounted for 31.4% of the variance) and the PC3 score for the 2018 only dataset (which accounted for 10.5% of the variance) had statistically significant Spearman rank correlations. The PC1 score had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, nickel, uranium). The PC3 score for the 2018 dataset had strong negative loadings for total tin, total bismuth, and several dissolved metals (e.g., lead, silver, vanadium).

¹⁸ Of 46 samples, zero had a detected concentration of total bismuth, and three had detected concentrations of bromide (Table D-2).

None of the evaluated explanatory variables exhibited a consistent exposure-response relationship across all tests (Figure 3.4-8 to Figure 3.4-11). In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-2), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with nonsignificant results, and that were greater than a chronic BC WQG (when such exists) are discussed below.

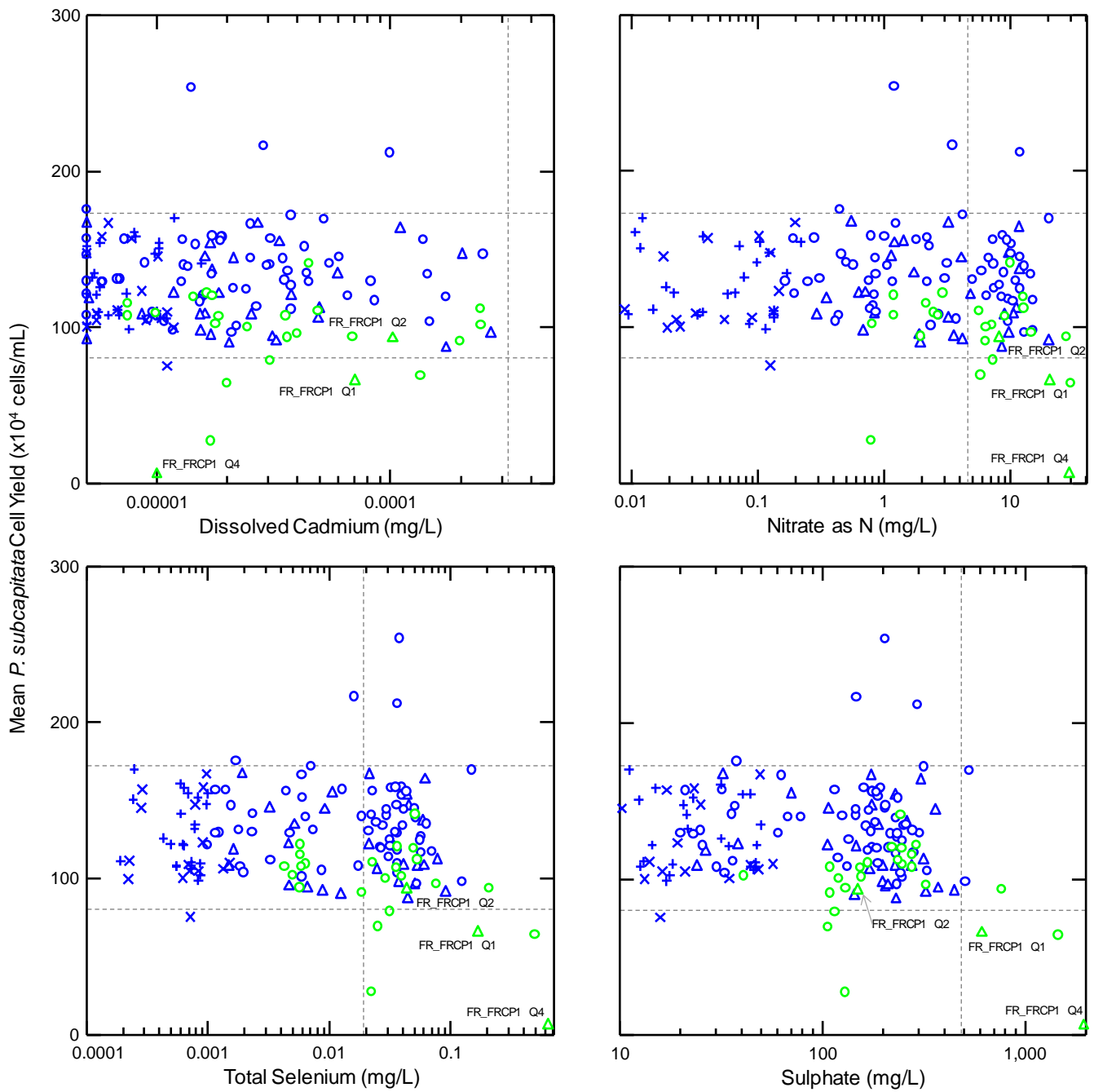
- **FR_FRCP1 (Q1):** No water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of selenium, sulphate, TDS, and several components related to TDS (e.g., calcium) in this test were higher in these tests than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks did not support a conclusion of causation. The nitrate concentration in this test was lower than in reference waters and test site waters categorized as no adverse response but was higher than the EVWQP benchmark. Concentrations of sulphate (613 mg/L), and TDS (1,280 mg/L) in this test were lower than the highest concentrations in the Golder (2013) mixture toxicity test that resulted in no significant adverse effects to *P. subcapitata* cell yield (sulphate = 931 mg/L; TDS = 1,498 mg/L), indicating they are not likely contributing to toxicity. The concentration of selenium in this test (170 µg/L) was greater than the highest concentration in the Golder (2013) mixture toxicity test that resulted in no significant adverse effects to *P. subcapitata* cell yield (138 µg/L), so it cannot be ruled out that selenium may have also contributed to the observed response in this test. The nitrate concentration in this test (20 mg/L NO₃-N) was lower than the highest concentration tested in the Golder (2013) mixture toxicity study that reported no adverse effects (41 mg/L NO₃-N), indicating nitrate did not contribute to the observed response.
- **FR_FRCP1 (Q2):** No water quality was identified as a potential cause of the observed response in this test. Concentrations of all constituents in this test were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-2), and/or were lower than the chronic BC WQG (Appendix C).
- **FR_FRCP1 (Q4):** The strongest evidence for causation was observed for sulphate, although TDS may also have contributed. Concentrations of lithium, nitrate, selenium, sulphate, uranium, TKN, TDS, and several components related to TDS (e.g., calcium) in this test were higher in these tests than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks did not support a conclusion of causation for most constituents. Concentrations of sulphate (1,940 mg/L) and TDS (3,260 mg/L) in this test were higher than the highest concentrations in the Golder (2013) mixture toxicity test that resulted in no significant adverse effects to *P. subcapitata* cell yield (sulphate = 931 mg/L; TDS = 1,498 mg/L), so potential effects could not be evaluated using site-specific testing. However, the concentration of sulphate in this test (1,940 mg/L) was higher than the reported IC₂₅ of 1,727 mg/L for *P. subcapitata* (Elphick et al. 2011; test hardness of 320 mg/L as CaCO₃), indicating that sulphate may have contributed to the observed response. Given the correlation between sulphate and TDS (i.e., as sulphate increases, so does TDS), it is possible that TDS also contributed to the observed response. Other exposure constituents exhibited no strong evidence for potential causation:

- The lithium concentration in this test (0.087 mg/L) was lower than the reported NOEC of 50 mg/L for *P. subcapitata*¹⁹, indicating that it is not likely contributing to toxicity.
- The uranium concentration in this test (0.023 mg/L) was lower than the reported IC₁₀ of 0.04 mg/L for *P. subcapitata* (CCME 2011), indicating that it is not likely contributing to toxicity.
- The TKN concentration in this test was higher than reference waters and test site waters categorized as no adverse response, but this difference was small (2%). Therefore, TKN is unlikely to be the cause of the observed response.
- Nitrate is not expected to have contributed to toxicity in this test because the test site concentration (29 mg/L NO₃-N) was lower than the highest concentration tested in the Golder (2013) mixture toxicity study that reported no adverse effects (41 mg/L NO₃-N).
- The selenium concentration in this test (620 µg/L) was higher than the highest concentrations (138 µg/L) in the Golder (2013) mixture toxicity test that resulted in no significant adverse effects to *P. subcapitata*, so it cannot be ruled out that selenium may have also contributed to the observed response in this test.

In addition to the constituents discussed above, the Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the Σ TU values for these tests were largely driven by the hazard quotients for nickel and nitrate. For example, in the Σ TUs calculated using BC WQGs (except for nickel, for which 5 µg/L was used [Section 2.3.4]) and EVWQP benchmarks, the hazard quotient for nickel and nitrate accounted for 70% (WQGs only) or 58% (WQGs and benchmarks) of the Σ TU value. These results indicate that the relationship between Σ TU and observed responses in this test is largely driven by nickel and nitrate, which does not align with the Q4 FR_FRCP1 TIE tests which identified sulphate and TDS as the likely contributors of observed effects. It is unknown whether the observed response was related to major ions alone, or whether additional constituents (e.g., nitrate) also contributed.

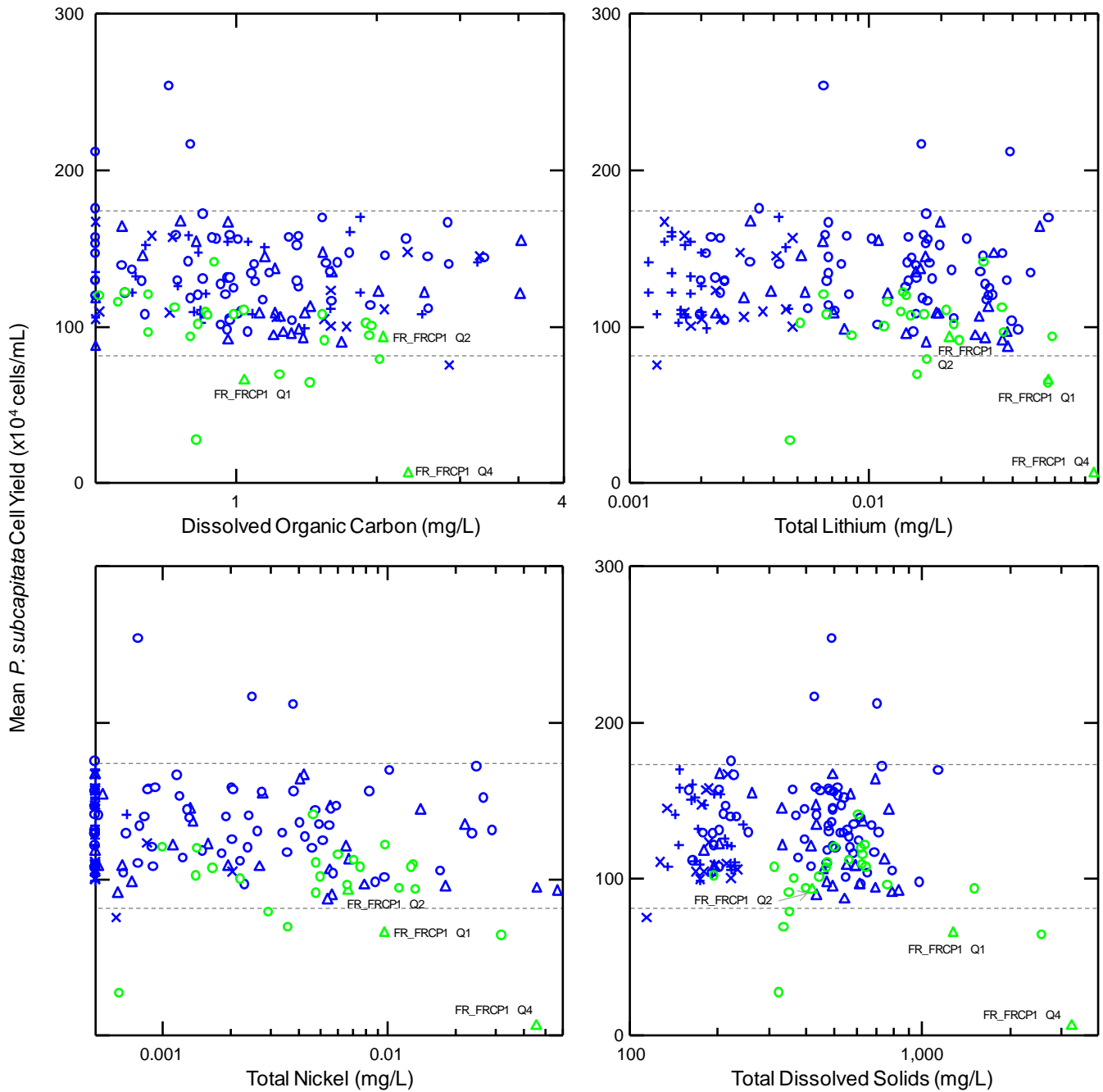
¹⁹ Reported in Material Safety Data Sheet:
<https://static1.squarespace.com/static/54f0b505e4b017cb0d7a6f26/t/55687e5fe4b0182dddbc570e/1432911455281/Rockwood+Lithium+SDS+Lithium+Carbonate.pdf>

Figure 3.4-8: Mean *P. subcapitata* cell yield versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



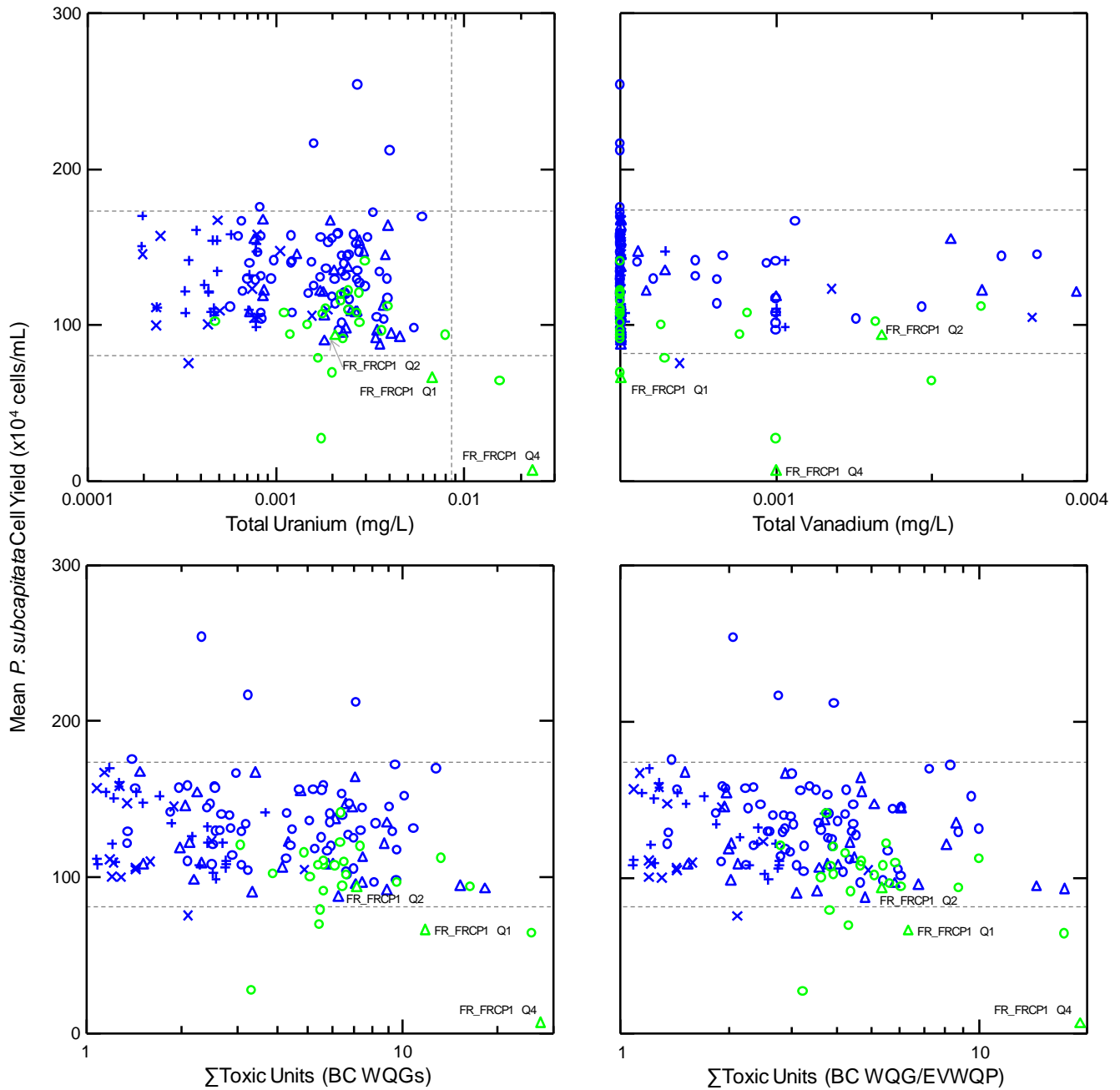
Note: Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-9: Mean *P. subcapitata* cell yield versus concentrations of dissolved organic carbon (top left), total lithium (top right), total nickel (bottom left), and total dissolved solids (bottom right).



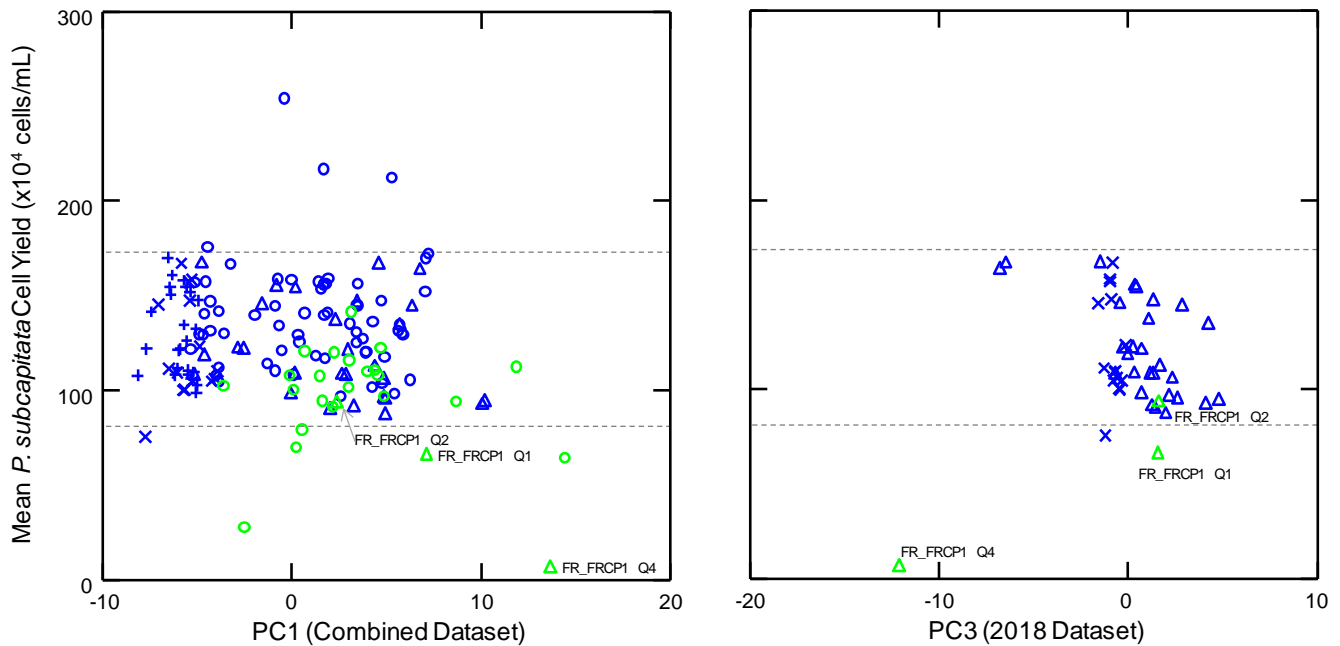
Note: Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-10: Mean *P. subcapitata* cell yield versus concentrations of total uranium (top left), total vanadium (top right), sum of toxic units calculated using BC WQGs only (bottom left), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom right).



Note: Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-11: Mean *P. subcapitata* cell yield versus PC1 for the combined dataset (left) and PC3 for the 2018 dataset (right).



Note: Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

3.4.3 *Hyaella azteca* Survival and Growth

Survival

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-12), as well 13 additional constituents²⁰ with statistically significant Spearman rank correlations that did not screen out when compared to water quality guidelines, were all carried through to graphical analysis (Figure 3.4-13 to Figure 3.4-16; Table F-3). Although total bismuth and total tin had significant negative correlations, they were not included in graphical analysis because of low detection frequency²¹. The following PC scores had statistically significant Spearman rank correlations:

- **PC1 (combined dataset).** This component accounted for 32.3% of the variance (Table E-3). PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC3 (combined dataset).** This component accounted for 9.3% of the variance (Table E-3). PC3 had strong negative loadings for total boron, total strontium, and several dissolved metals (e.g. arsenic, cobalt).

²⁰ The 13 constituents were total nickel, nitrite, strontium, TDS, total uranium, ΣTUs (calculated using WQGs only and WQGs and EVWQP benchmarks), PC1 scores (combined dataset and 2018 dataset), PC3 scores (combined dataset and 2018 dataset), and PC4 score (combined dataset and 2018 dataset).

²¹ Of 38 samples, zero had a detected concentration of total bismuth, and zero had a detected concentration of total tin (Table D-3).

- **PC4 (combined dataset).** This component accounted for 6.5% of the variance (Table E-3). PC3 had strong negative loadings for total bismuth, and several dissolved metals (e.g. beryllium, mercury, vanadium).
- **PC1 (2018 only dataset).** This component accounted for 32.4% of the variance (Table E-3). Similar to the combined dataset, PC1 for the 2018 dataset had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC3 (2018 only dataset).** This component accounted for 9.1% of the variance (Table E-3). PC3 had a strong positive loading for pH, and strong negative loadings for several dissolved metals (e.g. beryllium, tin, vanadium).
- **PC4 (2018 only dataset).** This component accounted for 8.1% of the variance (Table E-3). PC3 had strong negative loadings for boron and cobalt.

Most of the evaluated explanatory variables did not exhibit a consistent exposure-response relationship across all tests (Figure 3.4-12 to Figure 3.4-16). However, nickel exhibited a consistent relationship between exposure concentration and magnitude of adverse response. The potential for nickel and other constituents to explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-3), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with non-significant results, and that were greater than a chronic BC WQG (when such exists) are discussed below.

- **CM_MC2 (Q1, Q2, and Q4):** Overall, no water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of iron (Q2 only), sodium (Q1 only), and strontium (Q1 and Q4) were higher in these tests than reference waters and test site waters categorized as no adverse response. The concentration of total iron in Q2 (1.4 mg/L) was higher than reference waters and test site waters categorized as no adverse response, but this difference was small (9%). Therefore, iron is not expected to be the cause of the observed response. The strontium concentrations (Q1 = 0.45 mg/L; Q4 = 0.41 mg/L) were approximately two orders of magnitude lower than the IC₂₀ of 31.2 mg/L for *H. azteca* (McPherson et al. 2014), indicating that it is not likely contributing to toxicity. The concentration of sodium in Q1 (16 mg/L) was approximately 20% higher than reference waters and test site waters categorized as no adverse response. Mount et al. (1997, 2016) document that the toxicity of sodium salts to crustaceans is low relative to other major ion salts, reflects primarily an influence of the paired anions, and correlates well with osmolarity. Therefore, sodium as an individual constituent is unlikely to be the cause of observed responses.

Although nickel was lower in these tests relative to test site waters categorized as no adverse response, the nickel concentrations were reviewed because of the strong relationship observed between nickel and *H. azteca* survival at CMO (Figure 3.4-13). Nickel concentrations in Q1 (15 µg/L), Q2 (15 µg/L), and Q4 (12 µg/L) were below concentrations in 2017 TIE testing that were associated with a small effect on survival (approximately 10% at 40 µg/L) (Nautilus 2018), indicating that nickel did not contribute to the observed responses. There is some uncertainty in this conclusion because the thresholds for adverse effects of nickel to *H. azteca* may be somewhat under-estimated here (i.e., the IC_x may be lower), since the exposure to nickel concentrations were in good agreement with the target concentrations for the first 14 days of

exposure, but the test organisms were exposed to a ten-fold lower dose of nickel during the subsequent 14 days of the 28-day exposure (Nautilus 2018).

The above interpretation does not align with the 2018 *H. azteca* TIE testing conducted with Q1 to Q4 CM_MC2 waters, which showed increased survival with the addition of EDTA. Based on this improvement, divalent metals were identified as the probable cause of *H. azteca* toxicity (Section 3.3.1.2). As discussed above, the lack of alignment could be due to the under-estimation of nickel effects thresholds in 2017 TIE testing.

In addition to the constituents discussed above, the Σ TU calculated in Q2 using BC WQGs and EVWQP benchmarks was also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, Σ TUs for this test were largely driven by the hazard quotient for nickel. When calculated using BC WQGs and EVWQP benchmarks (except for nickel, for which 5 μ g/L was used [Section 2.3.4]), the nickel hazard quotient accounted for 31% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced survival is largely driven by nickel, which was discussed above as not likely contributing to toxicity. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs calculated using BC WQGs and EVWQP benchmarks for this test would be within the range observed in reference waters and test sites categorized as no adverse response. This interpretation indicates that mixture-related effects (as evaluated by Σ TUs) are not contributing to toxicity.

- **CM_MC2 (Q3):** The strongest evidence for causation was observed for nickel. Concentrations of cobalt, nickel, and strontium were higher in this test than reference waters and test site waters categorized as no adverse response. The nitrite concentration in this test was lower than in reference waters and test site waters categorized as no adverse response, but higher than the chronic BC WQG. The nickel concentration in this test (53 μ g/L) was between concentrations in 2017 Michel Creek TIE testing with a small effect on survival (approximately 10% at 40 μ g/L) and with a moderate effect on survival (approximately 40% at 80 μ g/L) (Nautilus 2018), indicating that nickel likely contributed to the observed response. The identification of nickel as a causal factor aligns with the 2018 *H. azteca* TIE testing conducted with Q3 CM_MC2 water, which indicated that divalent metals, particularly nickel, were the probable cause of *H. azteca* toxicity (Section 3.3.1.2). Other exposure constituents exhibited no strong evidence for potential causation:
 - The strontium concentration (0.6 mg/L) was lower than the reported IC₁₀ of 30.2 mg/L for *H. azteca* weight (McPherson et al. 2014), indicating that it is not likely a contributor to toxicity²². Although the strontium effect concentration is for weight, effects to survival would not be expected because MacPherson et al. (2014) compiled reported effect concentrations for the most sensitive endpoint.
 - The concentration of cobalt in this test (5.7 μ g/L) was below the effect concentrations from Michel Creek TIE testing (IC₂₅ >8 μ g/L) (Nautilus 2018), indicating that it is not likely contributing to toxicity.
 - The nitrite concentration (0.034 mg/L as nitrogen [N]; chloride of 3.2 mg/L) was lower than the chronic HC₅ value (0.085 mg/L as N at chloride of 3.2 mg/L) developed by Costa and de Bruyn (2017) to assess potential chronic effects to aquatic life, indicating that it is not likely contributing to toxicity.

The Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, Σ TUs for this test were largely driven by the hazard quotient for nickel. When

²² There is some uncertainty in this comparison because the IC₁₀ of 30.2 mg/L is based on a 14-day test, whereas the CM_MC2 tests were 28 days; however, this uncertainty is offset due to that measured concentrations were an order of magnitude below the IC₁₀.

calculated using BC WQGs and EVWQP benchmarks (except for nickel, for which 5 µg/L was used [Section 2.3.4]), the nickel hazard quotient accounted for 66% of the Σ TU value. When calculated using BC WQGs only, the nickel hazard quotient accounted for 62% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced survival is largely driven by nickel, which was discussed above as likely contributing to toxicity. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs calculated using BC WQGs and EVWQP benchmarks for this test would be within the range observed in reference waters and test sites categorized as no adverse response. This interpretation indicates that mixture-related effects (as evaluated by Σ TUs) are not contributing to toxicity.

- **CM_MC3 (Q3):** No water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of all constituents in this test were equal to or lower than reference waters and test site waters categorized as no adverse response (Table D-3), and/or were lower than the chronic BC WQG (Appendix C). Although nickel was lower in this test relative to test site waters categorized as no adverse response, the nickel concentration was reviewed because of the strong relationship observed between nickel and *H. azteca* survival at CMO (Figure 3.4-13). The nickel concentration (17 µg/L) was below concentrations in 2017 TIE testing that were associated with a small effect on survival (approximately 10% at 40 µg/L) (Nautilus 2018), indicating that nickel likely did not contribute to the observed response. There is some uncertainty in this conclusion because the thresholds for adverse effects of nickel to *H. azteca* may be somewhat under-estimated here (i.e., the IC_x may be lower), since the exposure to nickel concentrations were in good agreement with the target concentrations for the first 14 days of exposure, but the test organisms were exposed to a ten-fold lower dose of nickel during the subsequent 14 days of the 28-day exposure (Nautilus 2018).
- **FR_FRCP1 (Q4):** Potential contributors to the observed response are nickel, nitrate, and uranium. Concentrations of lithium, nickel, nitrate, selenium, sulphate, uranium, TDS and components related to TDS (e.g. calcium) were higher in this test than reference waters and test site waters categorized as no adverse response. The nitrate concentration in this test (29 mg/L NO₃-N) was higher than the 14-day EC₂₀ of 23 mg/L for *H. azteca* biomass in Fording River water (Teck 2014), indicating that nitrate may have contributed to the observed response in this test. The uranium concentration in this test (21 µg/L) was higher than the reported EC₁₀ of 12 µg/L (CCME 2011), indicating that uranium may have contributed to the observed response. The nickel concentration in this test (39 µg/L) was approximately equal to the concentration in 2017 Michel Creek TIE testing with a small effect on survival (approximately 10% at 40 µg/L) (Nautilus 2018), indicating that nickel may have contributed to the observed response. The inconsistency between the magnitude of response in this test (80% at 39 µg/L) and the magnitude of response observed in the 80 µg/L treatment (approximately 60%) could be due to the under-estimated effect concentrations from TIE testing (see bullet above; Nautilus 2018). Other exposure constituents exhibited no strong evidence for potential causation:
 - The lithium concentration (0.079 mg/L) was lower than the reported LC₅₀ of 3.13 mg/L for *H. azteca* (Borgmann et al. 2005), indicating that it is not likely a contributor to toxicity²³.
 - The concentrations of sulphate (1,940 mg/L) and TDS (3,508 mg/L) in this test were greater than the no-observed effect concentrations in Fording River water (sulphate = 1,110 mg/L; TDS = ~1,700 mg/L) (Teck 2014), so potential effects could not be evaluated using site-specific testing. However, the concentration of sulphate in this test (1,940 mg/L; 82% effect) was below the 28-day LC₁₀ of >2,000 mg/L (BC MoE 2013; test hardness of 250 mg/L as CaCO₃), indicating that it is not likely a contributor to

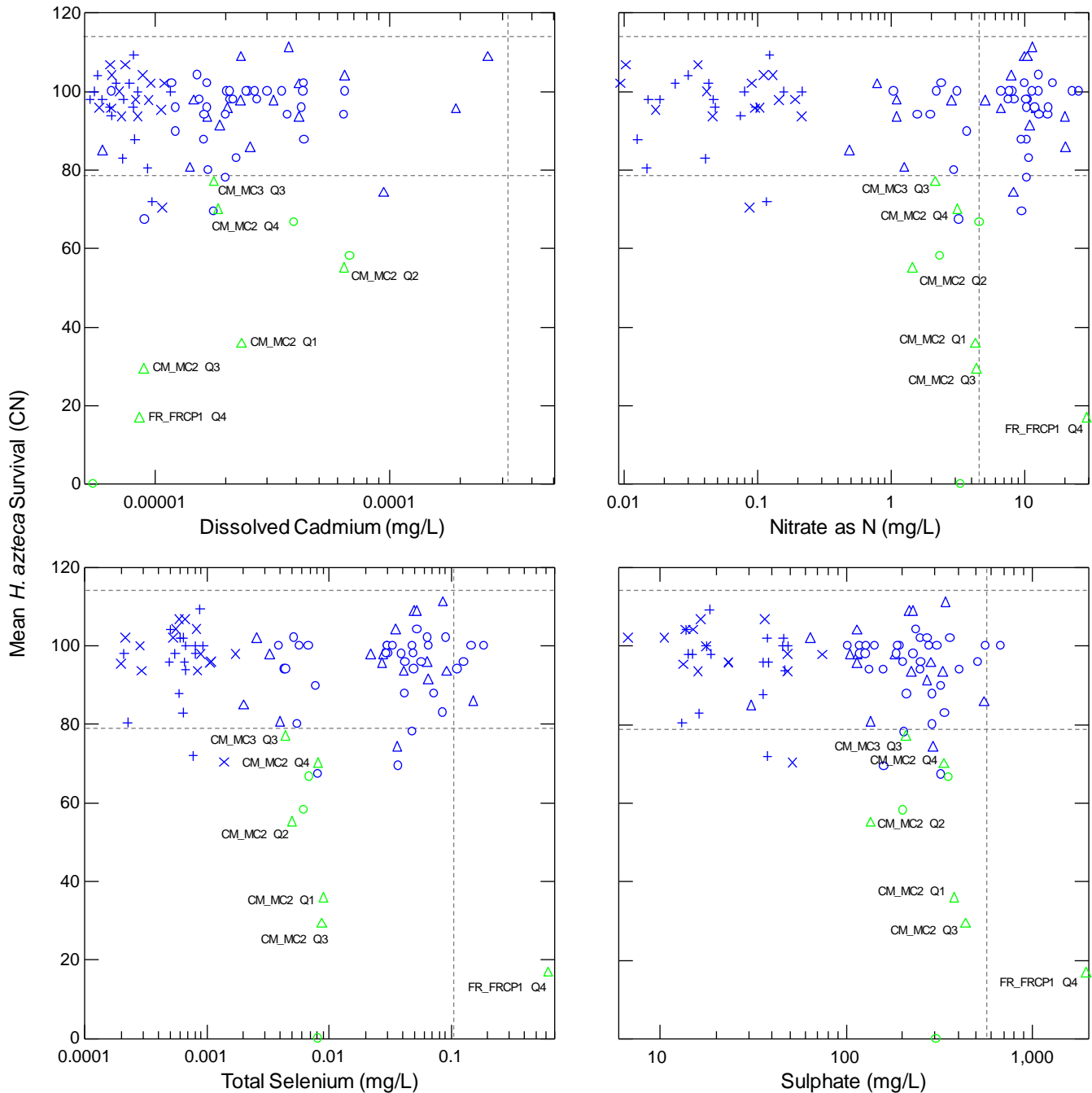
²³ There is some uncertainty in this comparison because the LC₅₀ of 3.13 mg/L is based on a 7-day test, whereas the FR_FRCP1 test was 28 days; however, this uncertainty is offset due to that the measured concentration was an order of magnitude below the LC₅₀.

toxicity. It is uncertain whether the interpretation for sulphate would also apply to TDS, given that TDS-related effects can vary by its individual components.

- The selenium concentration in this test (620 µg/L) was higher than the maximum concentration tested in the SPO mixture study that resulted in no adverse effects (57 µg/L) (Golder 2016), so it cannot be ruled out that selenium may have also contributed to the observed response in this test.

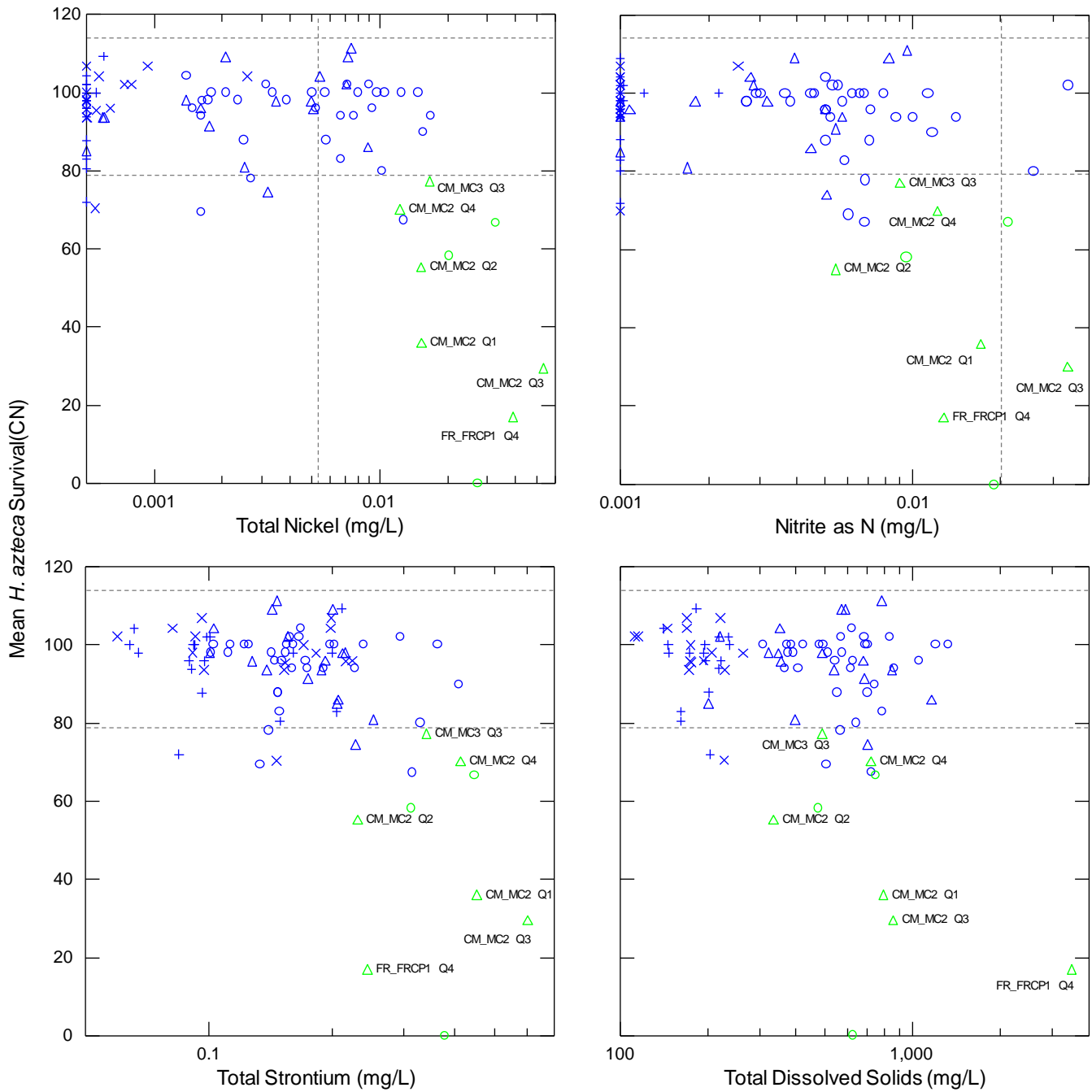
The Σ TUs were also higher in Q4 than in reference waters and/or test site waters categorized as no adverse response. The Σ TU values for these tests were not largely driven by the hazard quotients of any one constituent, and test concentrations of constituents were identified as being above toxicity benchmarks. Therefore, mixture-related effects (as evaluated by Σ TUs) could not be ruled out.

Figure 3.4-12: Mean *H. azteca* survival versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



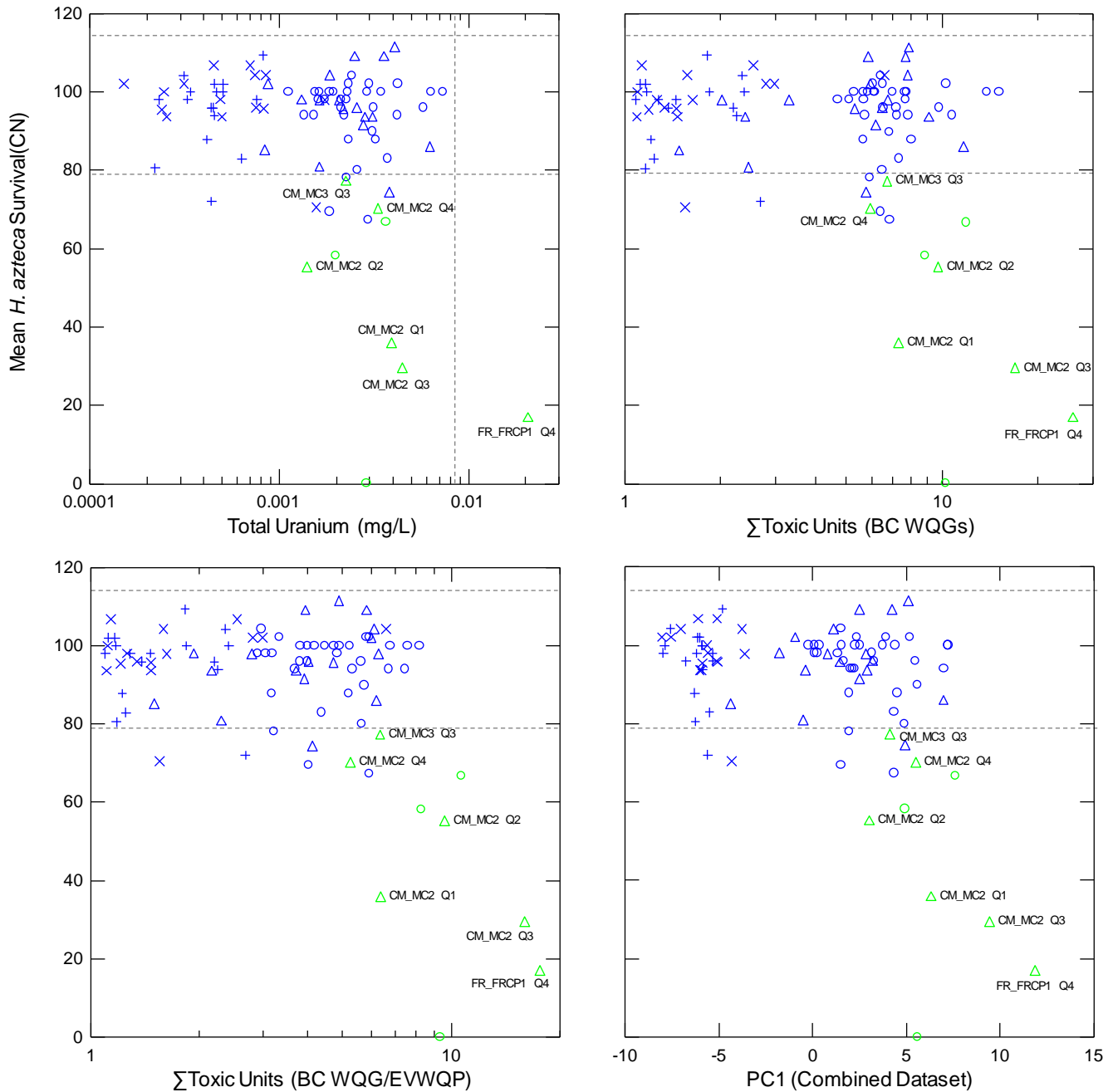
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are invertebrate level 1 benchmarks from EVWQP (hardness of 300 mg/L was used).

Figure 3.4-13: Mean *H. azteca* survival versus total nickel (top left), nitrite (top right), total strontium (bottom left), and total dissolved solids (bottom right).



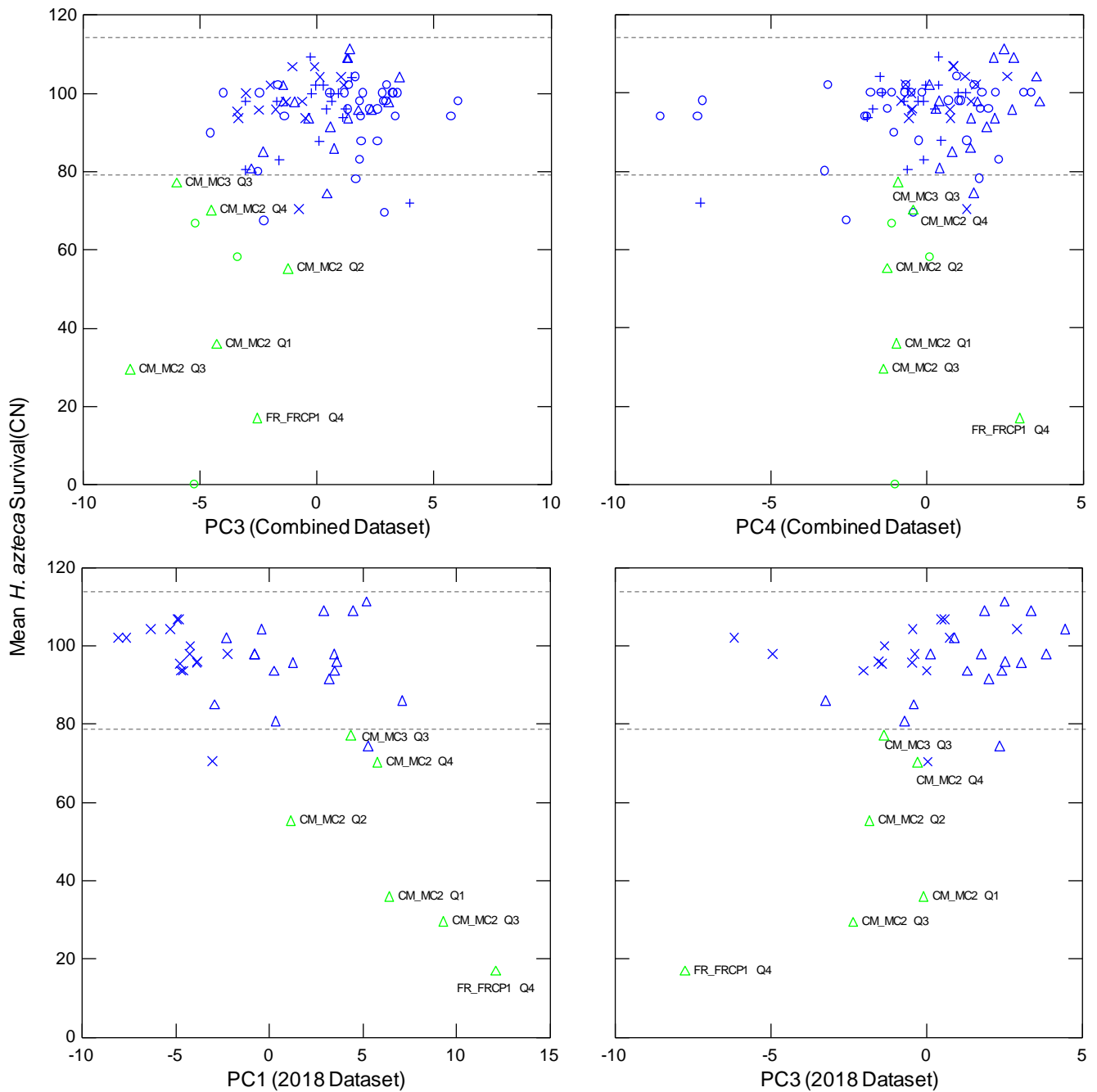
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-14: Mean *H. azteca* survival versus total uranium (top left), sum of toxic units calculated using BC WQGs only (top right), and sum of toxic units calculated using BC WQGs and EVWQP benchmarks (bottom left), and PC1 for the combined dataset (bottom right).



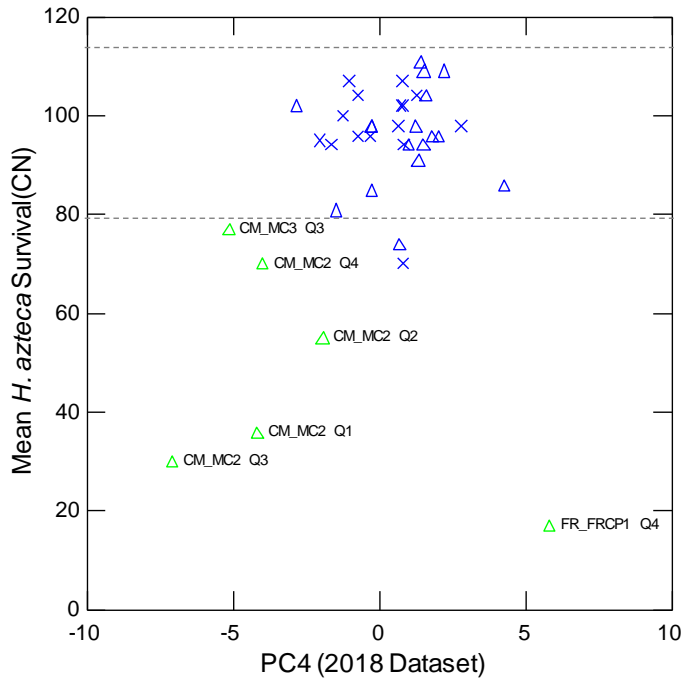
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-15: Mean *H. azteca* survival versus PC3 for the combined dataset (top left), PC4 for the combined dataset (top right), PC1 for the 2018 dataset (bottom left), and PC3 for the 2018 dataset (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-16: Mean *H. azteca* survival versus PC4 for the 2018 dataset.



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Dry Weight

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-17) and 13 additional constituents²⁴ with statistically significant Spearman rank correlations that did not screen out when compared to water quality guidelines, were all carried through to graphical analysis (Figure 3.4-18 to Figure 3.4-21; Table F-3). Although total bismuth and total tin had significant negative correlations, they were not included in graphical analysis because of low detection frequency²⁵. The following PC scores had statistically significant Spearman rank correlations:

- **PC1 (combined dataset).** This component accounted for 32.3% of the variance (Table E-3). PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (dissolved cadmium, sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC3 (combined dataset).** This component accounted for 9.3% of the variance (Table E-3). PC2 had strong positive loadings for DOC, TSS, turbidity, and several metals (e.g., lead, iron, arsenic, aluminum, copper).

²⁴ The 13 constituents were total nickel, nitrite, strontium, TDS, total uranium, ΣTUs (calculated using WQGs only and WQGs and EVWQP benchmarks), PC1 scores (combined dataset and 2018 dataset), PC3 scores (combined dataset and 2018 dataset), and PC4 score (combined dataset and 2018 dataset).

²⁵ Of 38 samples, zero had a detected concentration of total bismuth, and zero had a detected concentration of total tin (Table D-3).

- **PC4 (combined dataset).** This component accounted for 6.5% of the variance (Table E-3). PC3 had strong negative loadings for total tin, and several dissolved metals (e.g. lead, silver, vanadium).
- **PC1 (2018 only dataset).** This component accounted for 32.4% of the variance (Table E-3). Similar to the combined dataset, PC1 for the 2018 dataset had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC3 (2018 only dataset).** This component accounted for 9.1% of the variance (Table E-3). Similar to the combined dataset, PC3 for the 2018 dataset had strong negative loadings for total tin, and several dissolved metals (e.g. lead, silver, vanadium).

Most of the evaluated explanatory variables did not exhibit a consistent exposure-response relationship across all tests (Figure 3.4-17 to Figure 3.4-21). However, nickel exhibited a consistent relationship between exposure concentration and magnitude of adverse response. The potential for nickel and other constituents to explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-3), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with nonsignificant results, and that were greater than a chronic BC WQG (when such exists) are discussed below.

- **CM_MC2 (Q1, Q2, and Q4):** Evidence for potential causation was observed for nickel, although the evidence was less strong and consistent relative to Q3 (next bullet). Concentrations of total iron (Q2 only), sodium (Q1 only), and strontium (Q1 and Q4) were higher in these tests than reference waters and test site waters categorized as no adverse response. The strontium concentrations (Q1 = 0.45 mg/L; Q4 = 0.41 mg/L) were approximately two orders of magnitude lower than the IC_{20} of 31.2 mg/L for *H. azteca* (McPherson et al. 2014), indicating that it is likely not contributing to toxicity. The concentration of sodium in Q1 (16 mg/L) was 20% higher than reference waters and test site waters categorized as no adverse response. Mount et al. (1997, 2016) document that the toxicity of sodium salts to crustaceans is low relative to other major ion salts, reflects primarily an influence of the paired anions, and correlates well with osmolarity. Therefore, sodium as an individual constituent is unlikely to be the cause of observed responses. The concentration of total iron in Q2 was higher than reference waters and test site waters categorized as no adverse response, but this difference was small (9%). Therefore, iron is not expected to be the cause of the observed response in Q2

Although nickel was lower in these tests relative to test site waters categorized as no adverse response, the nickel concentrations were reviewed because of the known impacts of nickel at CMO and the strong relationship observed between nickel and *H. azteca* growth (Figure 3.4-18). Nickel concentrations in Q1 (15 µg/L), Q2 (15 µg/L), and Q4 (12 µg/L) were between concentrations in 2017 TIE testing that were associated with no effect on growth (10 µg/L) and the IC_{25} (22.4 µg/L) (Nautilus 2018), indicating that nickel may have contributed to the observed response. There is some uncertainty in this comparison because the thresholds for adverse effects of nickel to *H. azteca* may be somewhat under-estimated here (i.e., the IC_x may be lower), due to lower-doses of nickel administered during the second half of the 28-day exposure (see summary provided in survival section or Nautilus 2018). The identification of nickel as a causal factor aligns with the 2018 *H. azteca* TIE testing conducted with Q1 to Q4 CM_MC2 water, which indicated that divalent metals, particularly nickel, were the probable cause of *H. azteca* toxicity (Section 3.3.1.2).

In addition to the constituents discussed above, the Σ TU calculated using BC WQGs and EVWQP benchmarks was also higher in the Q2 test than in reference waters and/or test site waters categorized as no adverse response. However, Σ TUs for this test were largely driven by the hazard quotient for nickel. When calculated using BC WQGs and EVWQP benchmarks (except for nickel, for which 5 μ g/L was used [Section 2.3.4]), the nickel hazard quotient accounted for 31% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced growth is largely driven by nickel, which was discussed above as possibly contributing to toxicity. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs calculated using BC WQGs and EVWQP benchmarks for this test would be within the range observed in reference waters and test sites categorized as no adverse response. This interpretation indicates that mixture-related effects (as evaluated by Σ TUs) are not contributing to toxicity.

- **CM_MC2 (Q3):** The strongest evidence for causation was observed for nickel. Concentrations of cobalt, nickel, and strontium were higher in this test than reference waters and test site waters categorized as no adverse response. The nitrite concentration in this test was lower than in reference waters and test site waters categorized as no adverse response, but higher than the chronic BC WQG. The nickel concentration in this test (53 μ g/L) was higher than the IC₅₀ concentration in 2017 Michel Creek TIE testing (33.4 μ g/L) (Nautilus 2018) indicating that nickel may have contributed to the observed response. This interpretation aligns with the Q1 to Q4 CM_MC2 TIE results, which identified nickel as the likely cause of observed effects (Appendix B-6). Other exposure constituents exhibited no strong evidence for potential causation:
 - The strontium concentration (0.6 mg/L) was lower than the reported IC₁₀ of 30.2 mg/L for *H. azteca* weight (McPherson et al. 2014), indicating that it is not likely a contributor to toxicity²⁶.
 - The concentration of cobalt in this test (5.7 μ g/L) was below the effect concentrations from Michel Creek TIE testing (IC₂₅ >8 μ g/L; Nautilus 2018), indicating that it is not likely contributing to toxicity.
 - The nitrite concentration in this test (0.034 mg/L as nitrogen [N]; chloride of 3.2 mg/L) was lower than the chronic HC₅ value (0.085 mg/L as N at chloride of 3.2 mg/L) developed by Costa and de Bruyn (2017) to assess potential chronic effects to aquatic life, indicating that it is not likely contributing to toxicity.

The Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, Σ TUs for this test were largely driven by the hazard quotient for nickel. When calculated using BC WQGs and EVWQP benchmarks (except for nickel, for which 5 μ g/L was used [Section 2.3.4]), the nickel hazard quotient accounted for 66% of the Σ TU value. When calculated using BC WQGs only, the nickel hazard quotient accounted for 62% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced survival is largely driven by nickel, which was discussed above as potentially contributing to toxicity. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs calculated using BC WQGs and EVWQP benchmarks for this test would be within the range observed in reference waters and test sites categorized as no adverse response. This interpretation indicates that mixture-related effects (as evaluated by Σ TUs) are not contributing to toxicity.

- **CM_MC3 (Q3):** Evidence for potential causation was observed for nickel, although the evidence was less strong and consistent relative to Q3 CM_MC2. Concentrations of constituents in this test were equal to or lower than reference waters and test site waters categorized as no adverse response except for nickel. The nickel concentration in this test (17 μ g/L) was between concentrations in 2017 Michel Creek TIE testing with

²⁶ There is some uncertainty in this comparison because the IC₁₀ of 30.2 mg/L is based on a 14-day test, whereas the CM_MC2 tests were 28 days; however, this uncertainty is offset due to that measured concentrations were an order of magnitude below the IC₁₀.

no effect on growth (10 µg/L) and the IC₂₅ (22.4 µg/L) (Nautilus 2018), indicating that nickel may have contributed to the observed response. There is some uncertainty in this conclusion because the thresholds for adverse effects of nickel to *H. azteca* may be somewhat under-estimated here (i.e., the IC_x may be lower), since the exposure to nickel concentrations were in good agreement with the target concentrations for the first 14 days of exposure, but the test organisms were exposed to a ten-fold lower dose of nickel during the subsequent 14 days of the 28-day exposure (Nautilus 2018).

- **FR_FRCP1 (Q1):** The strongest evidence for causation was observed for nitrate. Concentrations of lithium, nitrate, selenium, sulphate, TDS, and components related to TDS (e.g. calcium) were higher in this test than reference waters and test site waters categorized as no adverse response. The nitrate concentration in this test (20 mg/L NO₃-N) was slightly higher than the 14-day EC₁₀ of 19 mg/L for *H. azteca* biomass in Fording River water (Teck 2014), indicating that nitrate may have contributed to the observed response in this test. Other exposure constituents exhibited no strong evidence for potential causation:

- The concentration of lithium in this test was greater than reference waters and/or test site waters with non-significant results. It could not be determined whether lithium contributed to the statistically significant response in this test. However, lithium is not normally considered to be a toxicant to aquatic life. There are no BC, CCME, or US EPA WQGs for the protection of aquatic life for lithium, and as of March 2019, the US EPA ECOTOX database does not have lithium chronic toxicity data for *H. azteca*. Therefore, it is unlikely that lithium contributed to the observed response in this test.
- The selenium concentration in this test (150 µg/L) was higher than the maximum concentration tested in the SPO mixture study that resulted in no adverse effects (57 µg/L) (Golder 2016), so it cannot be ruled out that selenium may have also contributed to the observed response in this test.
- The sulphate concentration in this test (552 mg/L) was lower than the no-observed effect concentration of 1,110 mg/L in Fording River water (Teck 2014), indicating that it is not likely contributing to toxicity.
- TDS is not expected to have contributed to toxicity in this test because the concentration (1,164 mg/L) was lower than the no-observed effect concentration of ~1,700 mg/L in Fording River water (Teck 2014).

The Σ TU calculated using BC WQGs (but not using BC WQGs and EVWQP benchmarks) was also higher in Q1 than in reference waters and/or test site waters categorized as no adverse response. However, Σ TU for this test were largely driven by the hazard quotient for nitrate which accounted for 56% of the Σ TU value. This result indicates that the relationship between Σ TU and reduced growth is largely driven by nitrate, which was discussed above as potentially contributing to toxicity. If the hazard quotient for nitrate were excluded from the calculation, then the Σ TUs calculated using BC WQGs for this test would be within the range observed in reference waters and test sites categorized as no adverse response. This interpretation indicates that mixture-related effects (as evaluated by Σ TUs) are not contributing to toxicity.

- **FR_FRCP1 (Q4):** Potential contributors to the observed response were nickel, nitrate, uranium, and major ions (i.e. components of TDS, including sulphate). Concentrations of lithium, nickel, nitrate, selenium, sulphate, uranium, TDS and components related to TDS (e.g. calcium) were higher in this test than reference waters and test site waters categorized as no adverse response. Concentrations of sulphate (1,940 mg/L) and TDS (3,508 mg/L) in this test were greater than the no-observed effect concentrations in Fording River water (sulphate = 1,110 mg/L; TDS = ~1,700 mg/L) (Teck 2014), so effects could not be evaluated using site-specific testing. In comparison to literature values, the concentration of sulphate in this test (1,940 mg/L) was lower than the 28-day IC₅₀ value of >2,000 mg/L at hardness of 50 and 100 mg/L as CaCO₃ but approximately equal to the IC₅₀ of 1,929 mg/L at hardness of 250 mg/L as CaCO₃. Based on this

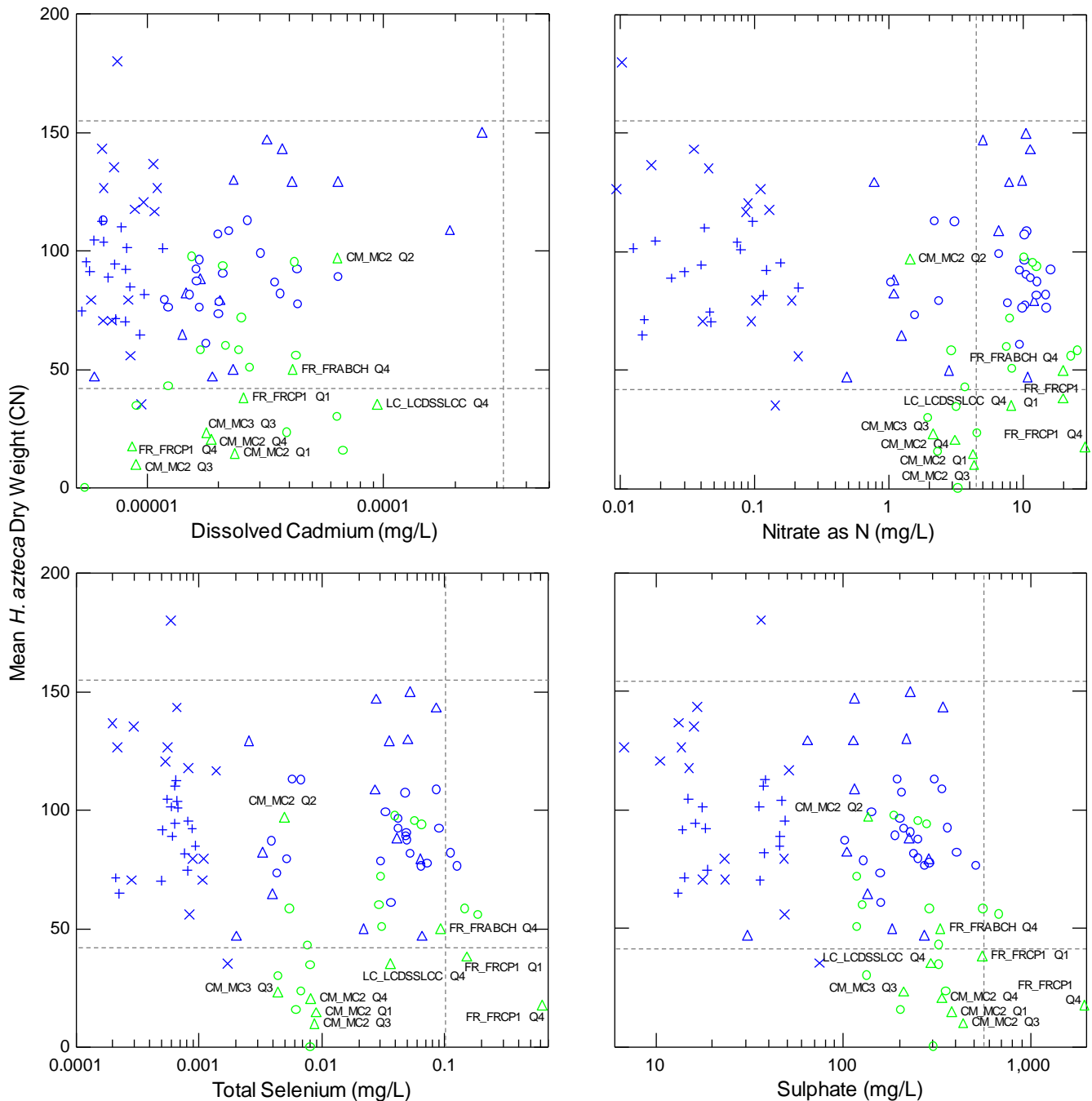
comparison, sulphate may have contributed to the observed response. Given the correlation between sulphate and TDS (i.e., as sulphate increases, so does TDS), it is possible that TDS also contributed to the observed response. The nitrate concentration in this test (29 mg/L NO₃-N) was higher than the 14-day EC₂₀ of 23 mg/L for *H. azteca* biomass in Fording River water (Teck 2014), indicating that nitrate may have contributed to the observed response in this test. Uranium potentially contributed to toxicity in this test because the test concentration (21 µg/L) was higher than the reported EC₁₀ of 12 µg/L (CCME 2011). Nickel concentration in this test (39 µg/L) was greater than the IC₅₀ (33.4 µg/L) in 2017 Michel Creek TIE testing (Nautilus 2018), indicating that nickel may have contributed to the observed response. The inconsistency between the magnitude of response in this test (approximately 80% at 39 µg/L) and the magnitude of response observed in the 40 µg/L TIE treatment (approximately 50%) could be due to the under-estimated effect concentrations from TIE testing (see survival section; Nautilus 2018). Other exposure constituents exhibited no strong evidence for potential causation:

- The concentration of lithium in this test was greater than reference waters and/or test site waters with non-significant results. It could not be determined whether lithium contributed to the statistically significant response in this test. However, lithium is not normally considered to be a toxicant to aquatic life. There are no BC, CCME, or US EPA WQGs for the protection of aquatic life for lithium, and as of March 2019, the US EPA ECOTOX database does not have lithium chronic toxicity data for *H. azteca*. Therefore, it is unlikely that lithium contributed to the observed response in this test.
- The selenium concentration in this test (620 µg/L) was higher than the maximum concentration tested in the SPO mixture study that resulted in no adverse effects (57 µg/L) (Golder 2016), so it cannot be ruled out that selenium may have also contributed to the observed response in this test.

The Σ TUs were also higher in Q4 than in reference waters and/or test site waters categorized as no adverse response. The Σ TU values for these tests were not largely driven by the hazard quotients of any one constituent. This indicates that mixture-related effects (as evaluated by Σ TUs) may be contributing to toxicity.

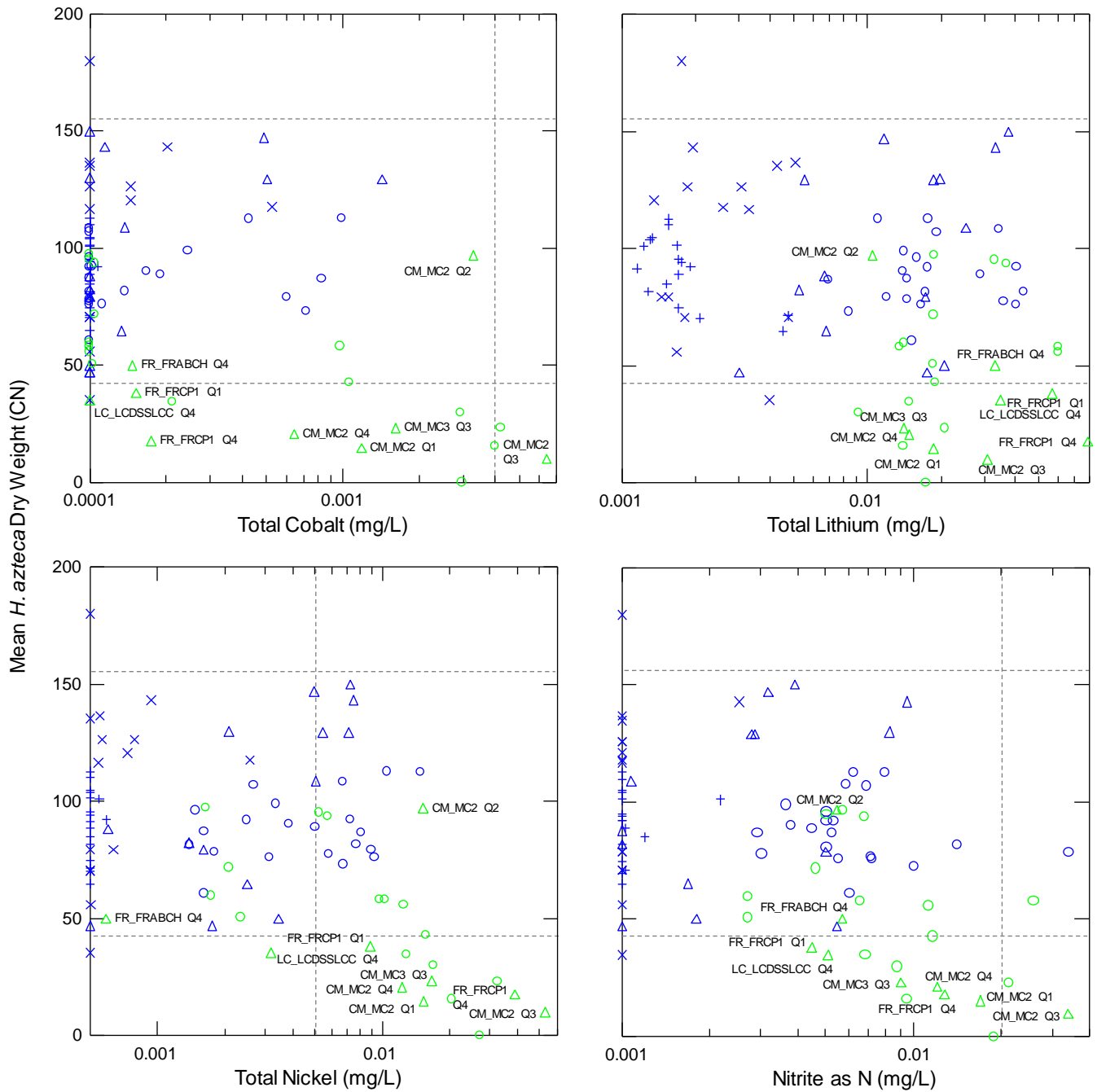
- **FR_FRABCH (Q4):** The strongest evidence for causation was observed for nitrate. Concentrations of alkalinity and nitrate were higher in this test than reference waters and test site waters categorized as no adverse response. The concentration of alkalinity in this test (239 mg/L) was higher than reference waters and test site waters with non-significant results, but this difference was small (6%), indicating that it is not likely contributing to toxicity. The nitrate concentration in this test (20 mg/L NO₃-N) was slightly higher than the 14-day EC₁₀ of 19 mg/L for *H. azteca* biomass in Fording River water (Teck 2014), indicating that nitrate may have contributed to the observed response in this test.
- **LC_LCDSSLCC (Q4):** No water quality constituent was identified as a potential cause of the observed responses in this test. Concentrations of all constituents in this test were equal to or lower than reference waters and test site waters categorized as no adverse response (Table D-3), and/or were lower than the chronic BC WQG (Appendix C).

Figure 3.4-17: Mean *H. azteca* dry weight versus dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



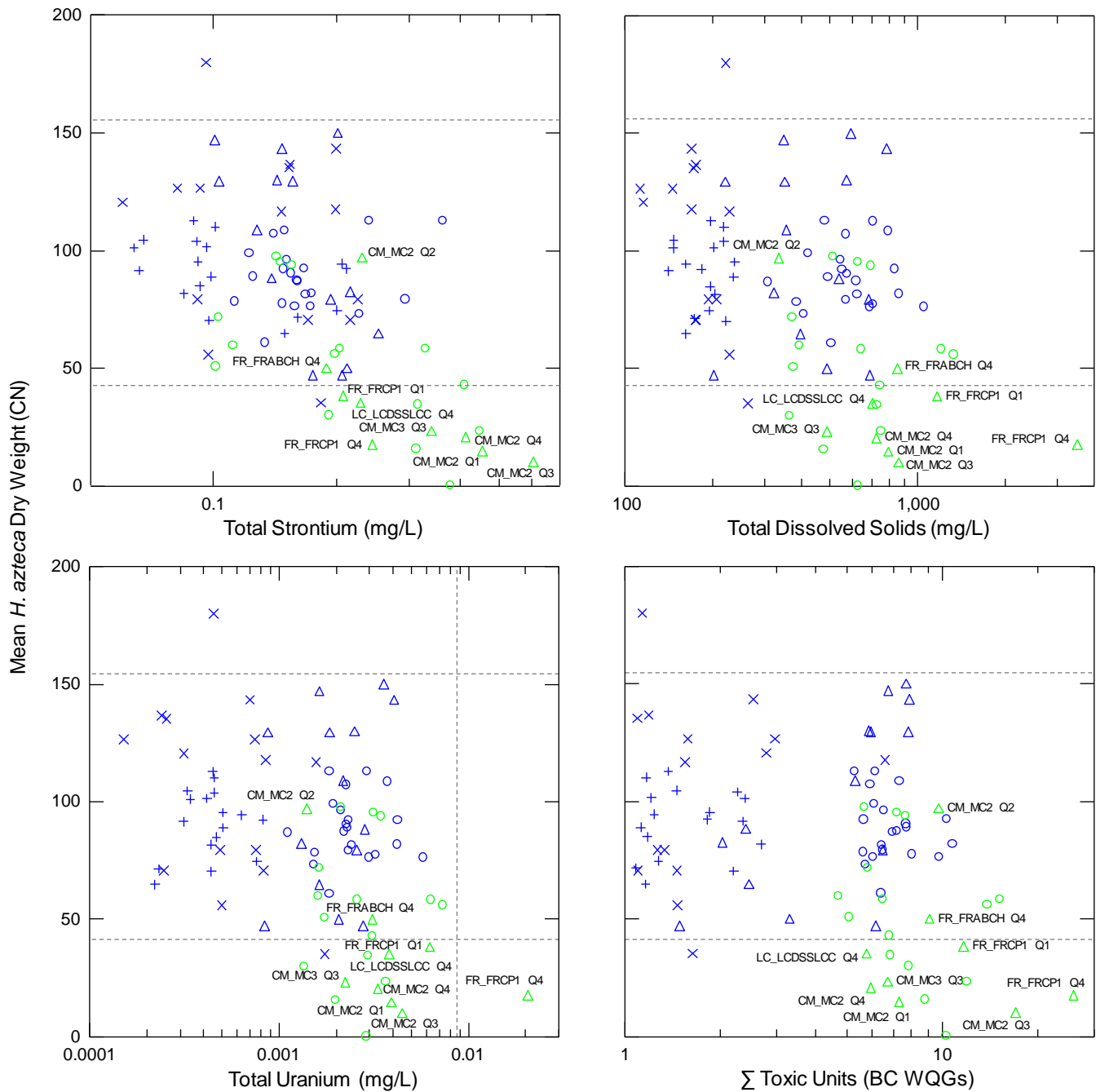
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are invertebrate level 1 benchmarks from EVWQP (hardness of 300 mg/L was used).

Figure 3.4-18: Mean *H. azteca* dry weight versus total cobalt (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right).



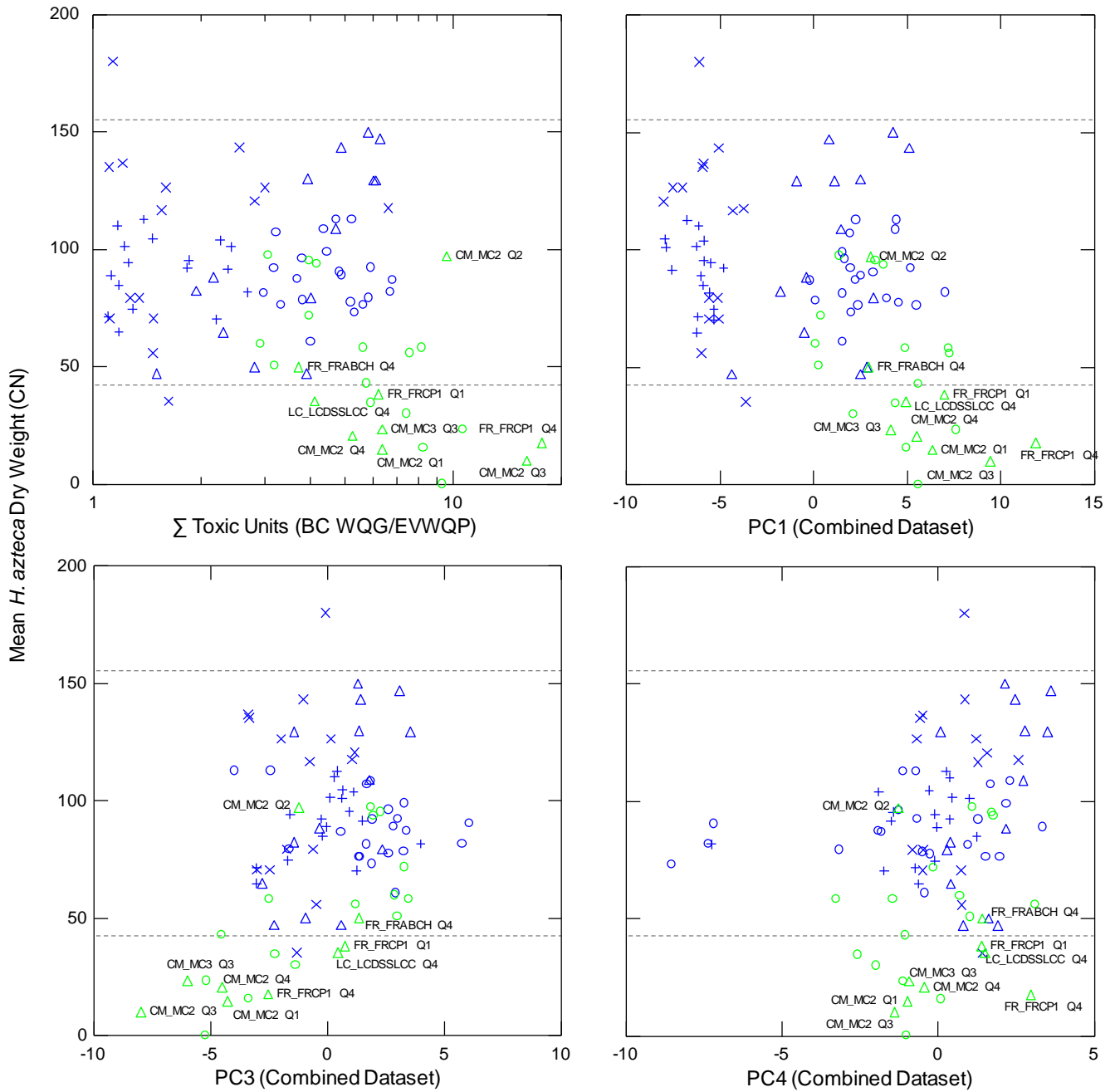
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-19: Mean *H. azteca* dry weight versus total strontium (top left), total dissolved solids (top right), total uranium (bottom left), and sum of toxic units calculated using BC WQGs only (bottom right).



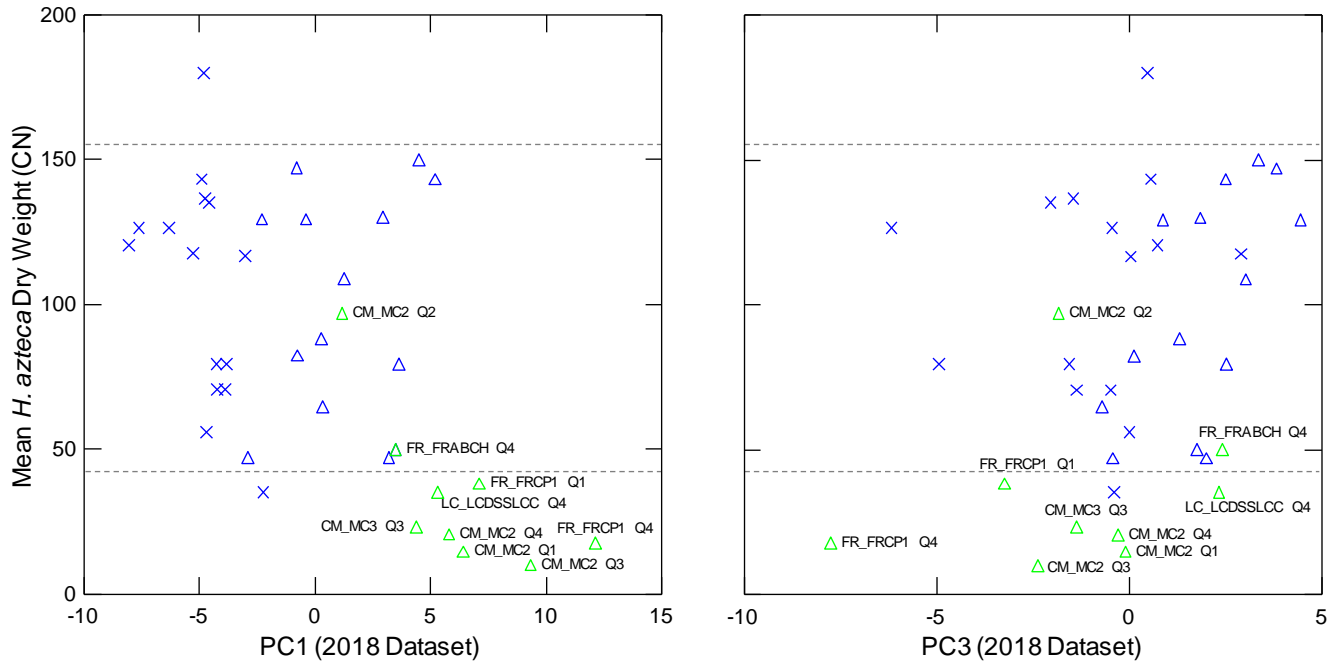
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-20: Mean *H. azteca* dry weight versus sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top left), PC1 for the combined dataset (top right), and PC3 for the combined dataset (bottom left), and PC4 for the combined dataset (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-21: Mean *H. azteca* dry weight versus PC1 for the 2018 dataset (left), PC3 for the 2018 dataset (right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

3.4.4 *Oncorhynchus mykiss* Survival, Viability, Length, and Weight

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium), along with five additional constituents for survival and viability (lithium, TDS, uranium, PC1, PC2) and four additional constituents for length and weight (PC2 [combined and 2018] and PC3 [combined for both and 2018 for weight only]), were all carried through to graphical analysis (Table F-4). Although bismuth, bromide, and tin had significant negative correlations, they were not included in graphical analysis because of low detection frequency²⁷.

The following PC scores had statistically significant Spearman rank correlations for one or more endpoints:

- **PC1 (combined and 2018 only datasets).** This component accounted for 30.1% of the variance for the combined dataset and 35.4% of the variance for the 2018 only dataset (Table E-4). For both datasets, PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, nickel, uranium).
- **PC2 (combined and 2018 only datasets).** This component accounted for 23.0% of the variance for the combined dataset and 25.0% of the variance for the 2018 only dataset (Table E-4). For both datasets, PC2 had strong positive loadings for DOC, TOC, TSS, turbidity, and several metals (e.g., aluminum, arsenic, iron, zinc).

²⁷ Of 23 samples, one had a detected concentration of bromide and zero had detected concentrations of bismuth and tin (Table D-5).

- **PC3 (combined and 2018 only datasets).** This component accounted for 9.0% of the variance for the combined dataset and 12.0% of the variance for the 2018 only dataset (Table E-4). For both datasets, PC3 had strong negative loadings for total tin and several dissolved metals (bismuth, lead, silver, thallium, vanadium).

Exposure-response plots for survival are plotted in Figure 3.4-22 to Figure 3.4-24, for viability are plotted in Figure 3.4-25 to Figure 3.4-27, for length are plotted in Figure 3.4-28 and Figure 3.4-29, and for weight are plotted in Figure 3.4-30 and Figure 3.4-31. None of the evaluated explanatory variables exhibited a consistent exposure-response relationship across all tests.

In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-4), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with nonsignificant results, and that were greater than a chronic BC WQG (when such exists), were:

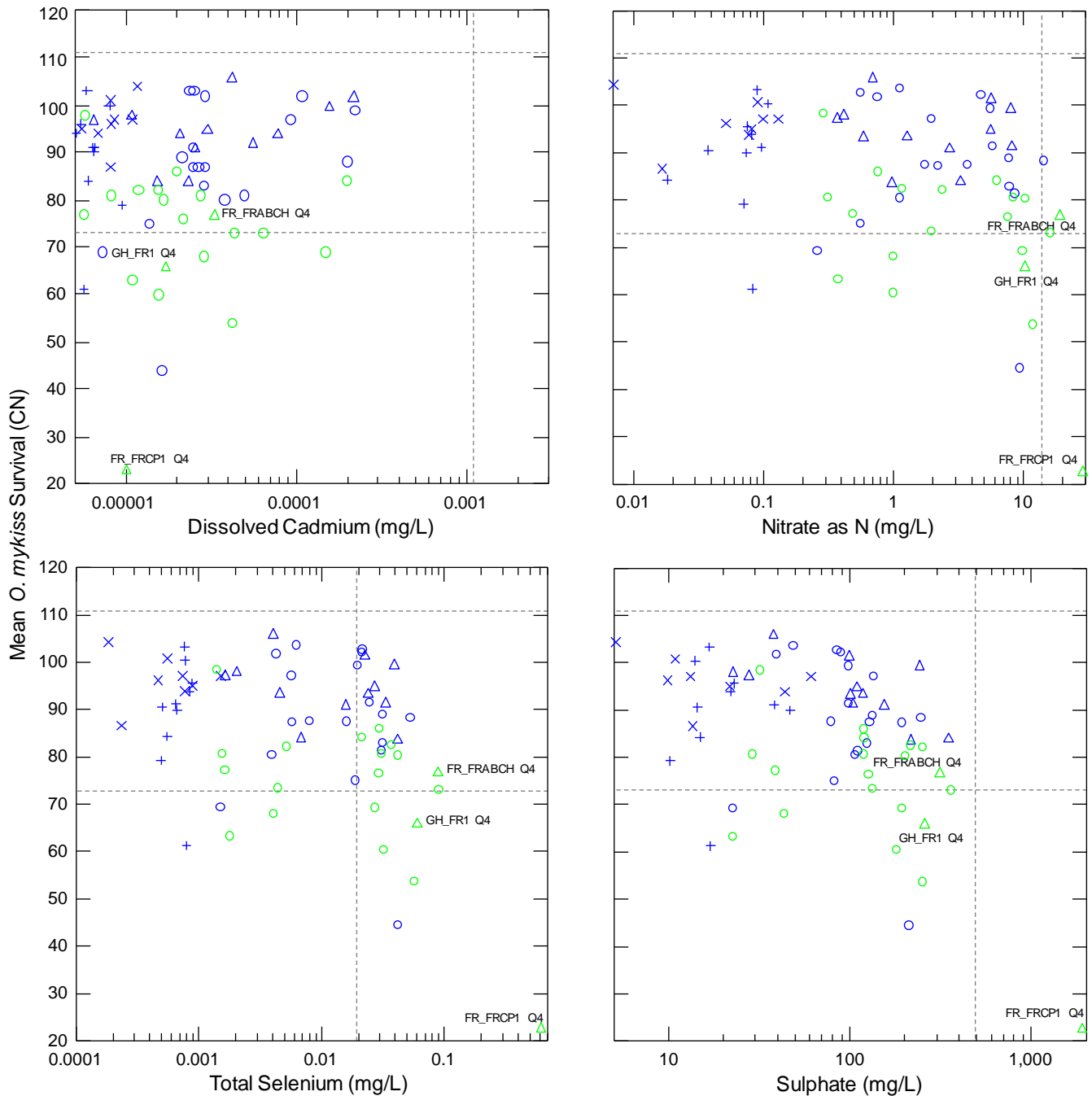
- **FR_FRCP1 (Q4):** The strongest evidence for causation was identified for major ions (i.e., components of TDS, including sulphate), although nitrate may have also contributed to the observed response. Concentrations of lithium, nickel, nitrate, selenium, sulphate, uranium, TDS, and several components related to TDS (e.g., calcium) were higher in this test than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks did not support a conclusion of causation for most constituents. Concentrations of sulphate (1,906 mg/L) and TDS (3,220 mg/L) in this test were greater than LC₅₀ values for Fording River water (sulphate LC₅₀ = 988 mg/L; TDS LC₅₀ = 1,555 mg/L) (Golder 2013), indicating that sulphate and TDS likely contributed to the adverse response in this test. The nitrate concentration in this test (29 mg/L NO₃-N) was approximately equal to the level 2 benchmark from the EVWQP (30 mg/L NO₃-N at hardness >500 mg/L as CaCO₃). The level 2 benchmark is associated with 20% effect on *O. mykiss* development, indicating that nitrate may have contributed to the observed response in this test. Other exposure constituents exhibited no strong evidence for potential causation:
 - The lithium concentration in this test (0.081 mg/L) was more than an order of magnitude lower than the reported no observed effect concentration of 1.1 mg/L (Emery et al. 1981), indicating that it is not likely contributing to toxicity.
 - The nickel concentration in this test (43 µg/L) was more than an order of magnitude lower than the effect concentration estimated by European Union (EU 2008) of 767 µg/L for pH of 8.1, DOC of 1 mg/L, and hardness of 320 mg/L (i.e., conditions that would result in similar toxicity [pH and DOC] or higher toxicity [hardness] relative to FR_FRCP1 conditions), indicating that it is not likely contributing to toxicity to trout.
 - The selenium concentration in this test (610 µg/L) was higher than the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013), so it cannot be ruled out that selenium may have contributed to the observed response in this test.
 - The uranium concentration in this test (22 µg/L) was more than an order of magnitude lower than the reported EC₁₀ of 350 µg/L (CCME 2011), indicating that it is not likely contributing to toxicity.

In addition to the constituents discussed above, the Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the Σ TU values for these tests were largely driven by the hazard quotients for nickel and nitrate. For example, in the Σ TUs calculated using BC WQGs (except for nickel, for which 5 µg/L was used [Section 2.3.4]) and EVWQP benchmarks, the

hazard quotient for nickel and nitrate accounted for 69% (WQGs only) or 58% (WQGs and benchmarks) of the Σ TU value. These results indicate that the relationship between Σ TU and observed responses in this test is largely driven by nickel and nitrate, which does not align with the identification of sulphate and TDS as the likely contributors of observed effects. It is unknown whether the observed response was related to major ions alone, or whether additional constituents (e.g., nitrate) also contributed.

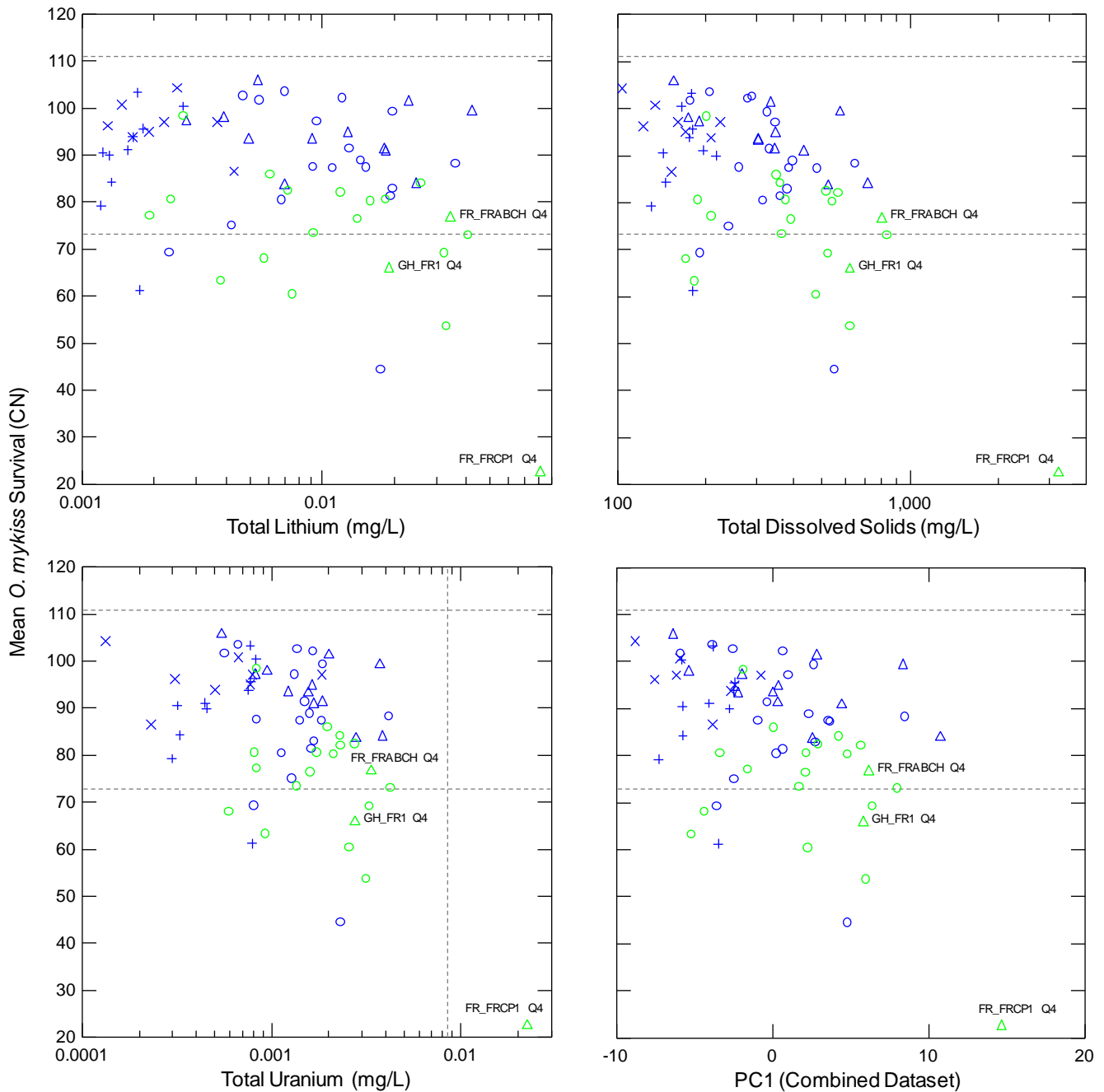
- **FR_FRABCH (Q4):** Overall, no water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of nitrate, selenium, TDS, and several components related to TDS (e.g., calcium) were higher in this test than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks did not support a conclusion of causation. The concentration of nitrate in this test (19 mg/L NO₃-N) was less than the level 1 benchmark from the EVWQP (22 mg/L NO₃-N at hardness >500 mg/L as CaCO₃), indicating that it is not likely contributing to toxicity. Concentrations of selenium (89 µg/L) and TDS (800 mg/L) in this test were lower than the effect concentrations reported in the Golder (2013) mixture toxicity study in Fording River water (selenium no observed effect concentration >139 µg/L; TDS = 923 mg/L), indicating that these constituents are not likely contributing to toxicity.
- **GH_FR1 (Q4):** No water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of all constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-4), and/or were lower than the chronic BC WQG (Appendix C).

Figure 3.4-22: Mean *O. mykiss* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



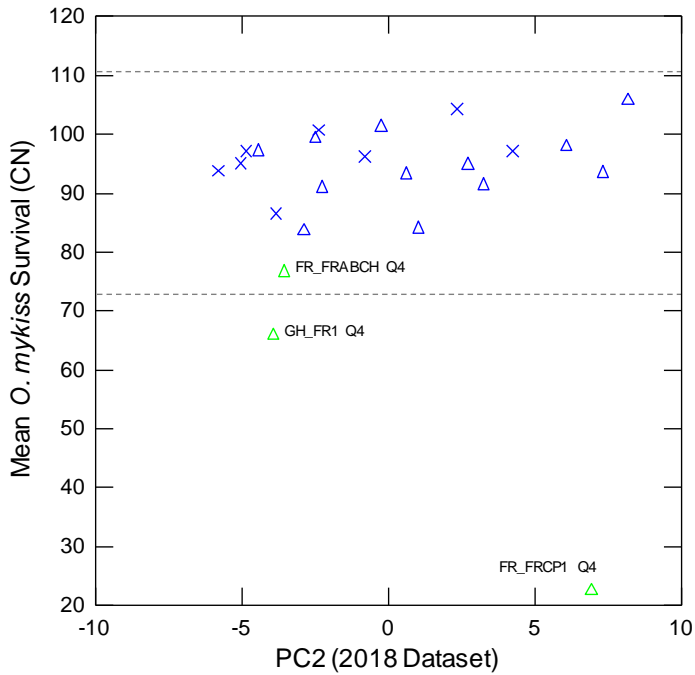
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-23: Mean *O. mykiss* survival versus concentrations of total lithium (top left), total dissolved solids (top right), total uranium (bottom left), and PC1 (bottom right).



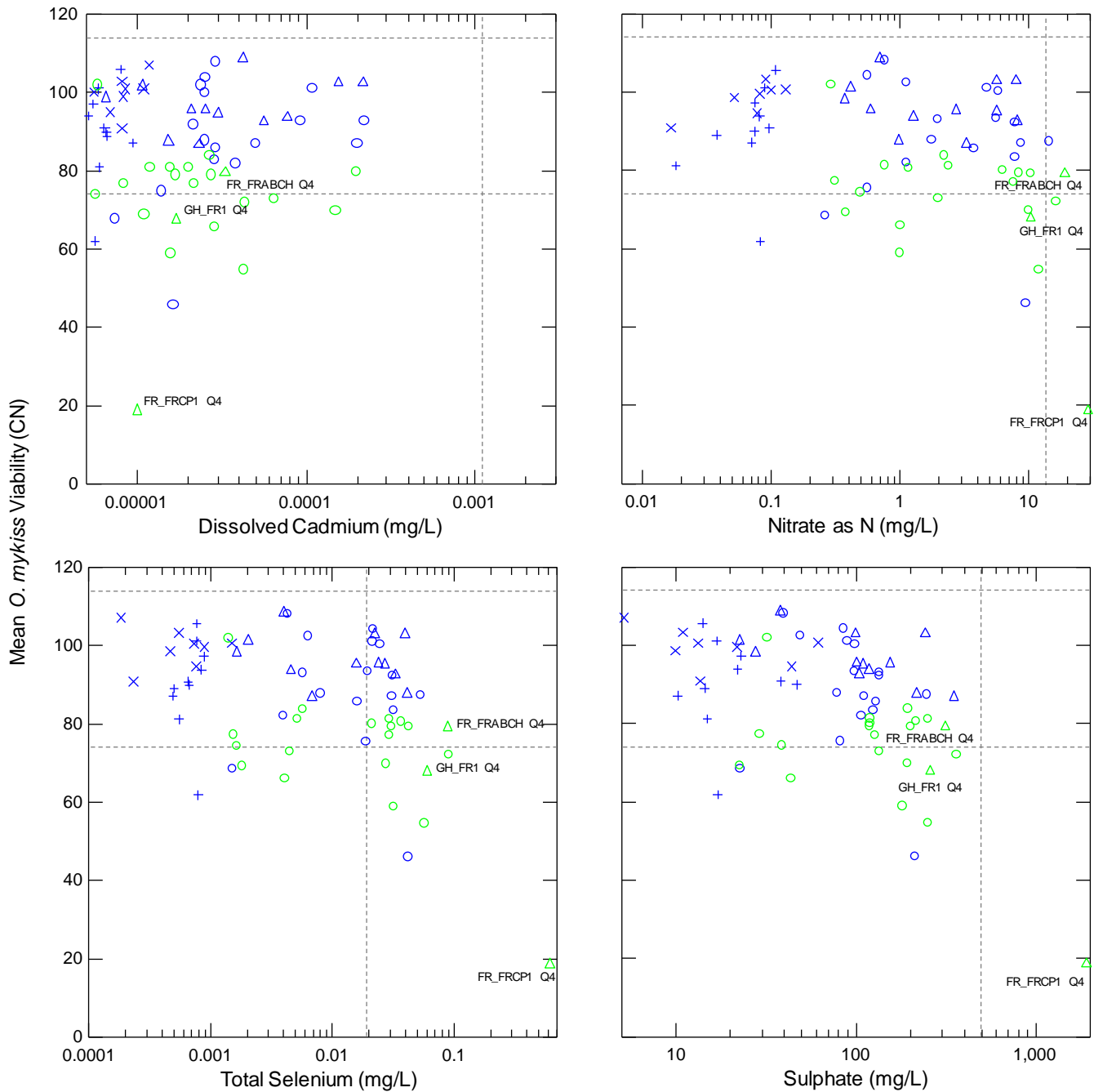
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs.

Figure 3.4-24: Mean *O. mykiss* survival versus PC2 for the 2018 dataset.



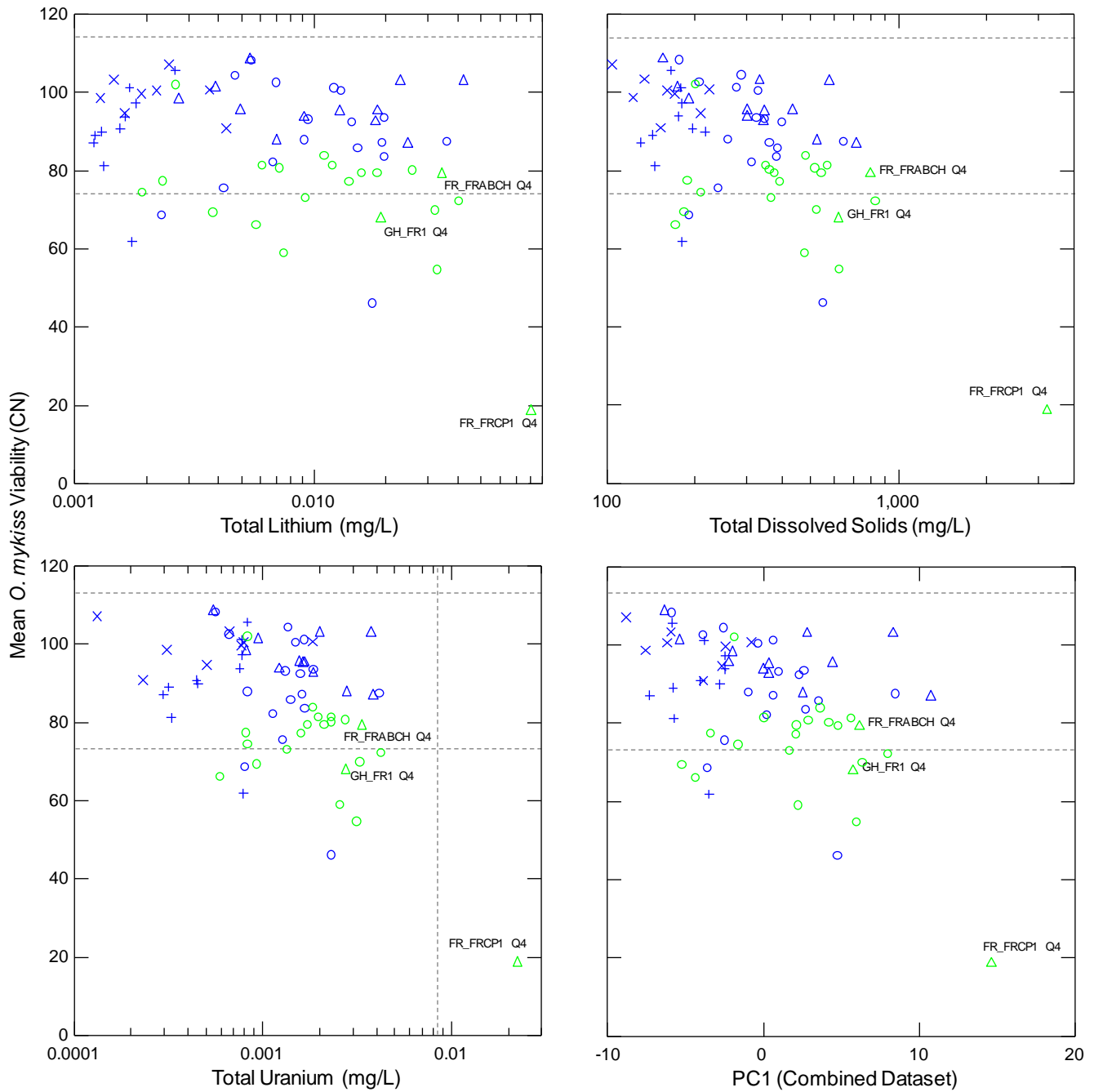
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-25: Mean *O. mykiss* viability versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



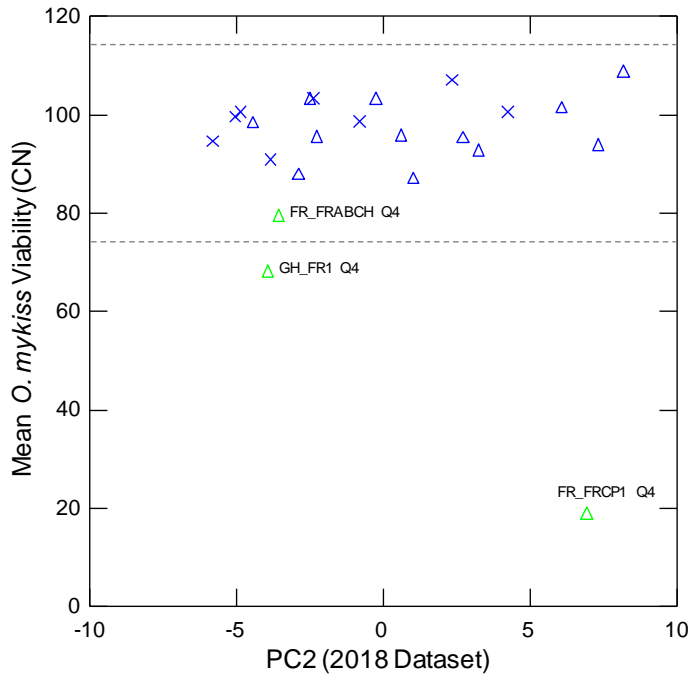
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-26: Mean *O. mykiss* viability versus concentrations of total lithium (top left), total dissolved solids (top right), total uranium (bottom left), and PC1 (bottom right).



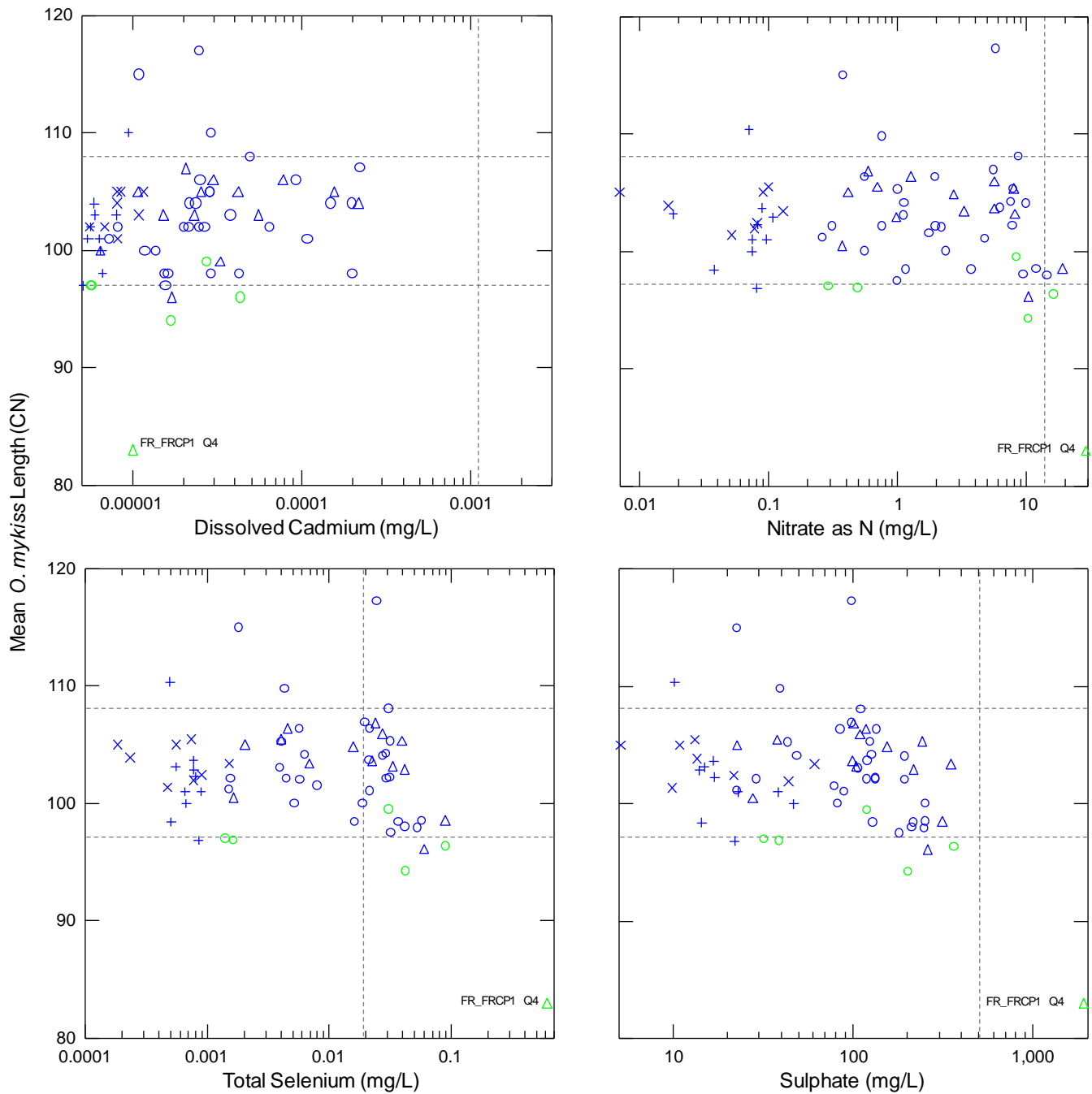
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs.

Figure 3.4-27: Mean *O. mykiss* viability versus PC2 for the 2018 dataset.



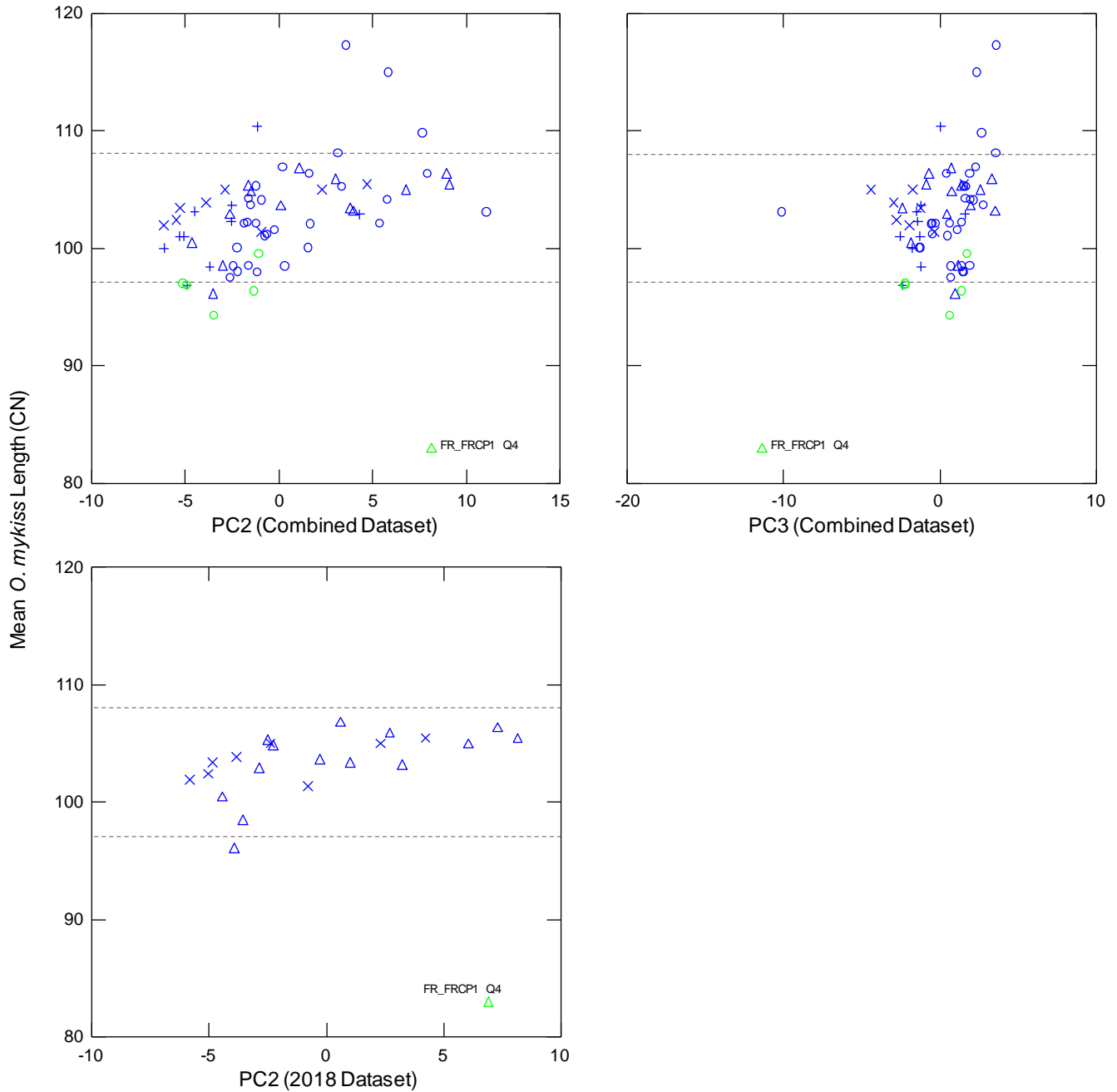
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-28: Mean *O. mykiss* length versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



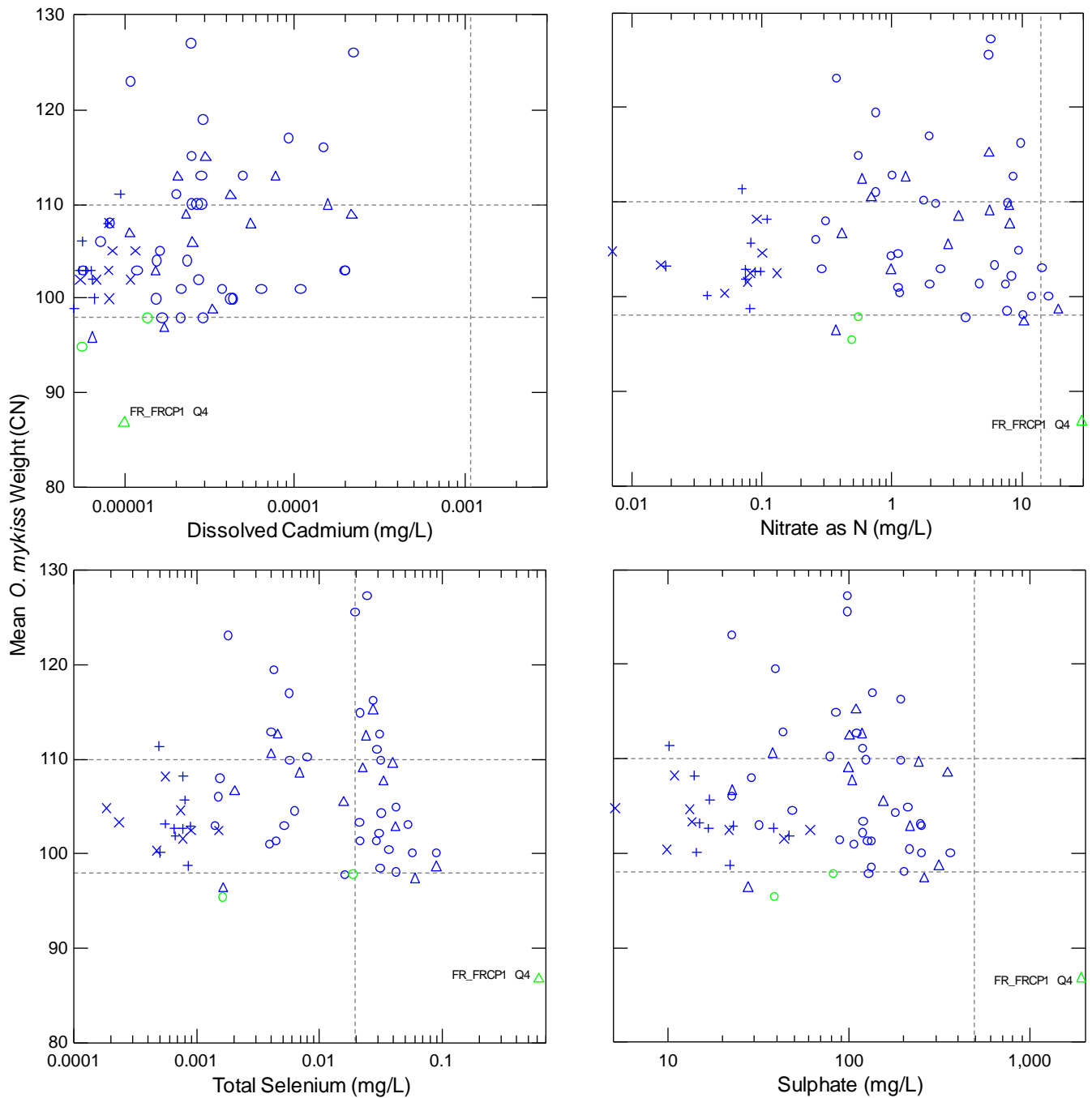
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-29: Mean *O. mykiss* length versus PC1 (top left), PC2 (top right), and PC2 for the 2018 dataset (bottom left).



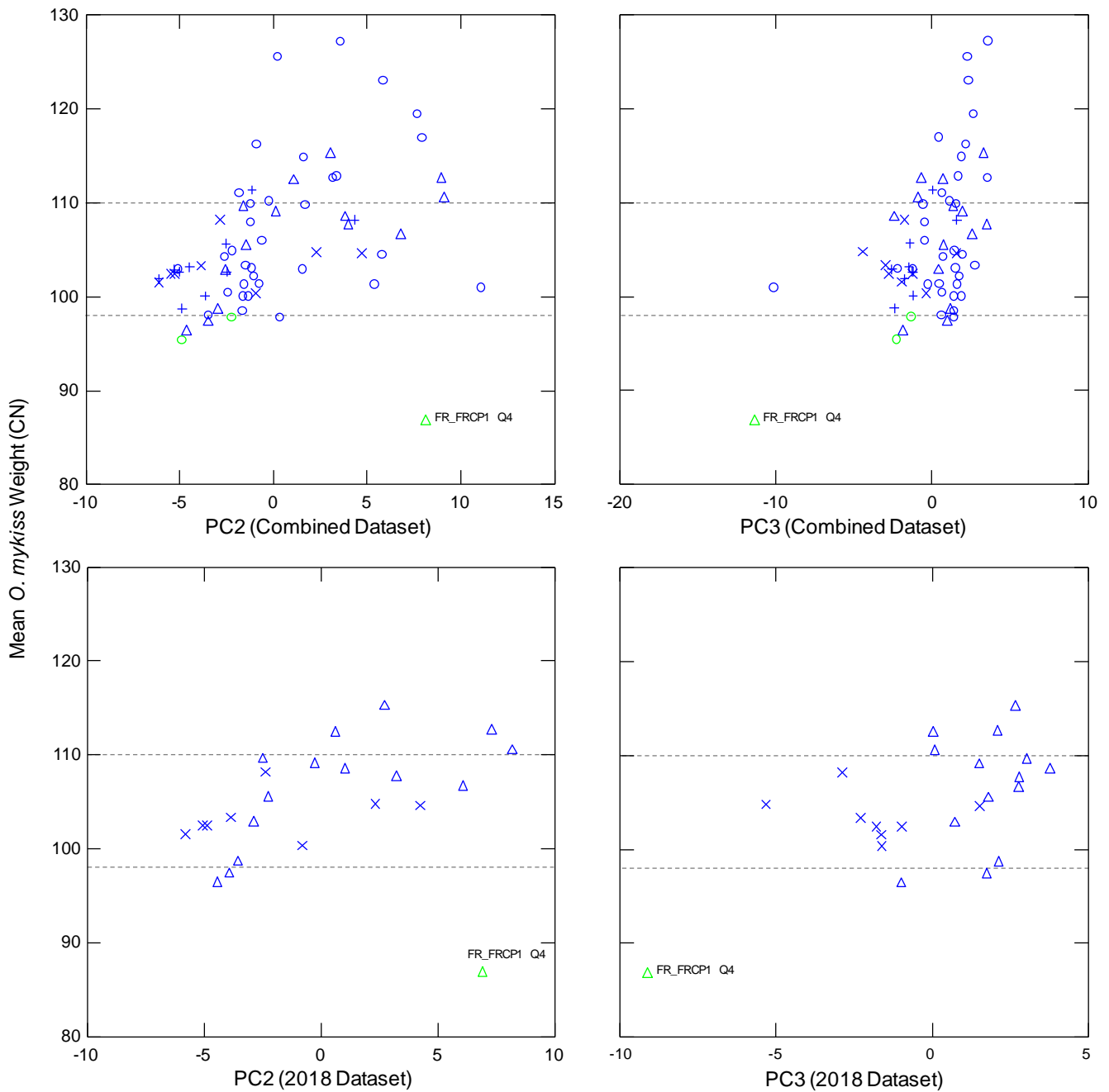
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

Figure 3.4-30: Mean *O. mykiss* weight versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-31: Mean *O. mykiss* length versus PC1 (top left), PC2 (top right), and PC2 for the 2018 dataset (bottom left), and PC3 for the 2018 dataset (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

3.4.5 *Pimephales promelas* Survival, Biomass, and Length

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium), along with 12 additional constituents²⁸ for survival and three additional constituents for biomass (PC1, PC3, and PC4 [combined dataset]) with statistically significant Spearman rank correlations that did not screen out when compared to water quality guidelines, were all carried through to graphical analysis (Table F-5). Although bismuth, bromide, and tin had significant negative correlations, they were not included in graphical analysis because of low detection frequency²⁹.

The following PC scores had statistically significant Spearman rank correlations for survival and/or length:

- **PC1 (combined dataset).** This component accounted for 34.8% of the variance (Table E-5). PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (dissolved cadmium, sulphate, nitrate, selenium), and several metals (e.g., lithium, nickel, uranium).
- **PC2 (combined dataset).** This component accounted for 19.7% of the variance (Table E-5). PC2 had strong positive loadings for DOC, TOC, TSS, turbidity, and several metals (e.g., aluminum, arsenic, iron, zinc).
- **PC3 (combined dataset).** This component accounted for 12.1% of the variance (Table E-5). PC3 had strong negative loadings for total bismuth and several dissolved metals (bismuth, chromium, silver, lead, vanadium).
- **PC4 (combined dataset).** This component accounted for 8.6% of the variance (Table E-5). PC3 had strong negative loadings boron and cobalt.
- **PC1 (2018 only dataset).** This component accounted for 35.8% of the variance (Table E-5). Similar to the combined dataset, PC1 for the 2018 dataset had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP constituents (sulphate, nitrate, selenium), and several metals (e.g., lithium, nickel, uranium).

Concentration-response plots for survival are plotted in Figure 3.4-32 to Figure 3.4-35, for biomass are plotted in Figure 3.4-36, and for length are plotted in Figure 3.4-37 and Figure 3.4-38. None of the evaluated explanatory variables exhibited a consistent exposure-response relationship across all tests.

In tests categorized as having a possible or likely adverse response, concentrations of most constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-5), and/or were lower than the chronic BC WQG (Appendix C). Such constituents are not expected to contribute to toxicity in these tests. Constituents that were greater than concentrations in reference waters and/or test site waters with nonsignificant results, and that were greater than a chronic BC WQG (when such exists), were:

- **FR_FRCP1 (Q4):** The strongest evidence for causation was observed for major ions (i.e., components of TDS, including sulphate). Concentrations of lithium, nickel, nitrate, selenium, sulphate, uranium, TDS, and several components related to TDS (e.g., calcium) were higher in this test than reference waters and test site waters categorized as no adverse response, but comparisons to toxicity benchmarks did not support a

²⁸ The 12 constituents were total lithium, total nickel, nitrite, total strontium, TDS, TKN, total uranium, Σ TUs (calculated using WQGs only and WQGs and EVWQP benchmarks), PC1 scores (combined dataset and 2018 dataset), and PC2 score (combined dataset only).

²⁹ Of 23 samples, one had a detected concentration of bromide and zero had detected concentrations of bismuth and tin (Table D-5).

conclusion of causation for most constituents. Concentrations of sulphate (1,896 mg/L) and TDS (3,272 mg/L) in this test were higher than the maximum concentration tested in the Fall 2016 sulphate testing that resulted in no adverse effects (1,248 mg/L sulphate; ~2,000 mg/L TDS) (Golder 2018b), so effects could not be evaluated using site-specific testing. In comparison to literature values, the concentration of sulphate in this test (1,896 mg/L) is between the 7-day growth IC_{10} (1,323 mg/L) and IC_{25} (3,463 mg/L) (Elphick et al. 2011; test hardness of 320 mg/L as $CaCO_3$), indicating that sulphate may have contributed to the observed sublethal responses in this test. With respect to survival, the sulphate concentration in this test (1,896 mg/L) was below the 7-day LC_{10} of 2,451 mg/L (Elphick et al. 2011; test hardness of 320 mg/L as $CaCO_3$). Because of the shorter test duration used in Elphick et al. (2011) (7 days versus 32 days), sulphate-related effects could not be deduced. Overall, sulphate and TDS could not be ruled as contributing to observed responses on survival. Other exposure constituents exhibited no strong evidence for potential causation:

- The lithium concentration in this test (0.079 mg/L) was lower than the reported IC_{25} of 0.38 mg/L for *P. promelas* (Kszos et al. 2003)³⁰, indicating that it is not likely contributing to toxicity.
- The nickel concentration in this test (42 µg/L) was lower than the NOEC of 57 µg/L (EU 2008)³¹, indicating that it is not likely contributing to toxicity.
- The nitrate concentration in this test (29 mg/L as N) was approximately two times lower than the 32-d EC_{10} of 55.5 mg/L (US EPA 2010), indicating that it is not likely contributing to toxicity.
- The selenium concentration in this test (620 µg/L) was higher than published toxicity data for direct effects to *P. promelas* and higher the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects to *O. mykiss* (149 µg/L) (Golder 2013), so it cannot be ruled out that selenium may have contributed to the observed response in this test.
- The uranium concentration in this test (22 µg/L) was lower than the 7-day IC_{10} of 1,040 µg/L (CCME 2011), indicating that it is not likely contributing to toxicity. There is uncertainty in this comparison because the test conducted herein (32 days) was approximately four times longer than the test used to derive the IC_{10} (7 days). This uncertainty is partially offset by the magnitude difference between the test concentration and the IC_{10} . Overall, uranium is not expected to have contributed to the observed response.

In addition to the constituents discussed above, the Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the Σ TU values for these tests were largely driven by the hazard quotients for nickel and nitrate. For example, in the Σ TUs calculated using BC WQGs (except for nickel, for which 5 µg/L was used [Section 2.3.4]) and EVWQP benchmarks, the hazard quotient for nickel and nitrate accounted for 69% (WQGs only) or 58% (WQGs and benchmarks) of the Σ TU value. These results indicate that the relationship between Σ TU and reduced survival in this test is largely driven by nickel and nitrate, which were identified above as unlikely causes of adverse effects. If the hazard quotient for these constituents were excluded from the calculation, then the Σ TUs for these tests would be within the range observed in reference waters and test sites categorized as no adverse response.

³⁰ Sodium has been shown to ameliorate lithium toxicity (Kszos et al. 2003). The sodium concentrations in the Q4 FR_FRCP1 test (2.2 mg/L) was similar to conditions in which the IC_{25} was derived (2.8 mg/L), making the effect concentration from Kszos et al. (2003) relevant to the FR_FRCP1 test.

³¹ Hardness has been shown to ameliorate nickel toxicity (EU 2008). Hardness in the Q3 CM_MC2 test (628 mg/L) was higher than conditions in which the NOEC was reported (103 mg/L), making the effect concentration additionally protective.

This analysis indicates that mixture-related effects (as evaluated by Σ TUs) is unlikely to explain the observed response.

- **CM_MC2 (Q3):** Overall, no water quality constituent was identified as a potential cause of the observed response in this test. Concentrations of cobalt, nickel, nitrite, and strontium were higher in these tests than reference waters and test site waters categorized as no adverse response. The cobalt concentration in this test (7.2 μ g/L) was lower than the reported EC₁₀ of 339 μ g/L (Environment Canada 2017)³², indicating that it is not likely contributing to toxicity. The nickel concentration in this test (56 μ g/L) was approximately equal to the NOEC of 57 μ g/L (EU 2008)³³, indicating that it is not likely contributing to toxicity. The nitrite concentration in this test (0.036 mg/L as N) was more than an order of magnitude lower than the NOEC (6.8 mg/L), indicating that it is not likely contributing to toxicity. The strontium concentration in this test (0.63 mg/L) was more than an order of magnitude lower than the chronic effects benchmark derived to protect freshwater aquatic life (10.7 mg/L; MacPherson et al. 2014), indicating that it is likely not contributing to toxicity.

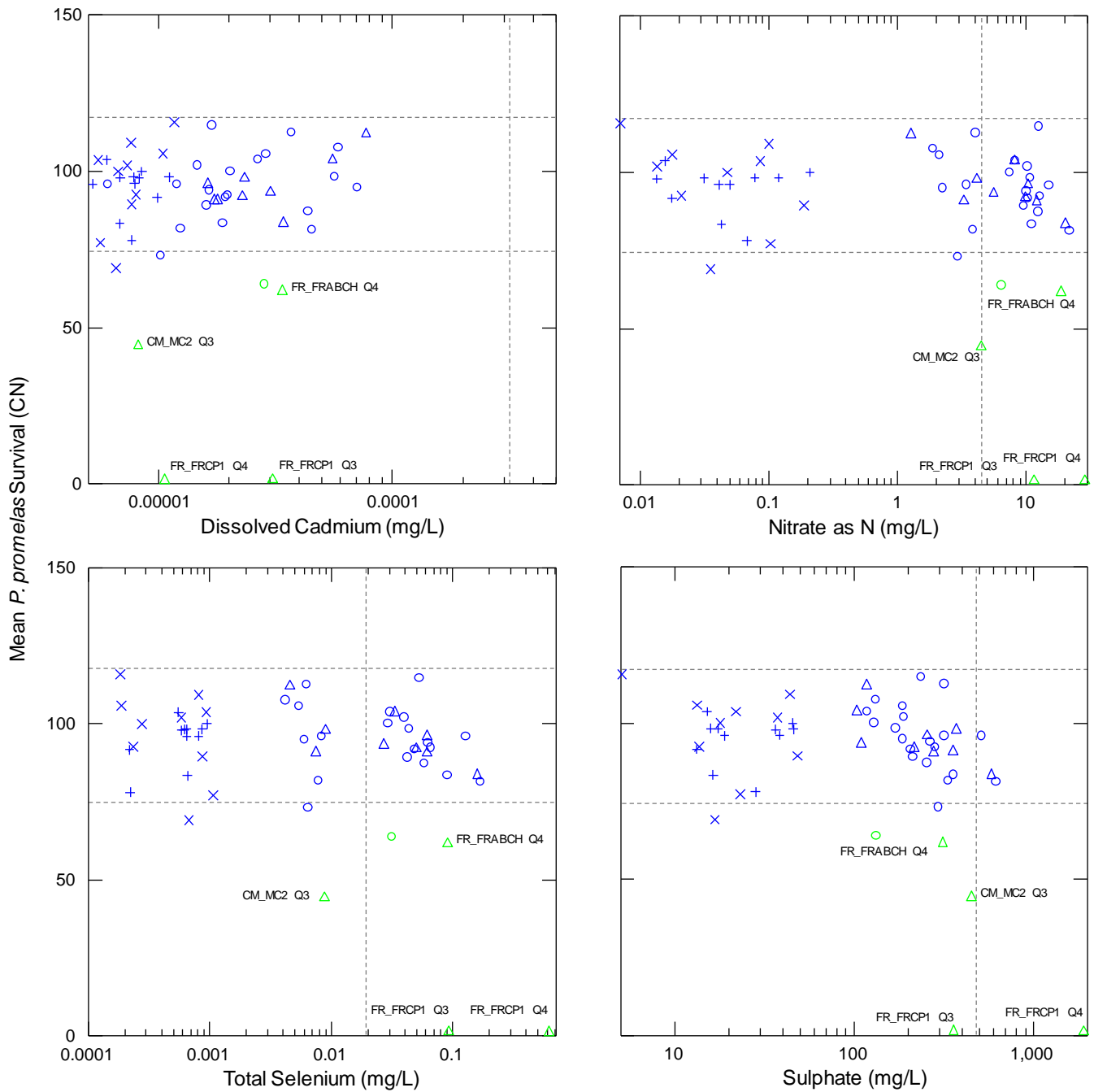
In addition to the constituents discussed above, the Σ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the Σ TU values for these tests were largely driven by the hazard quotient for nickel. For example, in the Σ TUs calculated using BC WQGs (except for nickel, for which 5 μ g/L was used [Section 2.3.4]) and EVWQP benchmarks, the hazard quotient for nickel accounted for between 62% and 66% of the Σ TU value. These results indicate that the relationship between Σ TU and reduced survival in this test is largely driven by nickel, which was identified above as an unlikely cause of adverse effects. If the hazard quotient for nickel were excluded from the calculation, then the Σ TUs for these tests would be within the range observed in reference waters and test sites categorized as no adverse response. This analysis indicates that mixture-related effects (as evaluated by Σ TUs) is unlikely to explain the observed response.

- **FR_FRCP1 (Q3):** No water quality constituent was identified as a potential cause of the observed responses in this test. Concentrations of all constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-5), and/or were lower than the chronic BC WQG (Appendix C).
- **FR_FRABCH (Q4):** No water quality constituent was identified as a potential cause of the observed responses in these tests. Concentrations of all constituents were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-5), and/or were lower than the chronic BC WQG or EVWQP benchmarks, except nitrate (Appendix C). The nitrate concentration in this test (19 mg/L as N) was lower than the 32-d EC₁₀ of 55.5 mg/L (US EPA 2010), indicating that it is not likely contributing to toxicity.

³² Hardness has been shown to ameliorate cobalt toxicity (Environment Canada 2018). Hardness in the Q3 CM_MC2 test (628 mg/L) was higher than conditions in which the LC₁₀ was reported (100 mg/L), making the effect concentration additionally protective.

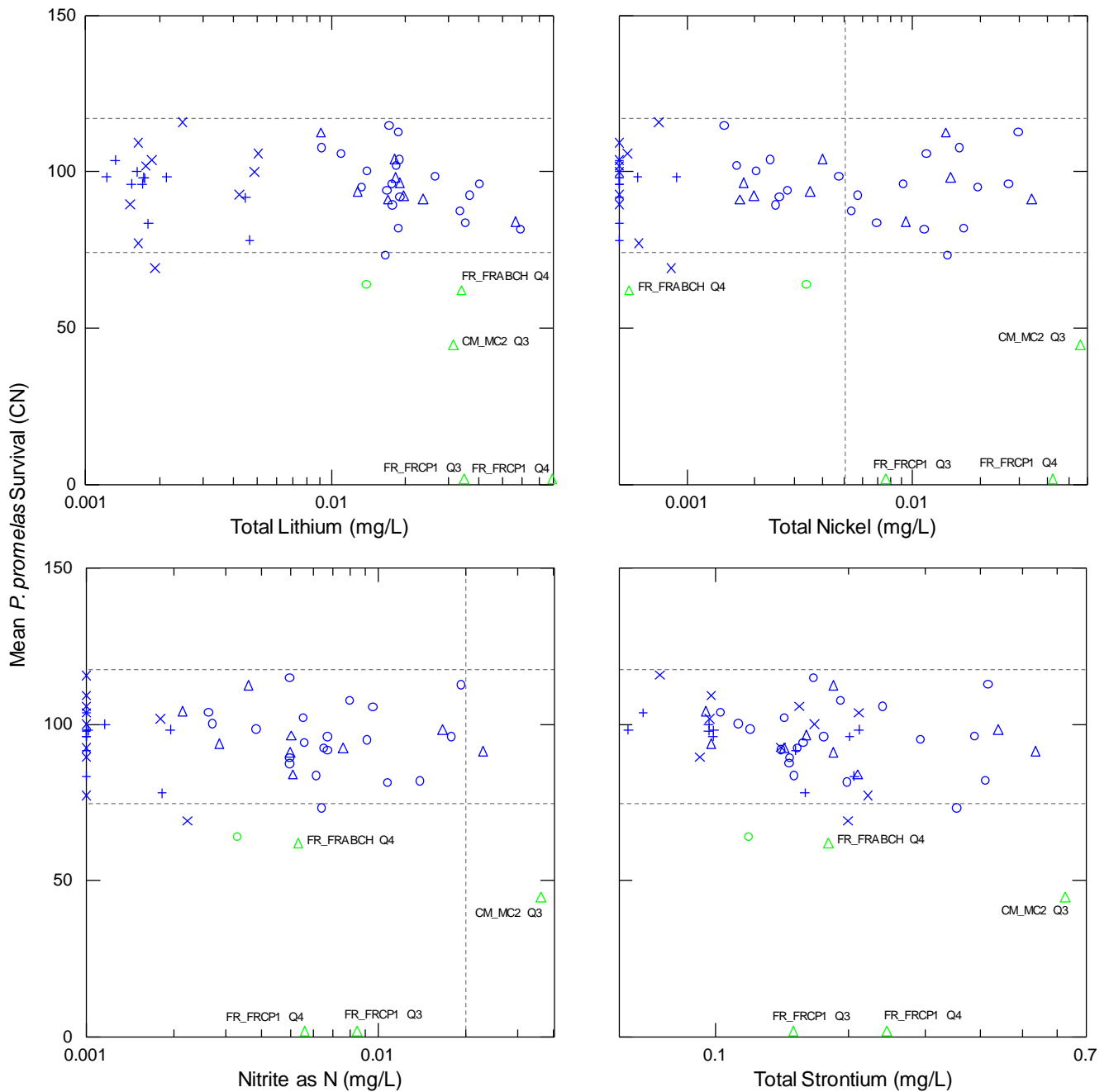
³³ Hardness has been shown to ameliorate nickel toxicity (EU 2008). Hardness in the Q3 CM_MC2 test (628 mg/L) was higher than conditions in which the NOEC was reported (103 mg/L), making the effect concentration additionally protective.

Figure 3.4-32: Mean *P. promelas* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



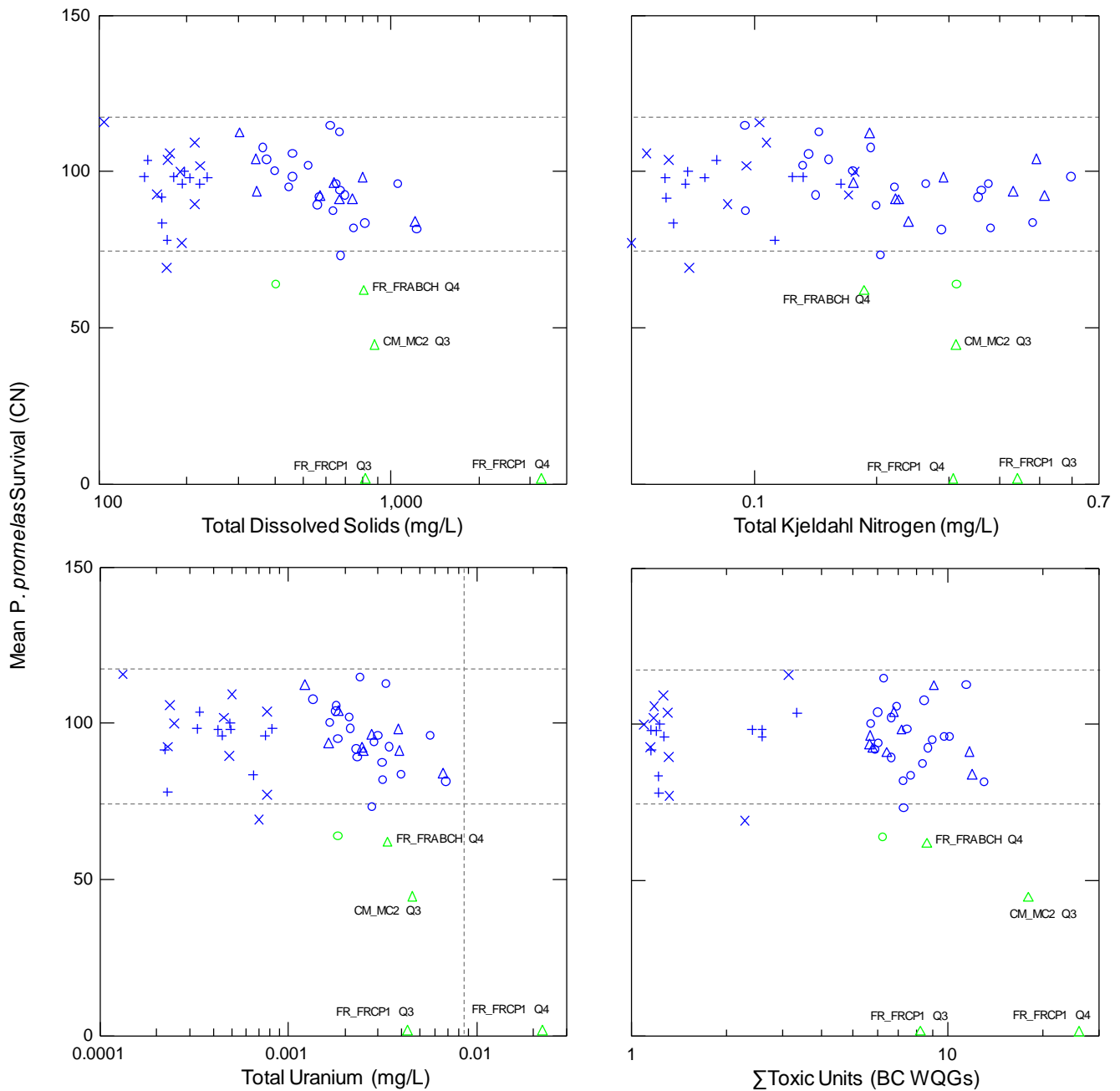
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-33: Mean *P. promelas* survival versus concentrations of total lithium (top left), total nickel (top right), nitrite (bottom left), and total strontium (bottom right).



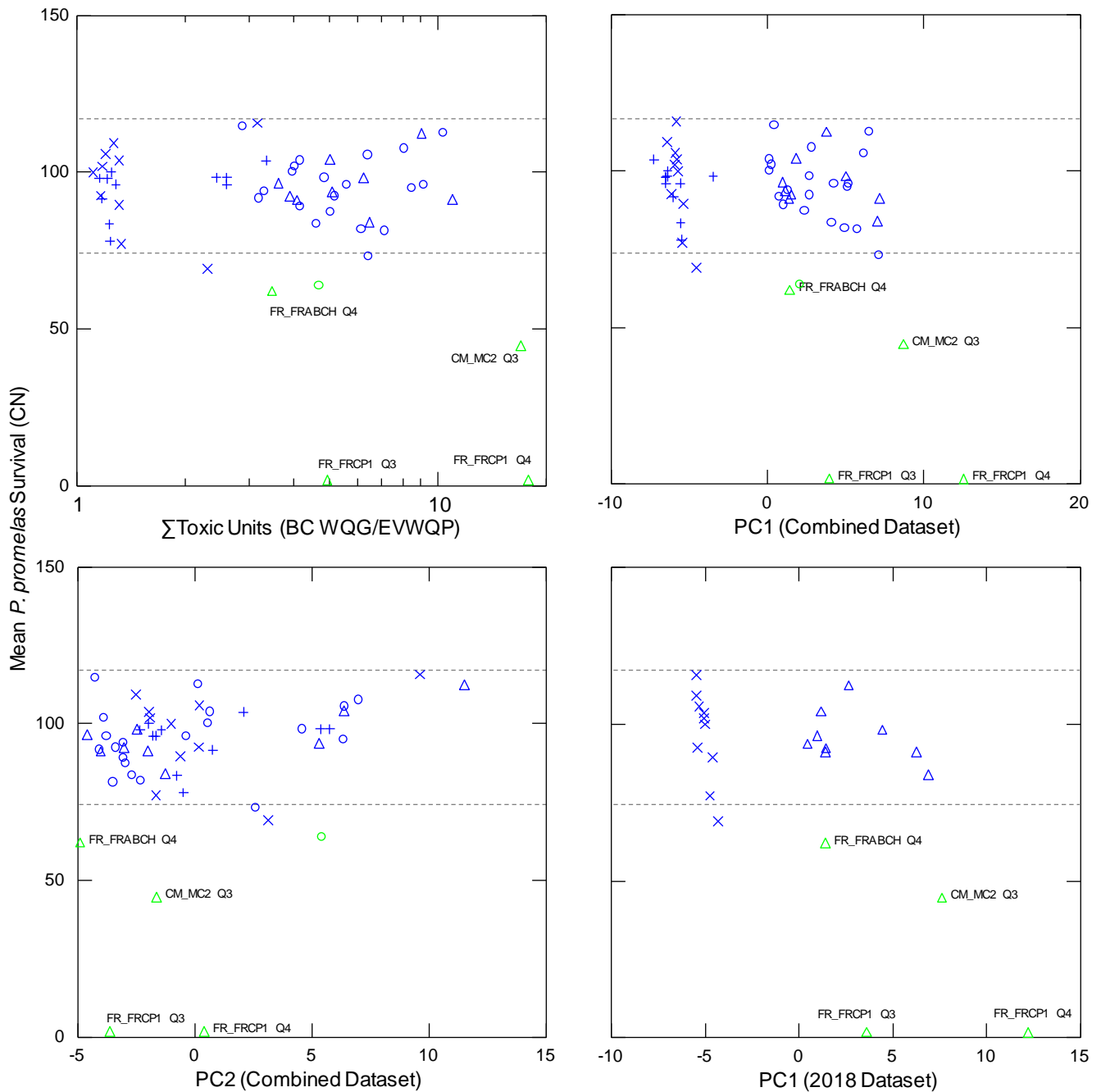
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs or interim screening value for nickel (see Section 2.3.4).

Figure 3.4-34: Mean *P. promelas* survival versus concentrations of total dissolved solids (top left), total Kjeldahl nitrogen (top right), total uranium (bottom left), and sum of toxic units calculated using BC WQGs only (bottom right).



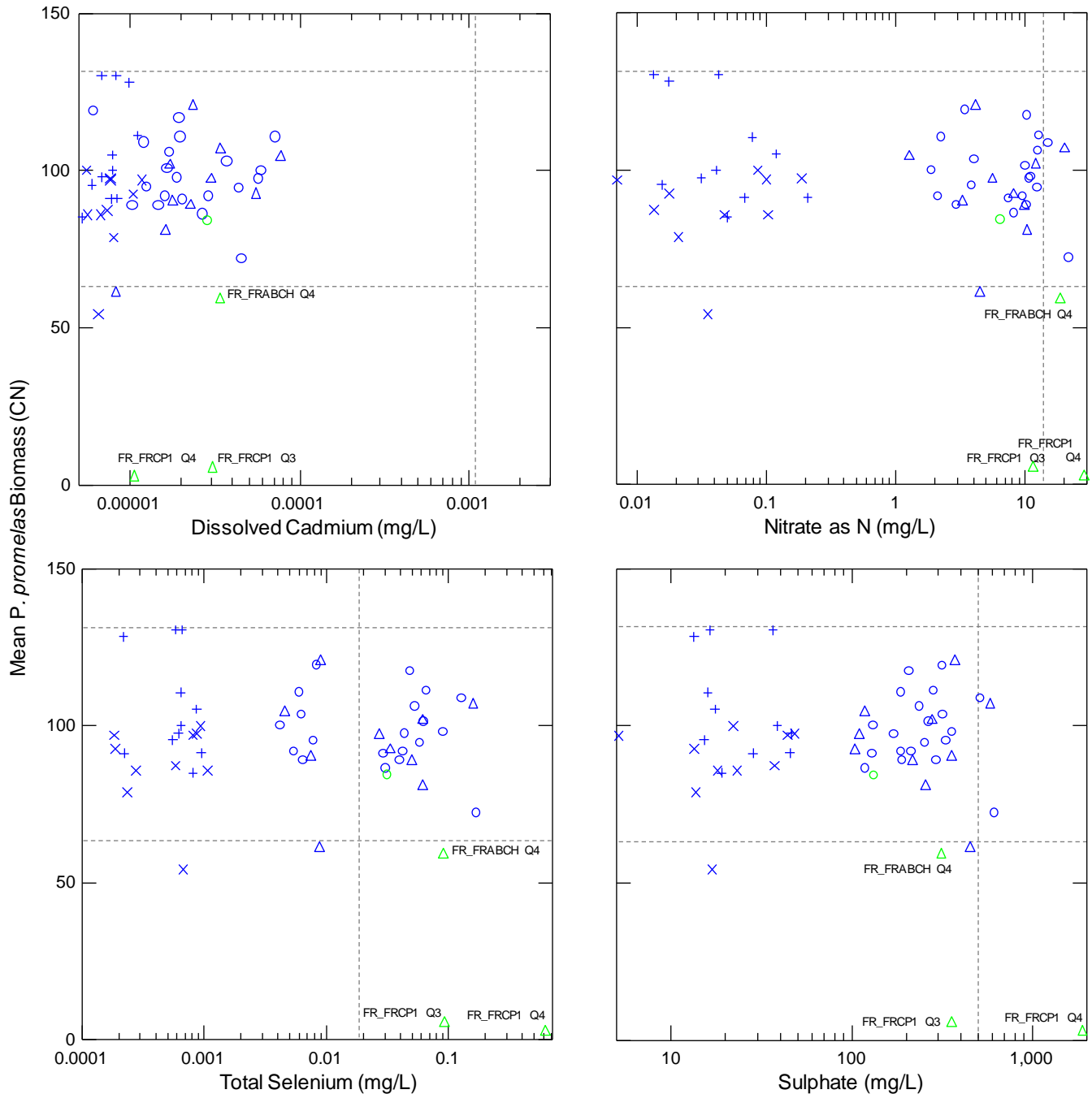
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs.

Figure 3.4-35: Mean *P. promelas* survival versus sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top left), PC1 (top right), PC2 (bottom left), and PC1 for the 2018 dataset (bottom right).



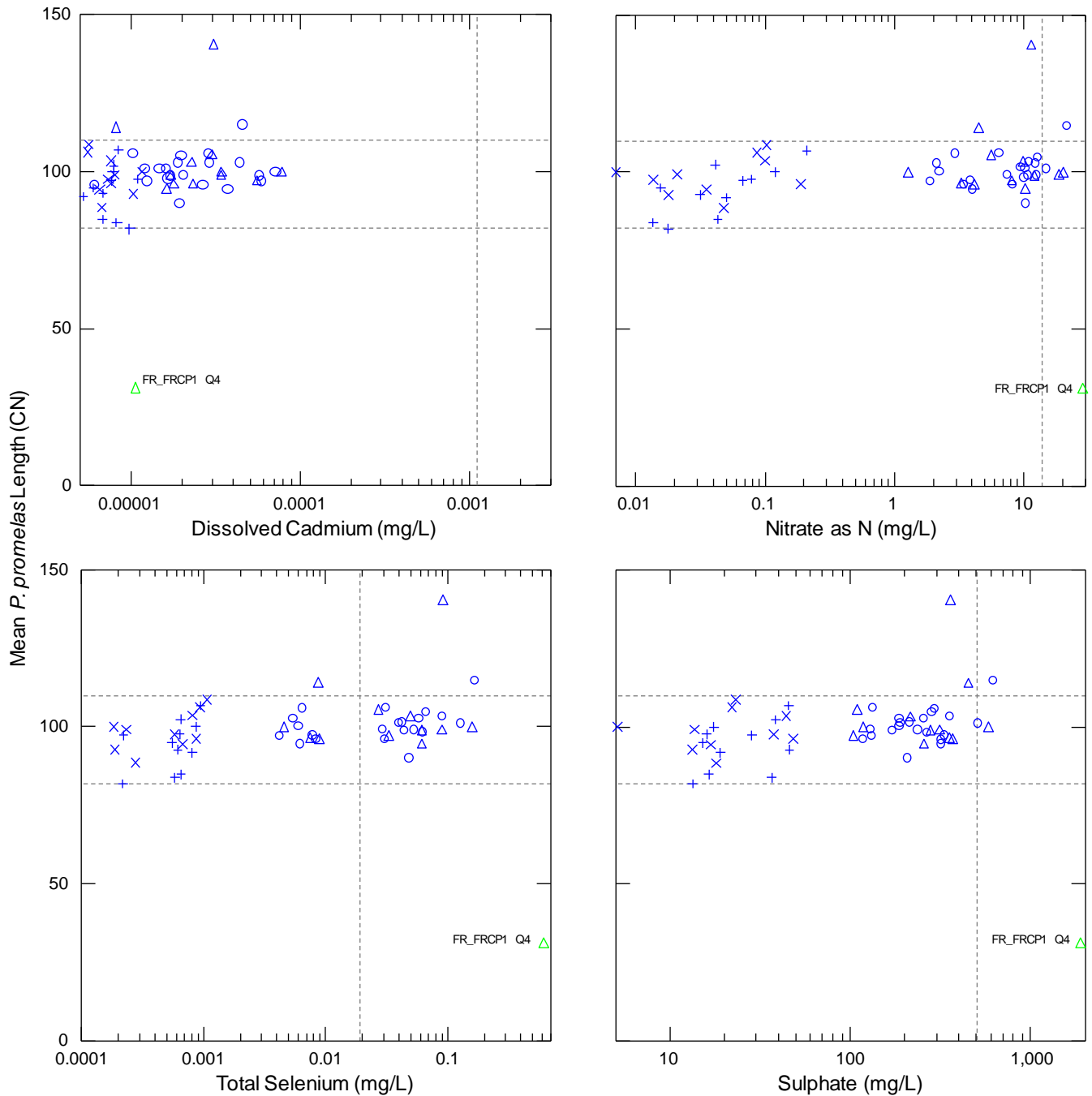
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are BC WQGs.

Figure 3.4-36: Mean *P. promelas* biomass versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



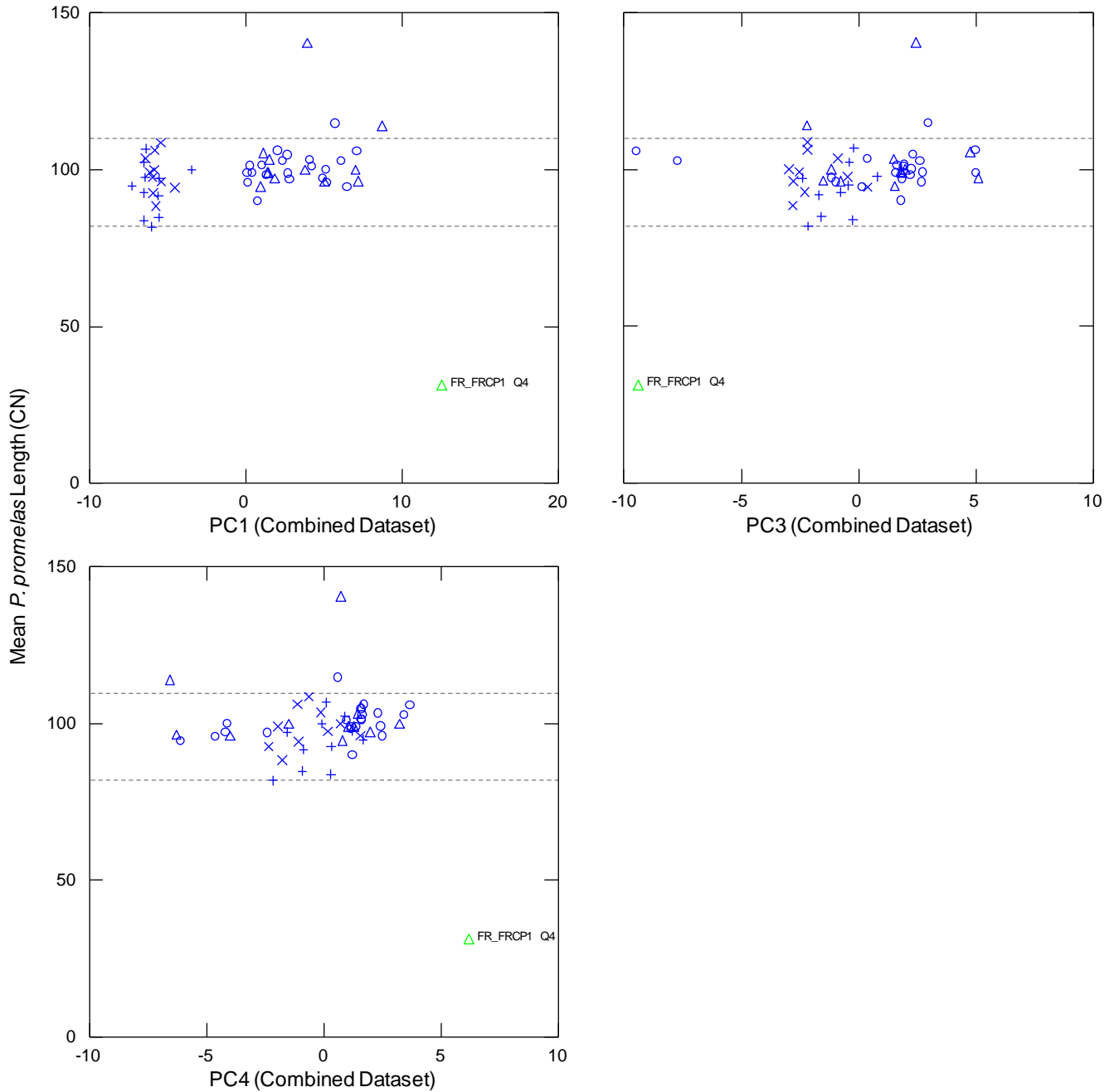
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-37: Mean *P. promelas* length versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description). Vertical lines are level 1 benchmarks for fish from the EVWQP (hardness of 300 mg/L was used).

Figure 3.4-38: Mean *P. promelas* length versus PC1 (top left), PC3 (top right), and PC4 (bottom left).



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 to 2017; blue + = 2018), test site waters with mean results categorized as no adverse response (blue o = 2015 to 2017; blue Δ = 2018), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 to 2017; green Δ = 2018). Test site waters categorized as possible or likely in 2018 (green Δ) are labelled with the test site and quarter. Horizontal lines are regional normal range (see Figure 2.3-3 for description).

3.5 Comparison of 2018 Results to Previous Years

Mean results for 2015, 2016, 2017, and 2018 were plotted to evaluate potential patterns in responses. As outlined in Section 2.3.5, mean results were control-normalized prior to plotting so that data processing was the same across years. An example plot is provided in Figure 2.3-3. Briefly, figures are interpreted as follows:

- Symbol color corresponds to an individual test site or reference location.
- Symbol type corresponds to the response category (circle = no; diamond = possible; triangle = likely). Categories were designated in each reporting year (i.e., 2015 results were categorized in Golder [2016], 2016 results were categorized in Golder [2017], 2017 results were categorized in Golder [2018a], and 2018 results were categorized in Section 3.3.1).
- Open symbols indicate test sites with a mean response statistically equivalent to all references tested in that batch. Filled symbols indicate test sites with a mean response significantly lower than one or more references tested in that batch.
- Local and regional NRs are provided on the plot to illustrate the range of responses in reference waters.

Plots were visually examined to identify potential seasonal or inter-annual changes in responses. Because some laboratory methods have changed over time and the methods used to categorize test results (i.e., narrative conclusions) as “no”, “possible”, or “likely” adverse response have changed over time, these graphics are intended to represent a coarse-level inter-annual comparison³⁴.

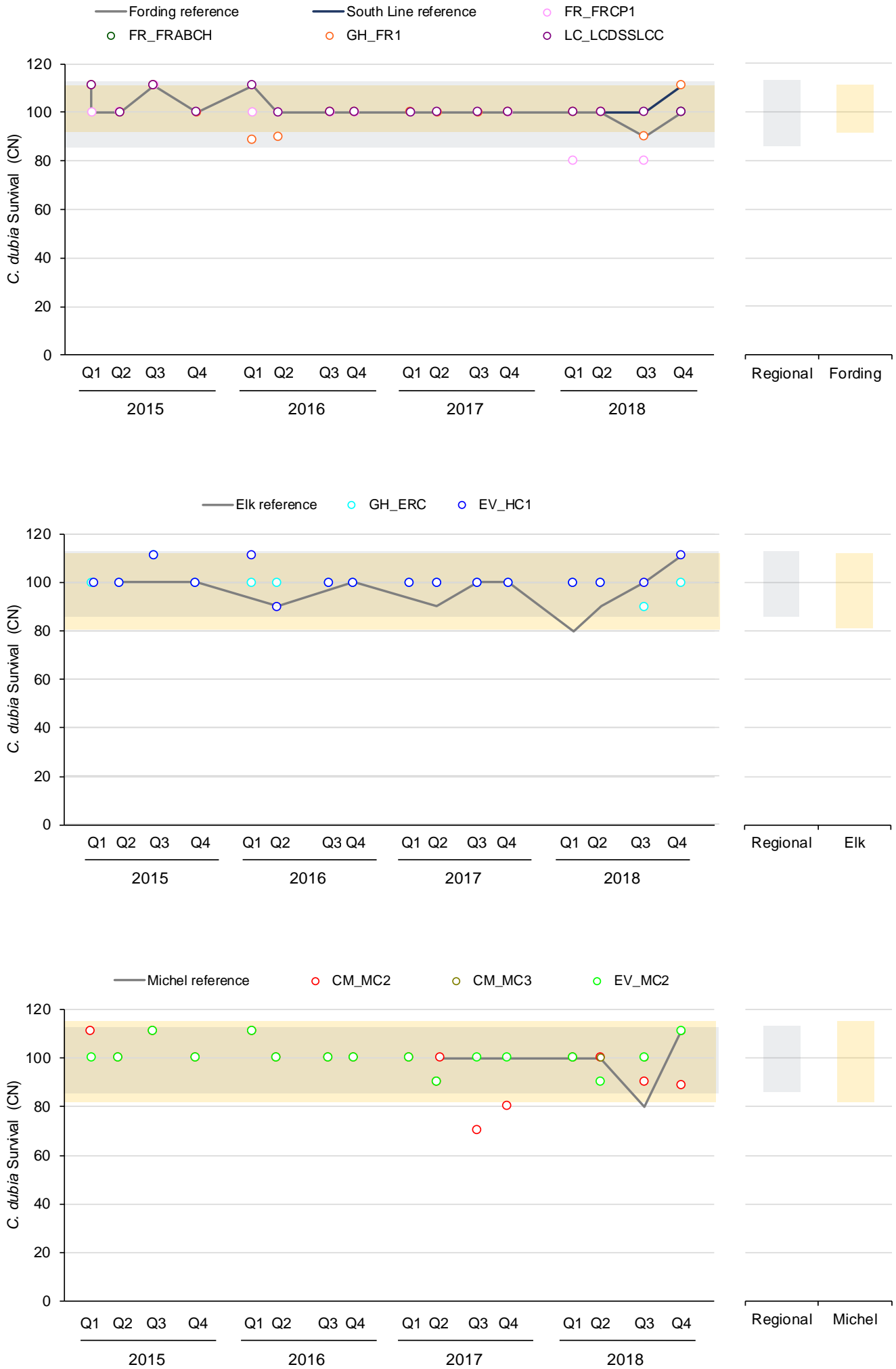
Mean results are plotted in the following figures:

- *C. dubia* survival (Figures 3.5-1) and reproduction (Figure 3.5-2)
- *P. subcapitata* cell yield (Figure 3.5-3)
- *H. azteca* survival (Figure 3.5-4) and dry weight (Figure 3.5-5)
- *O. mykiss* survival (Figure 3.5-6), viability (Figure 3.5-7), length (Figure 3.5-8), and weight (Figure 3.5-9)
- *P. promelas* hatch (Figure 3.5-10), survival (Figure 3.5-11), biomass (Figure 3.5-12), length (Figure 3.5-13), and development (Figure 3.5-14)

The following sections compare 2018 test results to previous years (i.e., 2015 to 2017) for each test site.

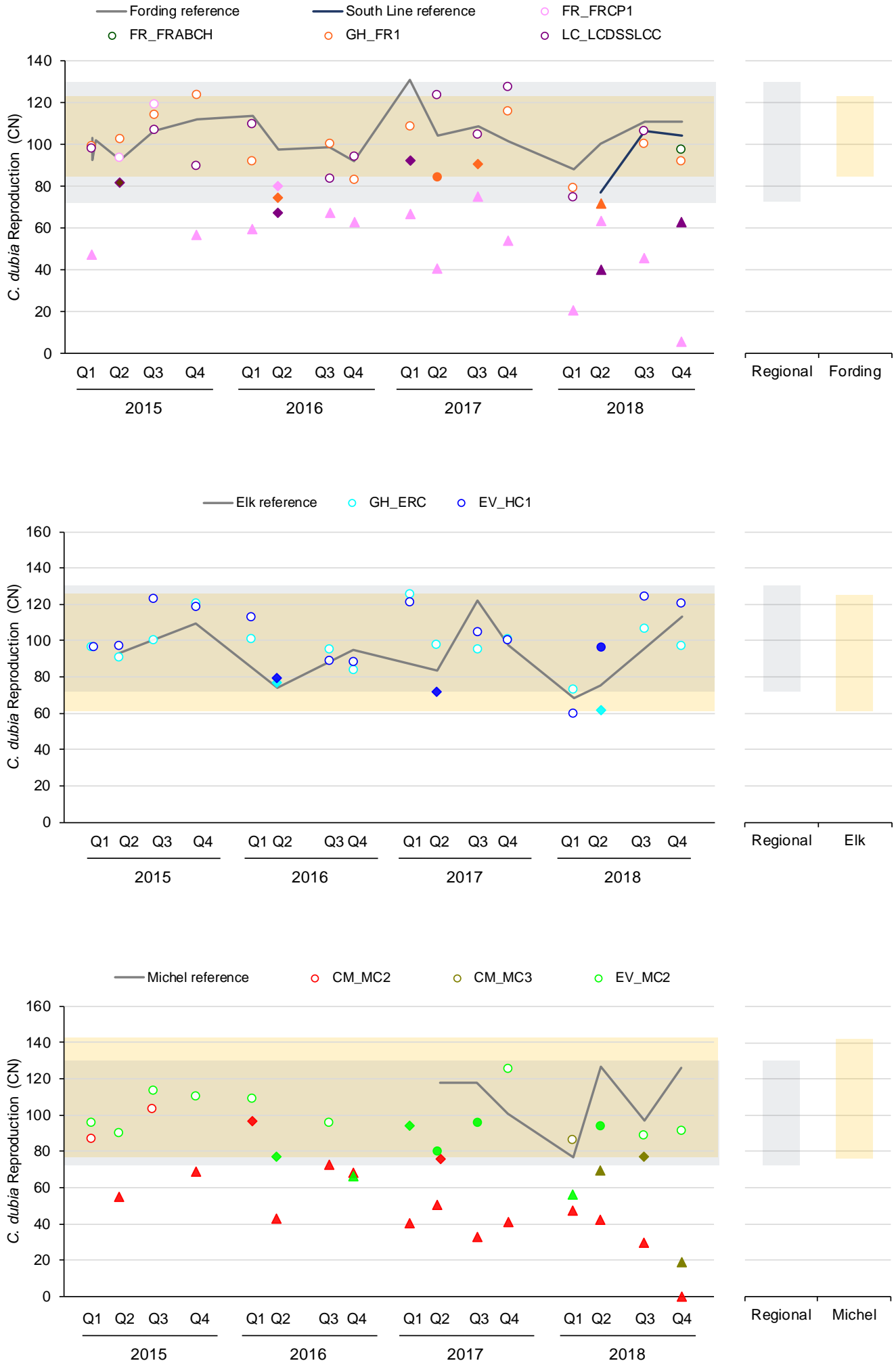
³⁴ In 2016 only, there was a fourth narrative conclusion called “significant (no category)”. This narrative conclusion occurred when there was insufficient information to categorize the test as possible or likely. Specifically, this narrative occurred when the following was true: 1) a single reference was tested in a batch (e.g., the Fording River reference was the only reference tested for *H. azteca*), and 2) there was no reference envelope calculated for that endpoint (e.g., *H. azteca* growth; Golder 2017). If both of these were true and the mean response for a test site was significantly lower than the reference tested in that batch, then the test was categorized as significant (no category).

Figure 3.5-1: Mean results for *C. dubia* survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



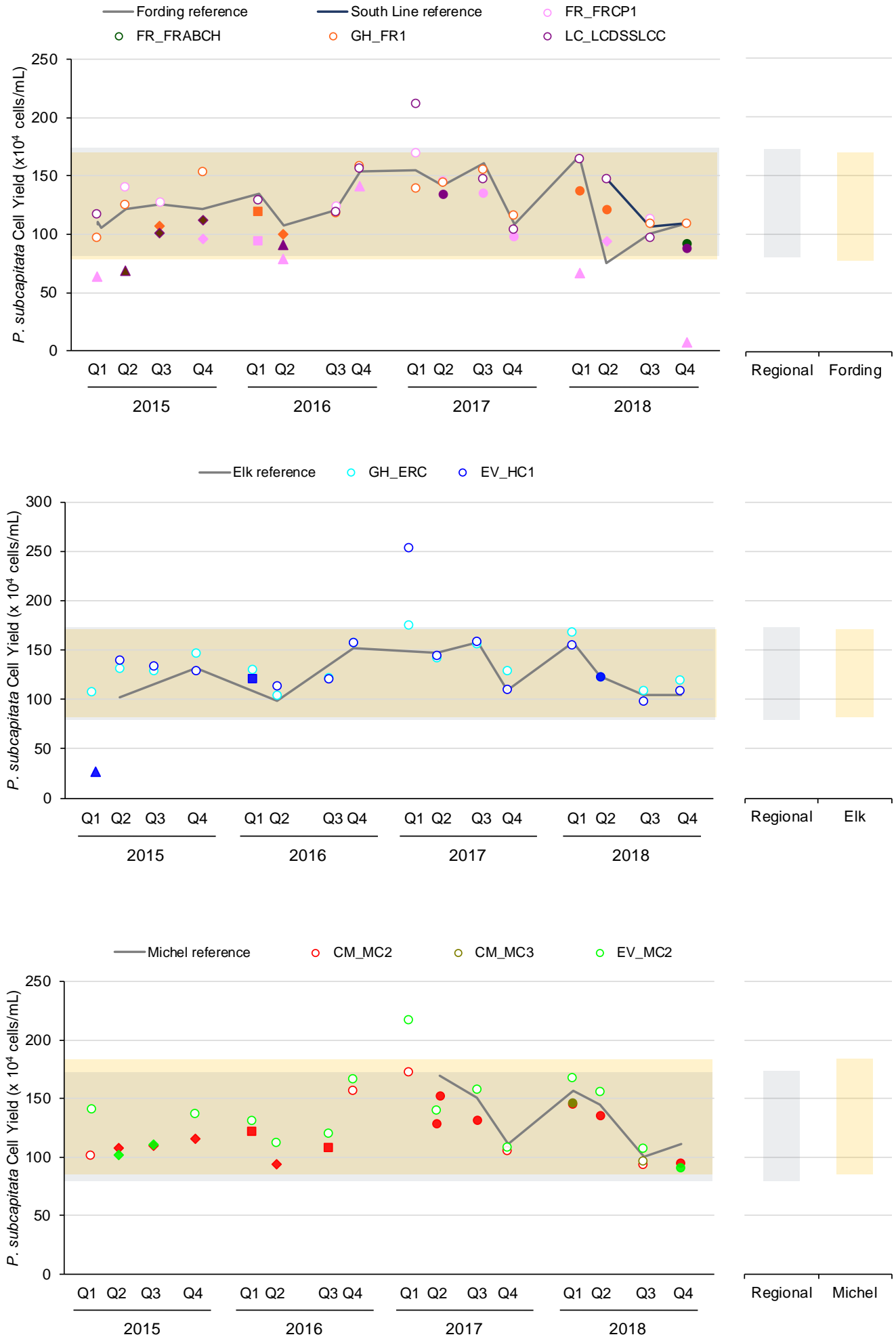
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-2: Mean results for *C. dubia* reproduction in the Fording River reference and its paired test site waters (top left panel), in the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



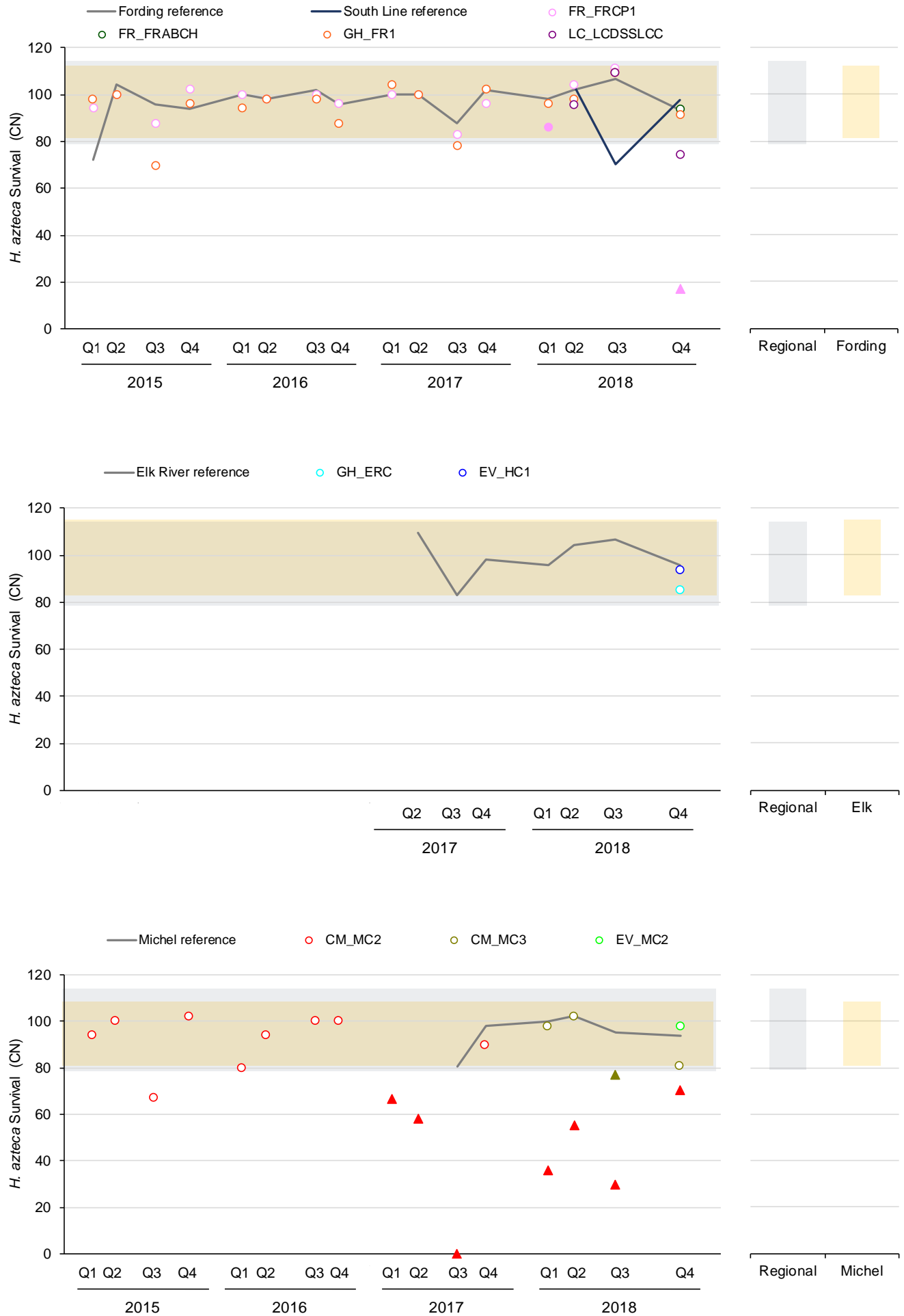
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-3: Mean results for *P. subcapitata* cell yield in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



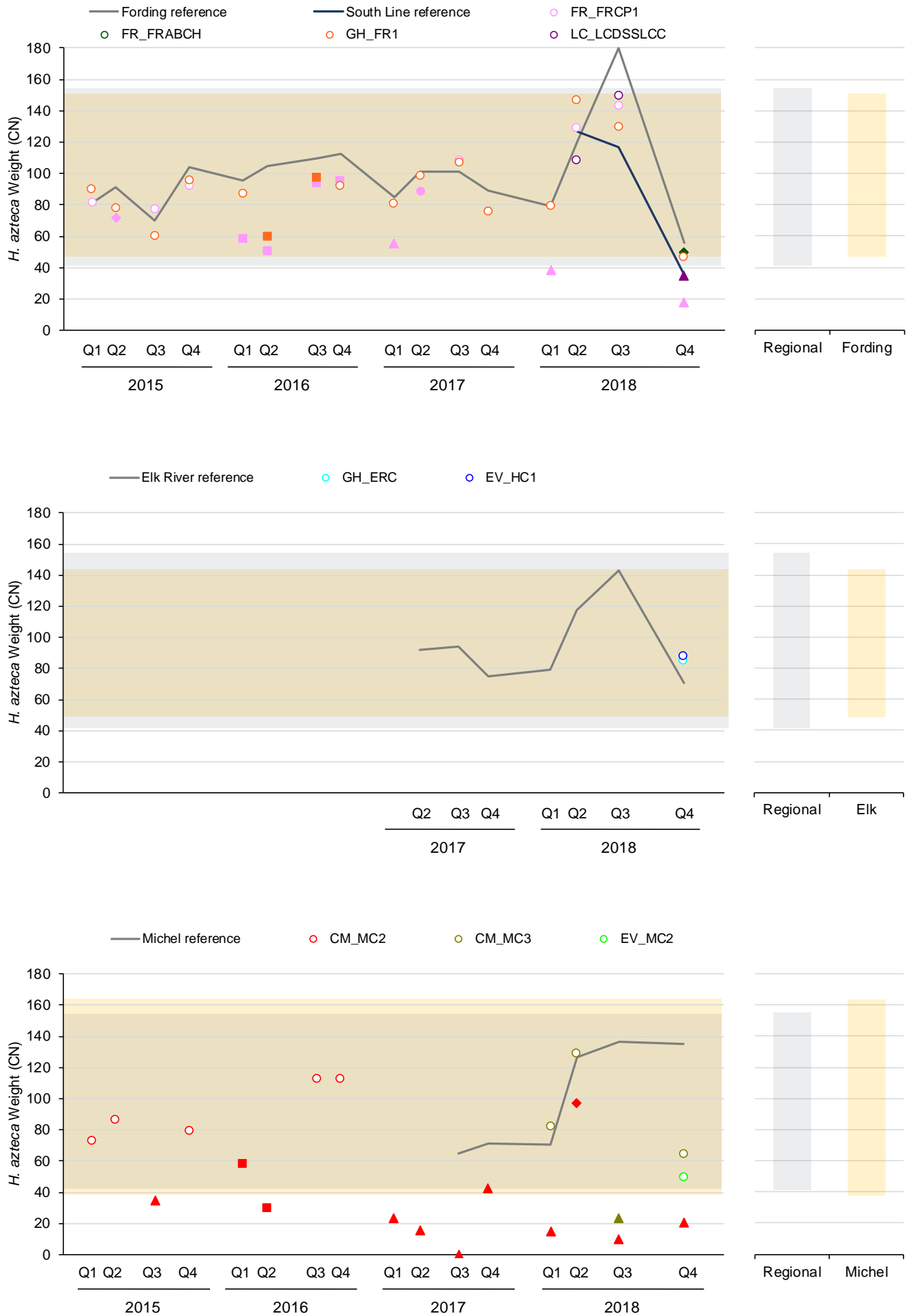
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-4: Mean results for *H. azteca* survival in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



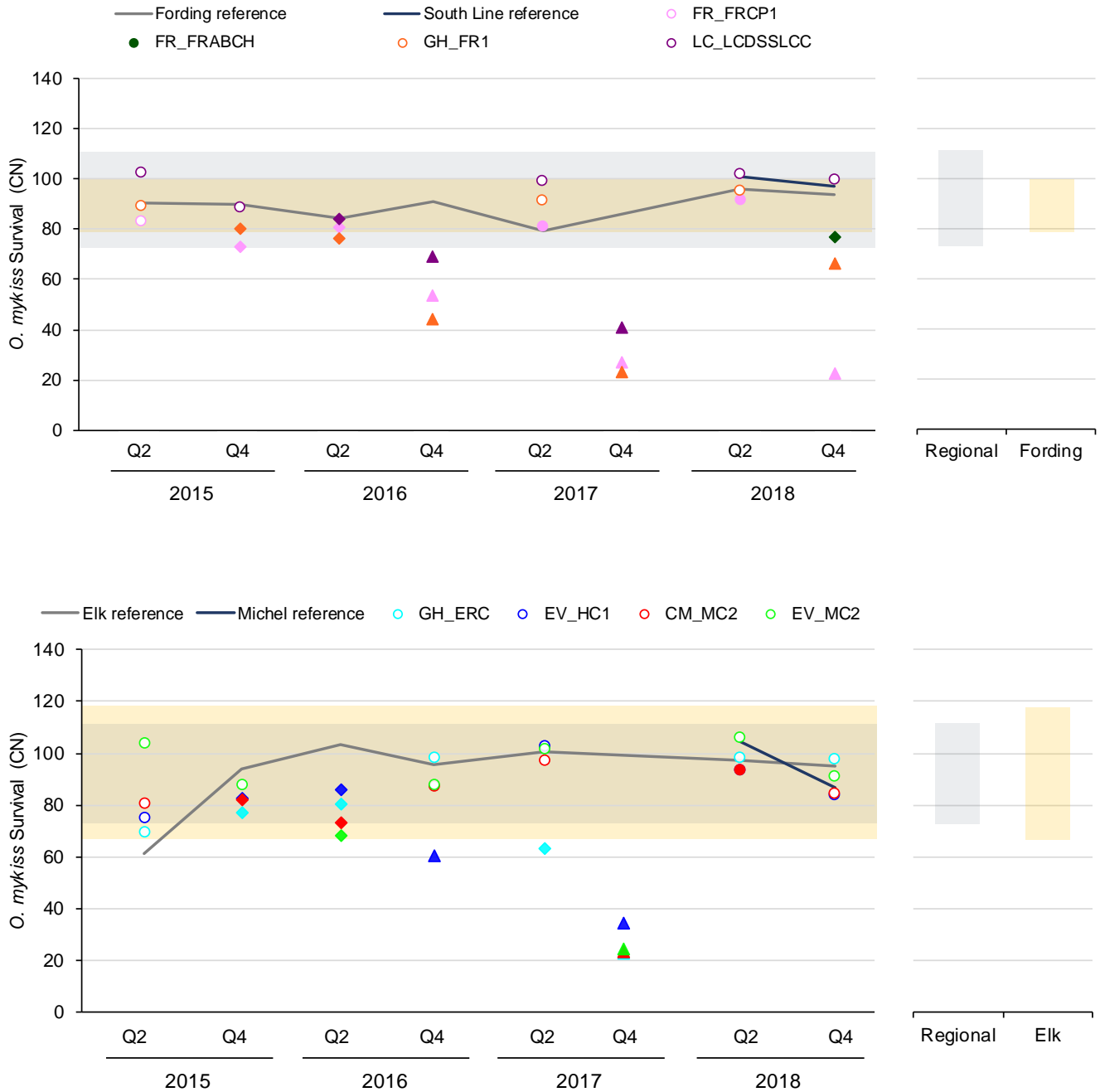
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-5: Mean results for *H. azteca* dry weight in the Fording River reference and its paired test site waters (top left panel), the Elk River reference and its paired test site waters (middle left panel), and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



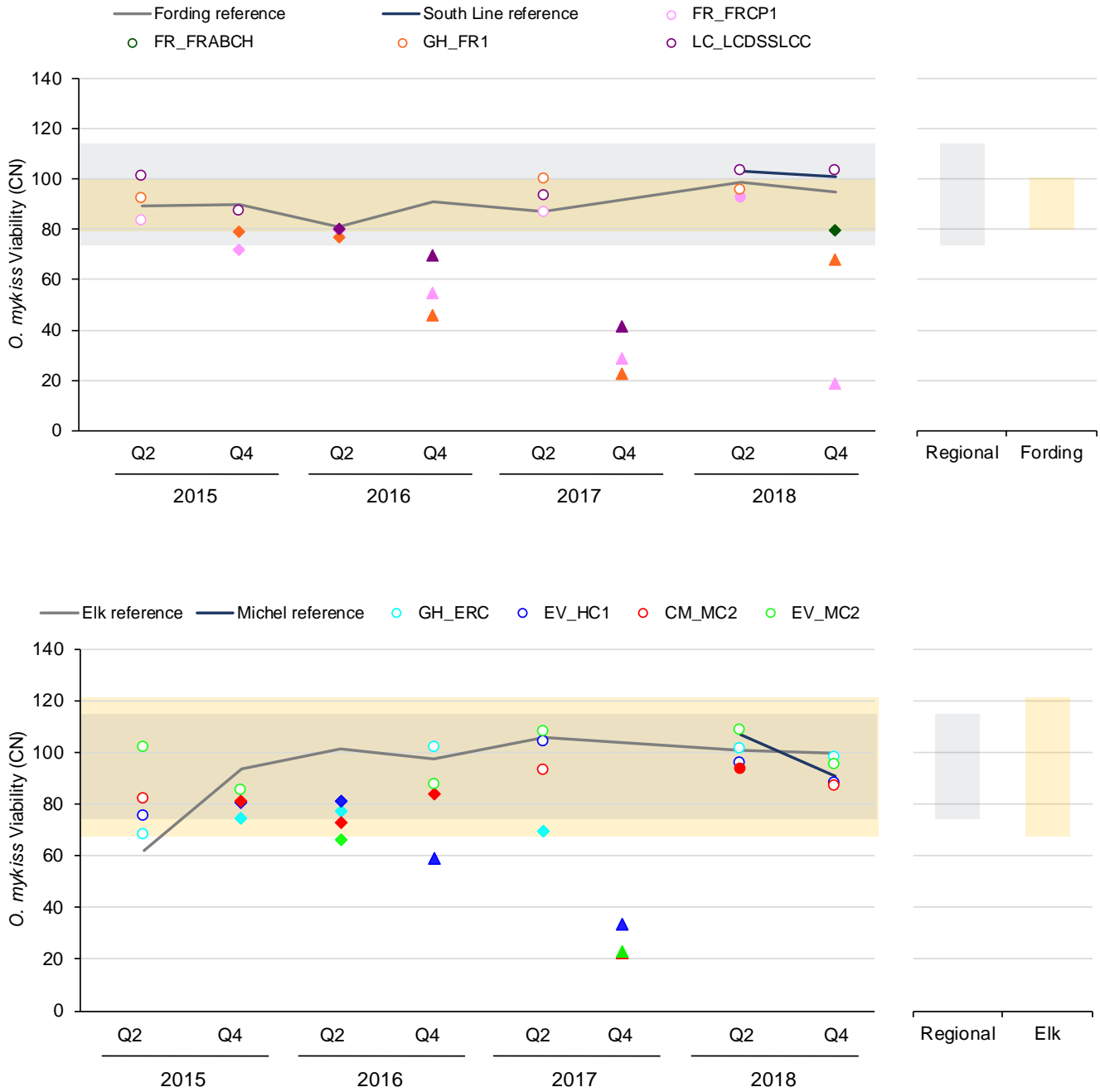
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-6: Mean results for *O. mykiss* survival in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



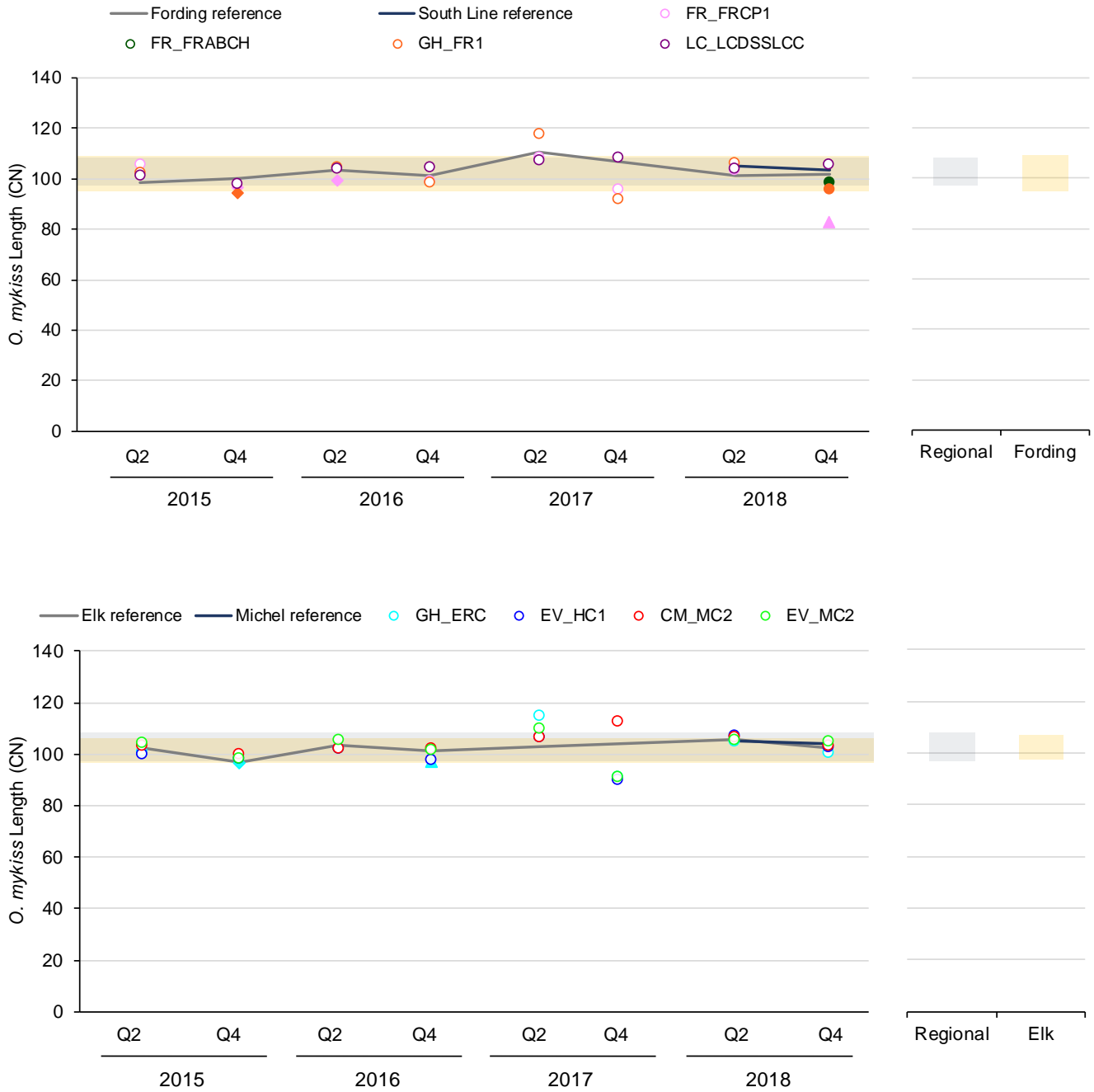
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-7: Mean results for *O. mykiss* viability in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



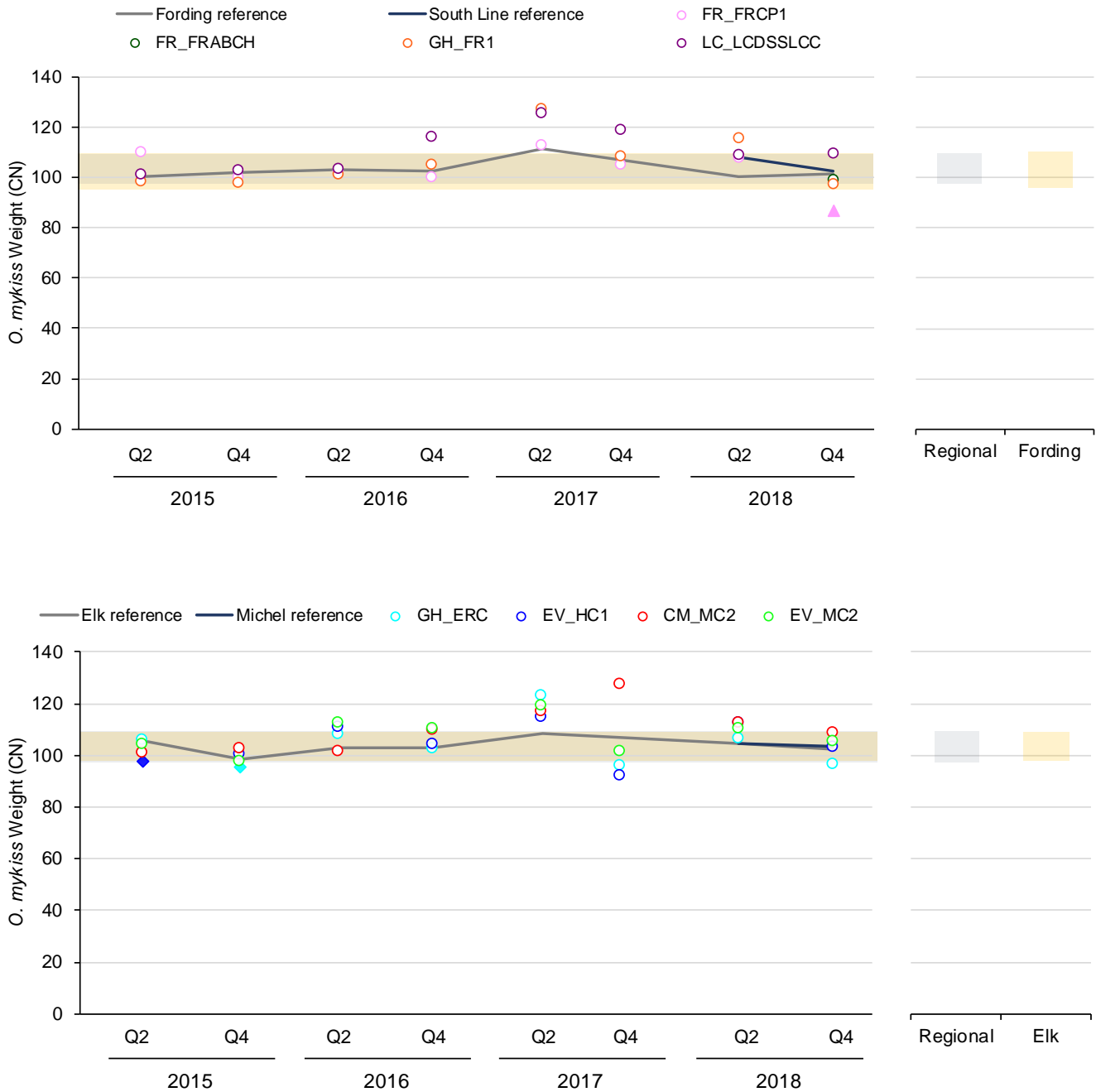
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-8: Mean results for *O. mykiss* length in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



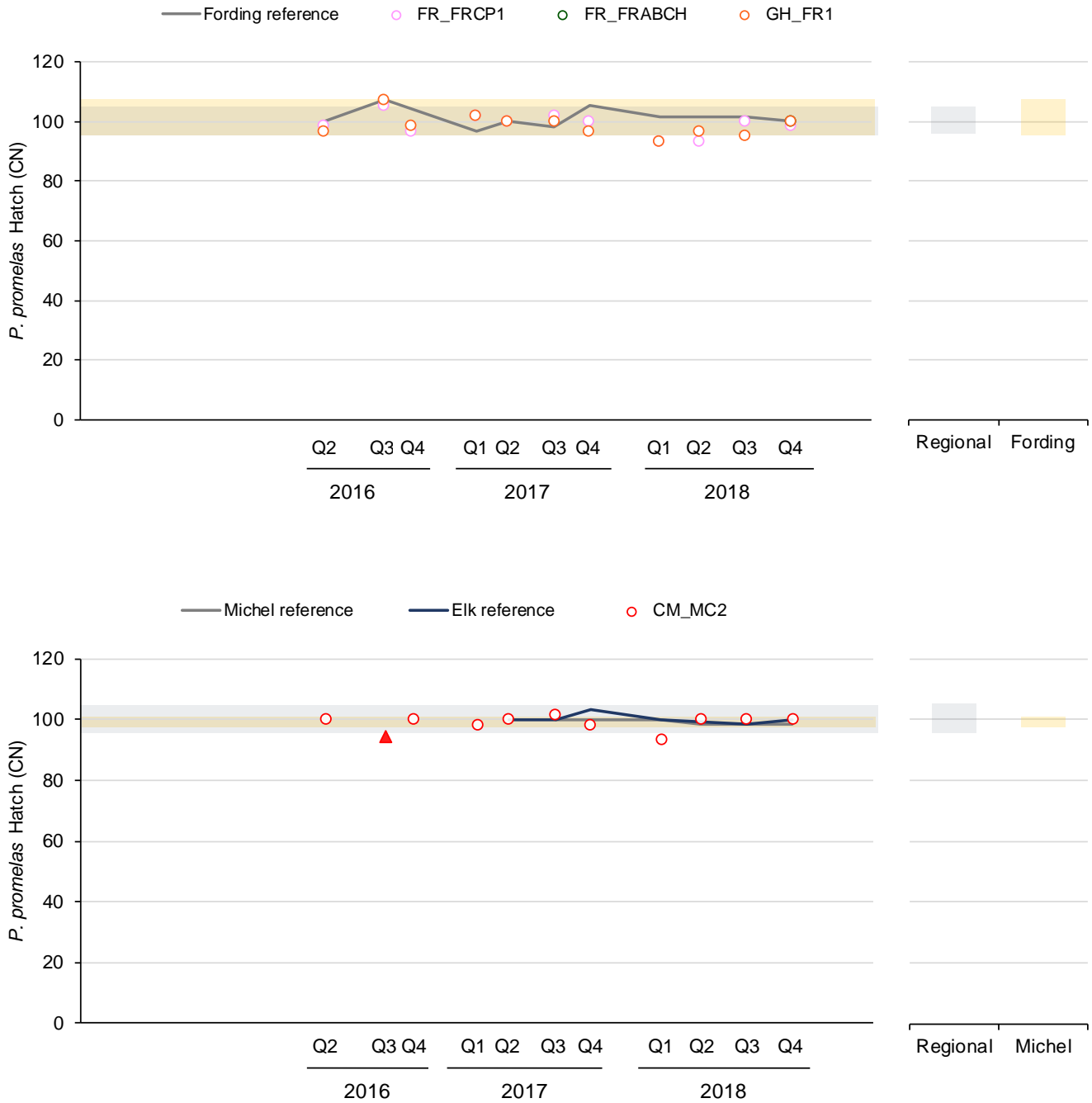
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-9: Mean results for *O. mykiss* weight in the Fording River reference and its paired test site waters (top left panel) and the Elk River reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



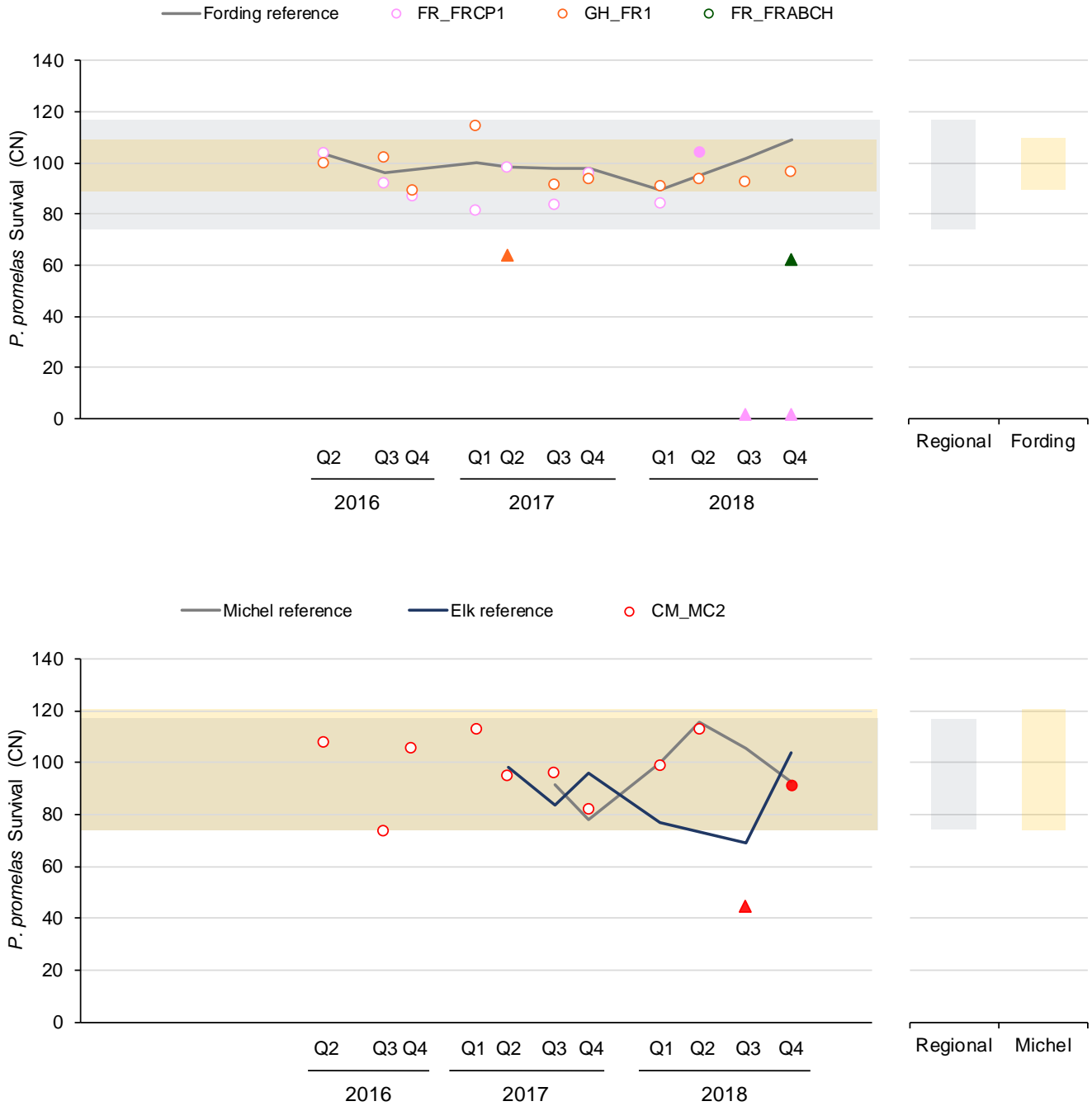
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-10: Mean results for *P. promelas* hatch in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



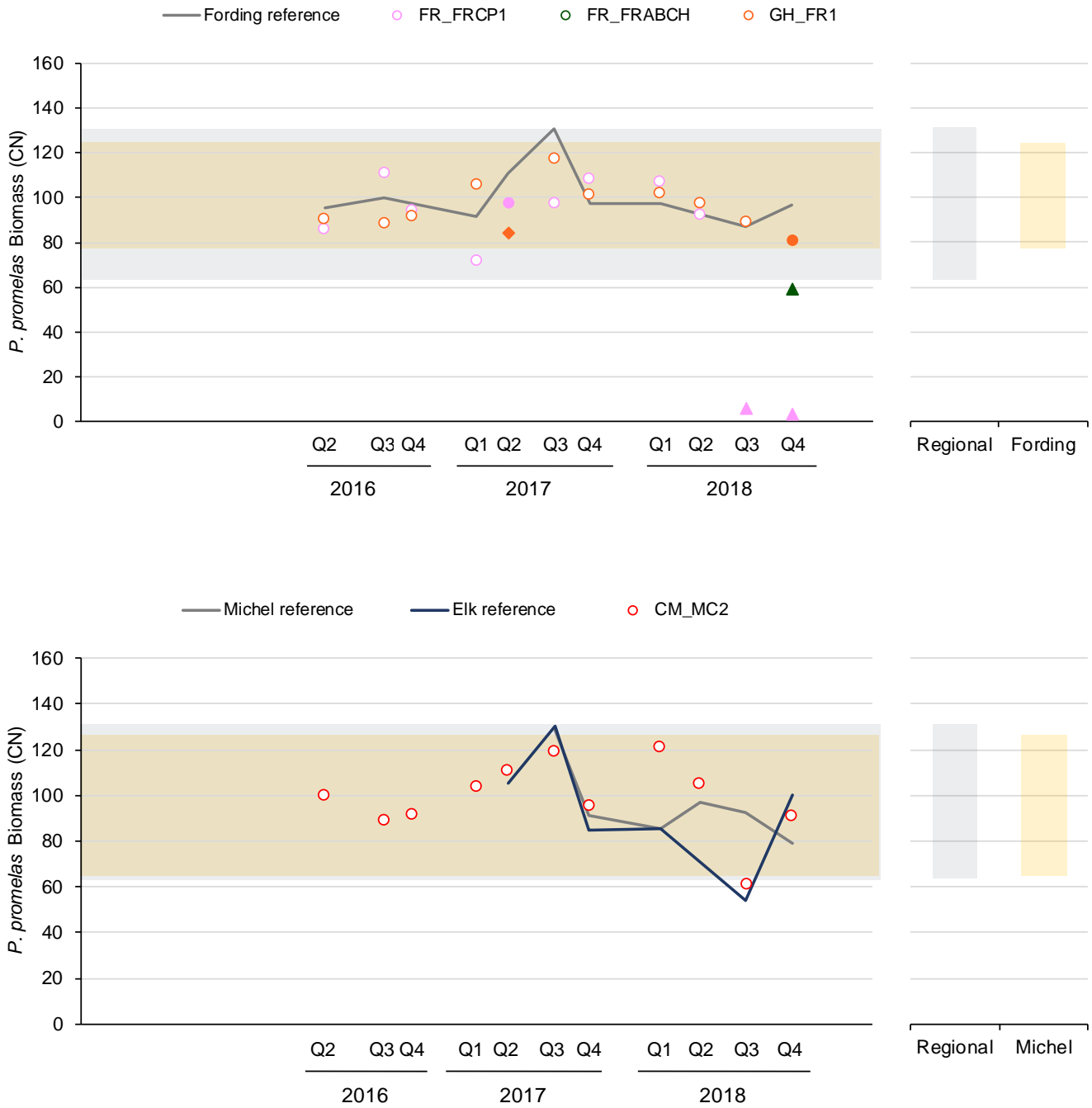
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-11: Mean results for *P. promelas* survival in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



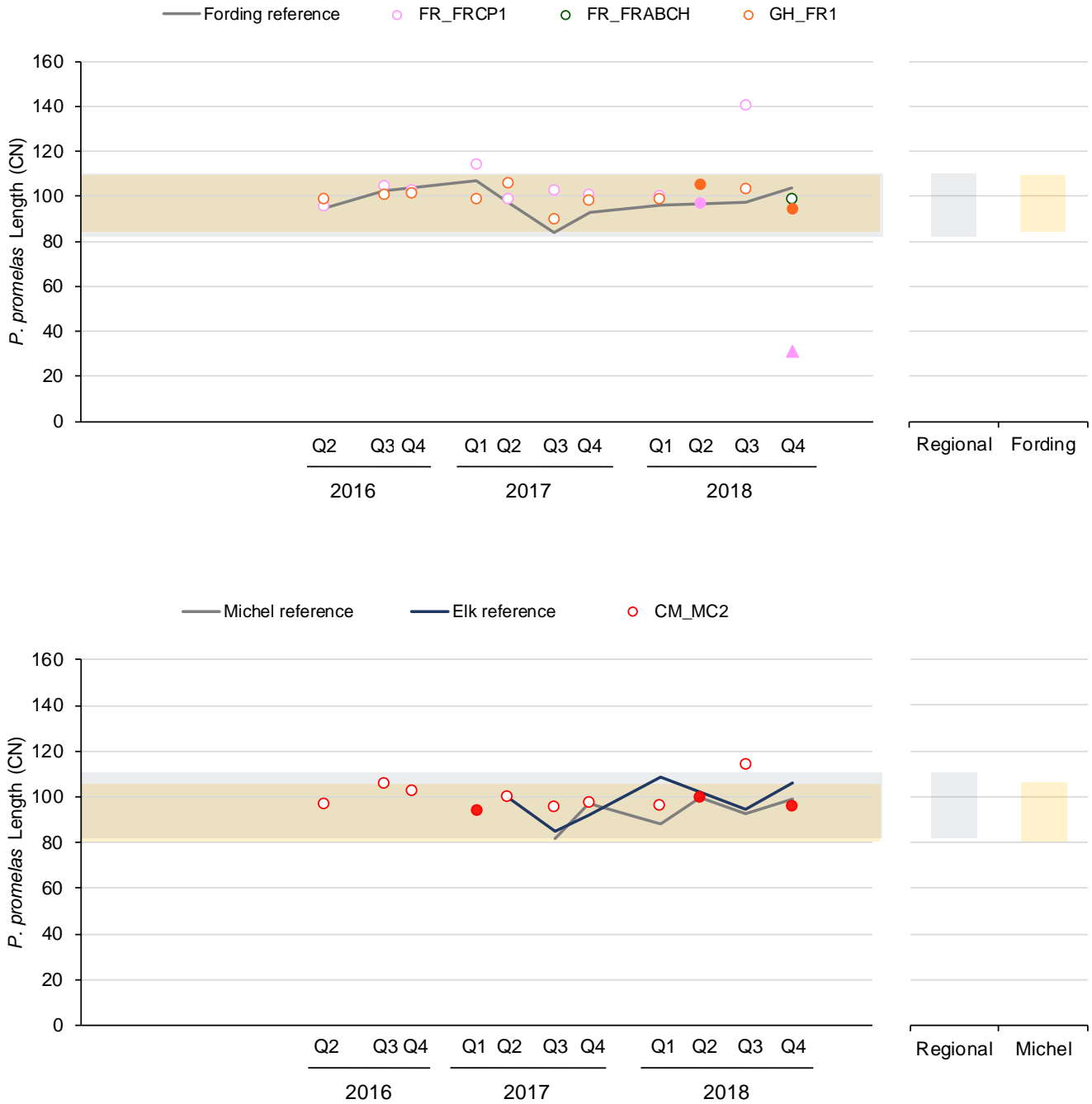
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-12: Mean results for *P. promelas* biomass in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



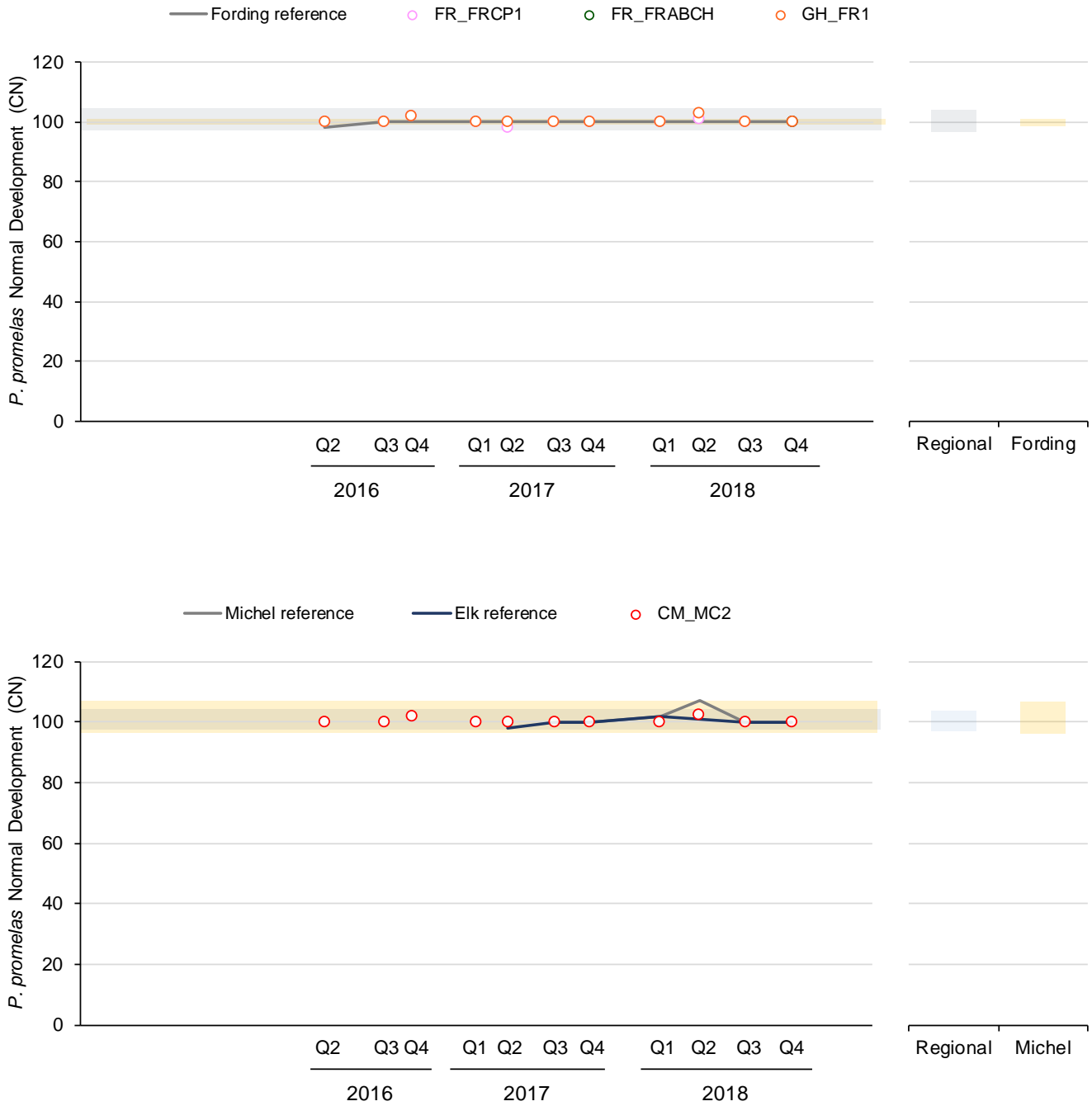
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-13: Mean results for *P. promelas* length in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3.3).

Figure 3.5-14: Mean results for *P. promelas* normal development in the Fording River reference and its paired test site waters (top left panel) and the Michel Creek reference and its paired test site waters (bottom left panel). Regional and local normal ranges (2.5th to 97.5th percentile) are shown as bars (right panels).



Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to their paired local NR (Section 2.3).

3.5.1 FR_FRCP1

Results for FR_FRCP1 in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-15. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally below the local and regional NRs (Figure 3.5-2), with a trend towards more and larger responses in recent tests. Several constituents have been identified as potentially contributing to observed response, including nickel (Q1 and Q4 2017, Q1 and Q4 2018), nitrate (Q1 2015, Q1 to Q4 2016, Q1 and Q4 2018), and sulphate/TDS (Q1 2015, Q1 2016, Q1 and Q4 2018).
- **P. subcapitata.** Mean cell yield was within the local and regional NRs in most quarterly tests (Figure 3.5-3). One notable exception was Q4 2018 when cell yield was 7×10^4 cells/mL. Sulphate/TDS was identified as potentially contributing to the observed response in the Q4 2018 test. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **H. azteca.** There was no adverse response on survival in any test in any year, except for Q4 2018 (Figure 3.5-4). Mean dry weight was generally within the local and regional NRs, except for Q1 and Q4 2018 tests (Figure 3.5-5). Nitrate was identified as potentially contributing to observed responses in Q1 tests in 2016, 2017, 2018. In Q4 2018, several constituents were identified as potentially contributing to the observed response, including nickel, nitrate, uranium, sulphate, and TDS for dry weight, and nickel, nitrate, and uranium for survival.
- **O. mykiss.** Mean length and weight were within the local and regional NRs, except for Q4 2018 (Figure 3.5-8; Figure 3.5-9). Mean survival and viability were below the local and regional NRs in approximately half of the tests (Figure 3.5-6; Figure 3.5-7). The magnitude of response for survival and viability was lower in Q4 tests compared to Q2 tests, and within those Q4 tests, there is a trend towards more and larger responses over time. There is some uncertainty in this trend given that Q4 2017 tests had evidence of microbial effects. Sulphate and TDS were also identified as potentially contributing to the observed response in Q4 2017. In Q4 2018, the strongest evidence for causation was identified for sulphate and TDS, although nitrate may also have contributed to the observed responses. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **P. promelas.** There were no adverse responses on *P. promelas* hatch and development in any test in any year (Figures 3.5-10 and 3.5-14). Mean survival, biomass, and length were generally within local and regional NRs, except for survival and biomass in Q3 and Q4 2018 tests and length in the Q4 2018 test (Figures 3.5-11 to 3.5-13). Sulphate and TDS were identified as potentially contributing to observed responses in Q4 2018. No water quality constituent was identified as potentially contributing to observed responses in other tests.

Overall, FR_FRCP1 has shown consistent patterns of response over time for many endpoints. Noteworthy interannual differences were a trend towards more and larger responses for *C. dubia* and a higher prevalence of adverse responses in Q4 2018 testing relative to previous years. Several parameters have been identified as potential causes of toxicity in previous testing. In Q4 2018 testing, sulphate and TDS were identified as potentially contributing to observed effects to all test species. This pattern in causation may be related to elevated sulphate and TDS concentrations, which were higher in Q4 2018 testing (~2,000 mg/L sulphate and ~3,200 mg/L TDS) relative to previously tested concentrations of sulphate (~100 to 750 mg/L, except for one test at ~1,500 mg/L) and TDS (~350 to 1,500 mg/L, except for one test at ~2,500 mg/L) in chronic toxicity monitoring (Appendix D).

As discussed in Section 2.2.2.2, water quality under winter low flow conditions at FR_FRCP1 is not representative of conditions in the upper Fording River to satisfy its primary intent, which is to monitor and evaluate cumulative discharges from Fording River Operations in the receiving environment (Teck 2019c). During low flow conditions, water quality at FR_FRCP1 is predominantly discharge from upstream mine-impacted Cataract Creek. Station FR_FRABCH (Section 3.5.2) was added to the program to characterize the potential for effects in conditions that are more representative of the upper Fording River.

Figure 3.5-15: Summary of test results by category at FR_FRCP1.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; NO3 = nitrate; SO4 = sulphate; TDS = total dissolved solids; U = uranium; None = no water quality constituent was identified.

3.5.2 FR_FRABCH

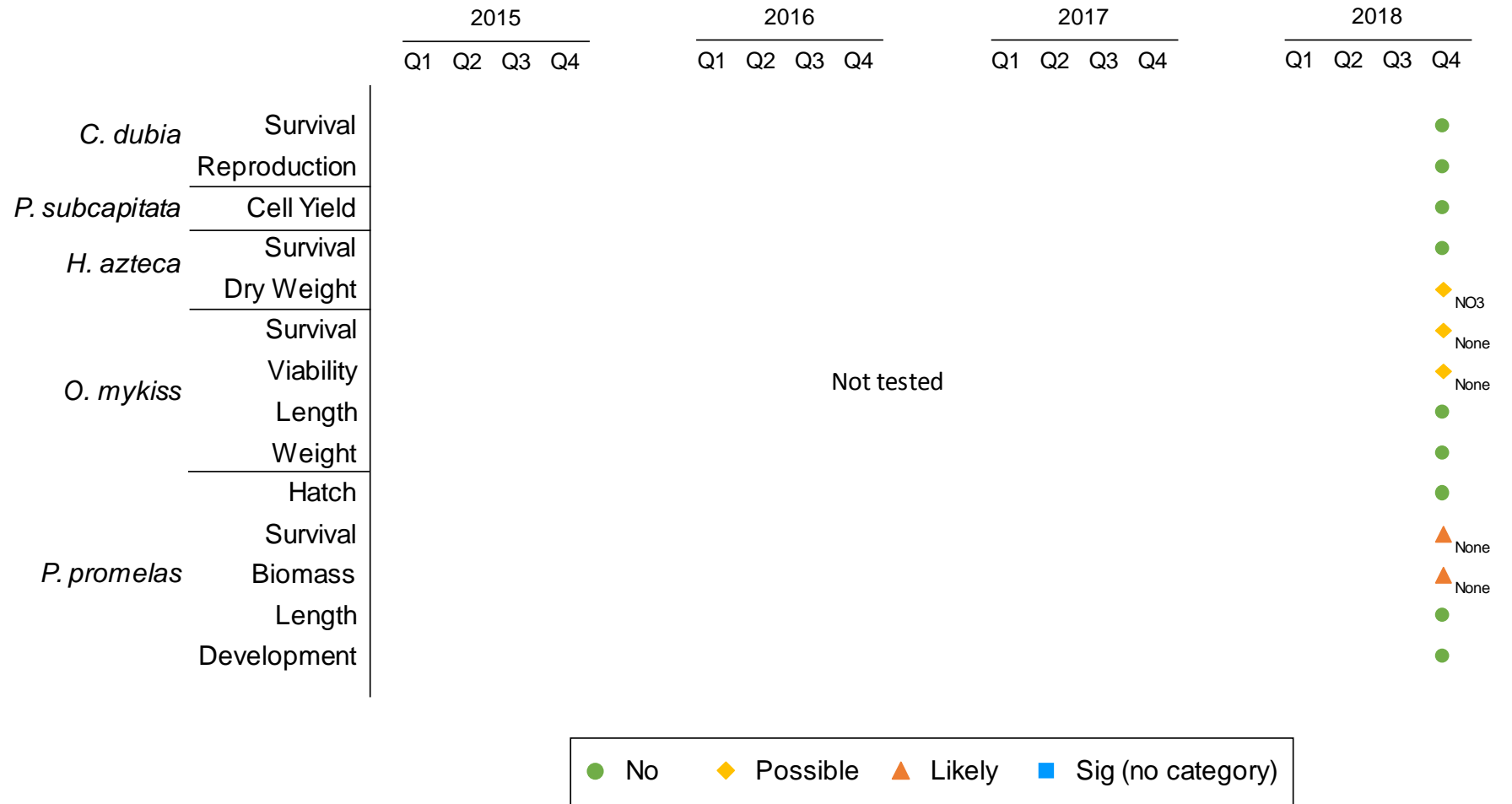
This station, which is approximately 5 kilometers downstream of FR_FRCP1, is not a Permit location but was added to the program in Q4 2018 to better represent mixed Fording River water quality and reduce the confounding influence of mid-winter Cataract Creek flows at FR_FRCP1 (see Section 2.2.2.2).

Results are summarized in Figure 3.5-16. Endpoints were categorized as no adverse response and/or within the local and regional NR, except for the following:

- ***H. azteca***. Mean dry weight was categorized as a possible response (Figure 3.5-5); nitrate was identified as potentially contributing to observed response.
- ***O. mykiss***. Mean survival and viability was categorized as a possible response (Figure 3.5-6; Figure 3.5-7); no water quality constituent was identified as potentially contributing to observed responses.
- ***P. promelas***. Mean responses were within the regional and local NRs, except for survival and biomass (Figures 3.5-10 to 3.5-14). No water quality constituent was identified as potentially contributing to observed responses.

Overall, FR_FRABCH showed fewer and lower magnitude responses relative to FR_FRCP1.

Figure 3.5-16: Summary of test results by category at FR_FRABCH.



Note: Results are categorized in Section 3.3.1. Possible and likely symbols are annotated with constituents identified as potentially contributing to observed response. NO3 = nitrate; None = no water quality constituent was identified.

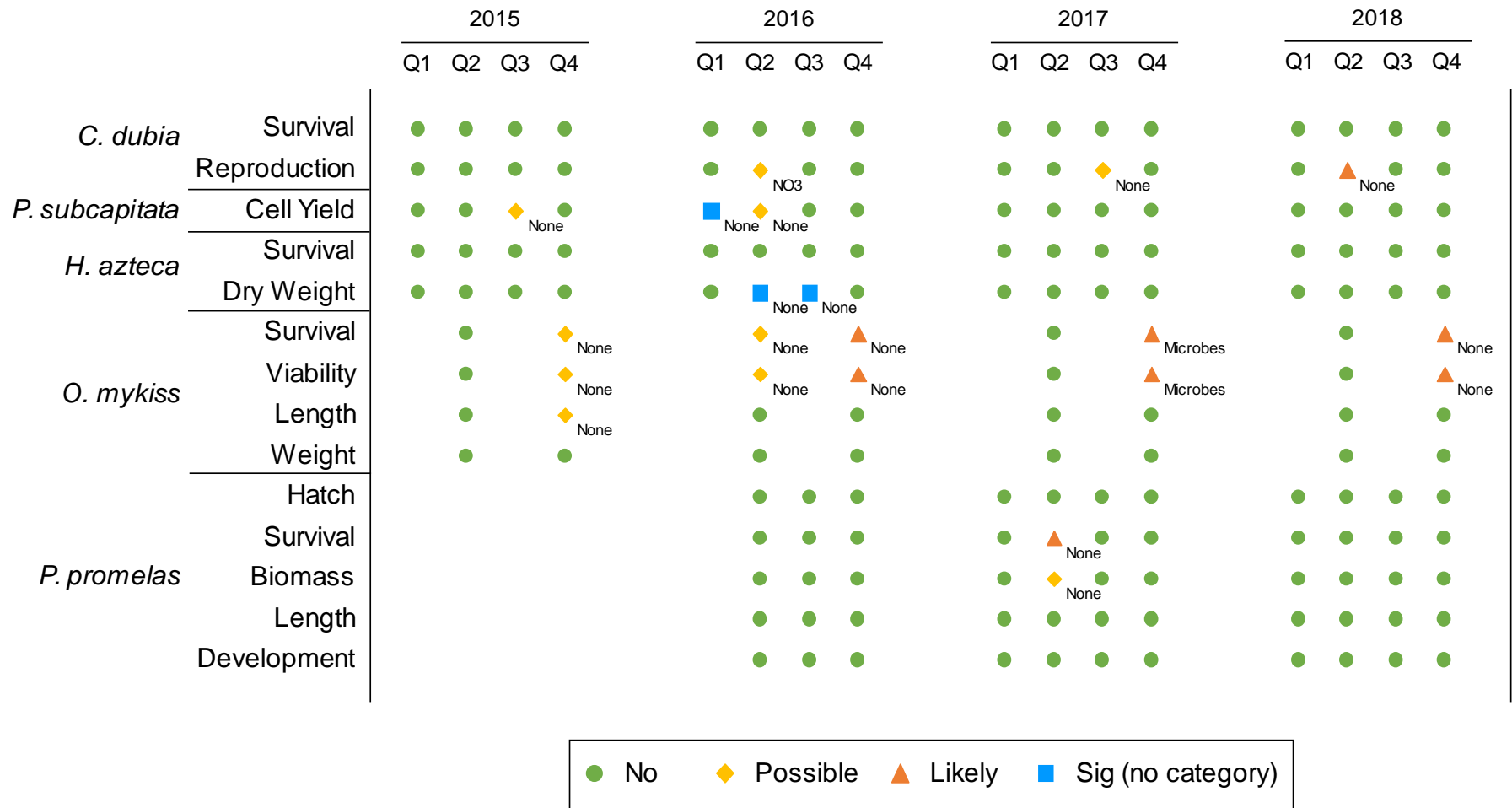
3.5.3 GH_FR1

Results for GH_FR1 in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-17. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally within the local and regional NRs, except for Q2 2018 (Figure 3.5-2). A potential contributor to the observed response in Q2 2016 was nitrate. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-3). No water quality constituent was identified as potentially contributing to observed responses.
- **H. azteca.** There was no adverse response on survival in any test in any year (Figure 3.5-4). Mean dry weight was generally within the local and regional NRs (Figure 3.5-5). No water quality constituent was identified as potentially contributing to observed responses.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-8; Figure 3.5-9). Mean survival and viability were below the local NR in approximately half of the tests (Figure 3.5-6; Figure 3.5-7). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).
- **P. promelas.** Mean responses were consistent over time and generally within the regional and local NRs (Figures 3.5-10 to 3.5-14). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).

Overall, GH_FR1 has shown few adverse responses, with no apparent consistent pattern of responses over time and no clear evidence of causal factors. Adverse responses have been observed on *O. mykiss* survival and viability in Q4 of every year, but at least one of these tests (2017) was consistent with effects caused by microbes.

Figure 3.5-17: Summary of test results by category at GH_FR1.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. NO3 = nitrate; None = no water quality constituent was identified.

3.5.4 GH_ERC

Results for GH_ERC in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-18. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally within the local and regional NRs, except for Q2 2018 (Figure 3.5-2). No water quality constituent was identified as potentially contributing to observed responses.
- **P. subcapitata.** There was no adverse response on cell yield in any test in any year (Figure 3.5-3). Mean cell yield was within the local and regional NRs.
- **H. azteca.** Testing for this species began in Q4 2018. There was no adverse response on survival or dry weight, and both endpoints were within the local and regional NRs (Figure 3.5-4; Figure 3.5-5).
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-8; Figure 3.5-9). Mean survival and viability were generally within the local and regional NRs in most quarterly tests (Figure 3.5-6; Figure 3.5-7). TSS was identified as potentially contributing to observed responses in Q2 2017. No water quality constituent was identified as potentially contributing to observed responses in other tests. Responses observed in Q4 2017 were consistent with effects caused by microbial growth (Golder 2018a).

Overall, GH_ERC has shown few adverse responses, with no apparent consistent pattern of responses over time and no clear evidence of causal factors. Adverse responses have been observed on *O. mykiss* survival and viability in Q2 and/or Q4 of every year between 2015 to 2017, but were not observed in 2018.

Figure 3.5-18: Summary of test results by category at GH_ERC.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent was identified; TSS = total suspended solids.

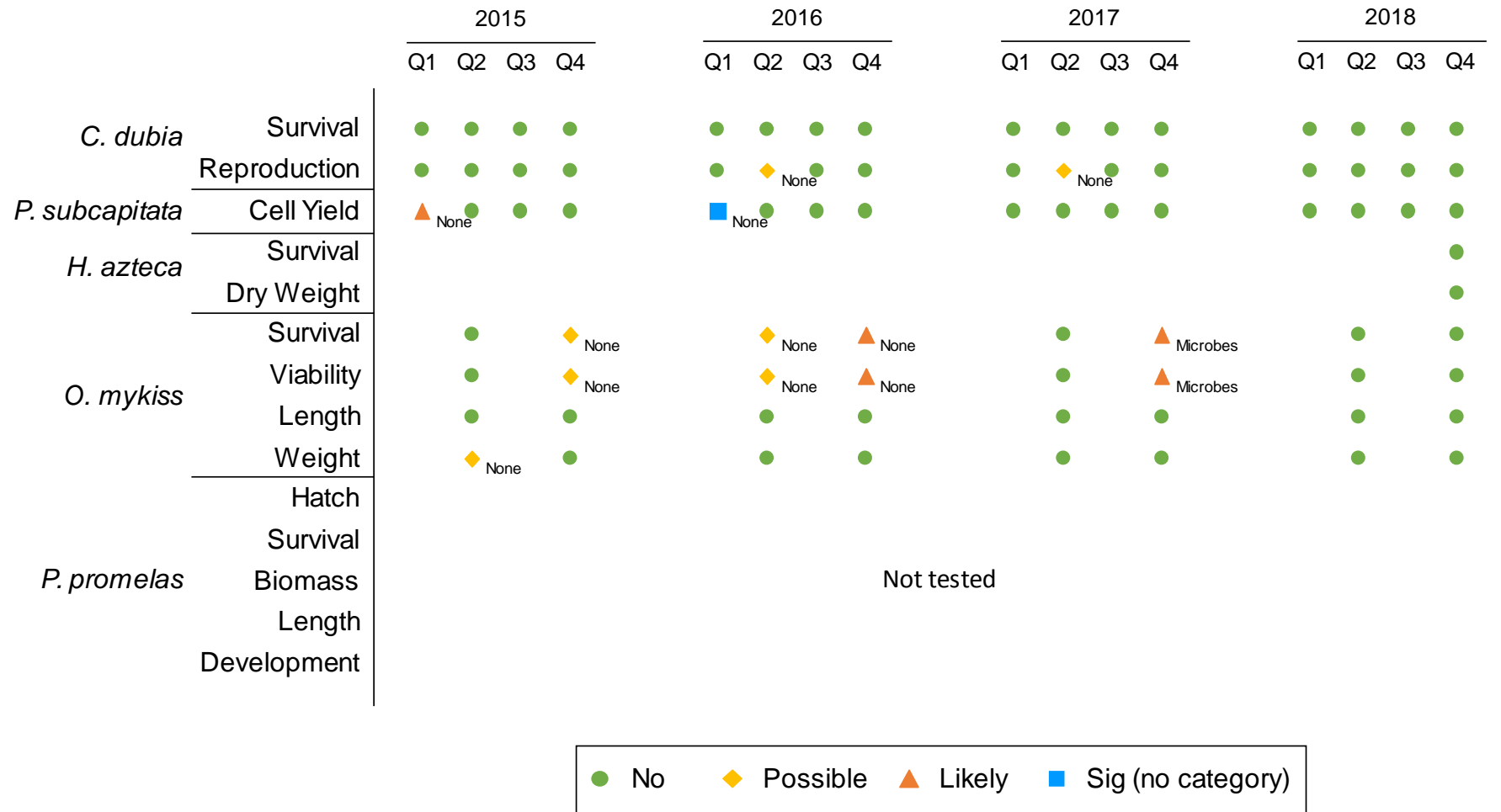
3.5.5 EV_HC1

Results for EV_HC1 in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-19. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally within local and regional NRs in most quarterly tests (Figure 3.5-2). No water quality constituent was identified as potentially contributing to observed responses.
- **P. subcapitata.** Mean cell yield was generally within the local and regional NRs in most quarterly tests (Figure 3.5-3). No water quality constituent was identified as potentially contributing to observed responses.
- **H. azteca.** Testing for this species began in Q4 2018. There was no adverse response on survival or dry weight, and both endpoints were within the local and regional NRs (Figure 3.5-4; Figure 3.5-5).
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-8; Figure 3.5-9). Mean survival and viability were within the local and regional NRs in most semi-annual tests (Figure 3.5-6; Figure 3.5-7). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).

Overall, EV_HC1 has shown few adverse responses over time, with no apparent consistent pattern of responses and no clear evidence of causal factors. Adverse responses have been observed on *O. mykiss* survival and viability in Q2 and/or Q4 of every year between 2015 to 2017, but were not observed in 2018.

Figure 3.5-19: Summary of test results by category at EV_HC1.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent was identified.

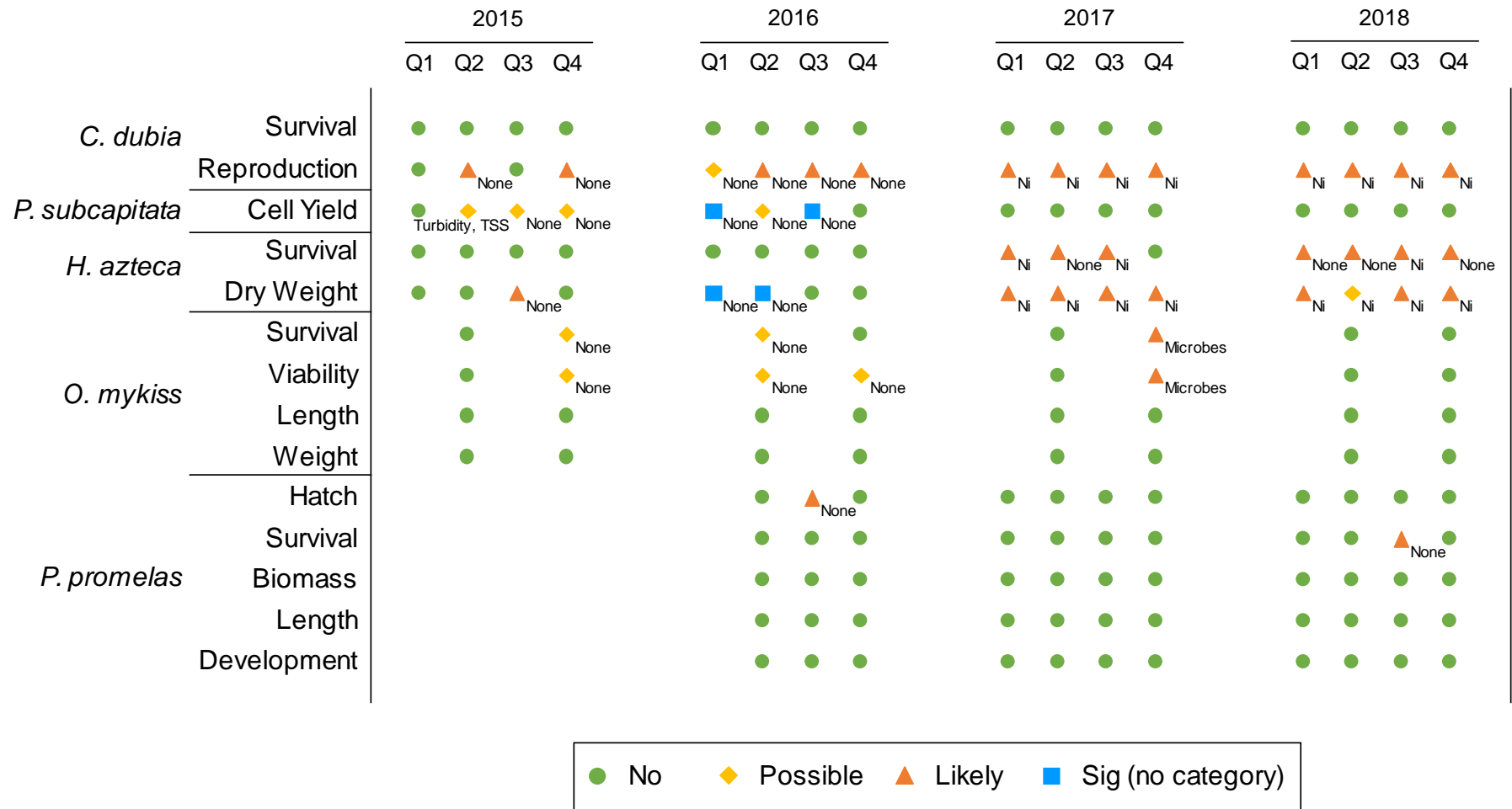
3.5.6 CM_MC2

Results for CM_MC2 in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-20. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally below the local and regional NRs (Figure 3.5-2), with a trend towards more and larger responses over time. Nickel was identified as potentially contributing to observed responses in 2017 and 2018 tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-3). TSS was identified as potentially contributing to the observed response in Q2 2015. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **H. azteca.** Mean survival and dry weight were below the local and regional NRs in approximately half of the tests (Figure 3.5-4; Figure 3.5-5), with a trend towards more and larger responses over time. Nickel was identified as potentially contributing to observed responses in most tests.
- **O. mykiss.** Mean survival, viability, length and weight were generally within the local and regional NRs (Figure 3.5-6 to Figure 3.5-9). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).
- **P. promelas.** Mean responses were consistent over time and generally within the regional and local NRs, except for survival in Q3 2018 (Figures 3.5-10 to 3.5-14). No water quality constituent was identified as potentially contributing to observed responses.

Overall, CM_MC2 has shown consistent patterns of response over time for *C. dubia* reproduction and *H. azteca* survival and dry weight, with a trend towards more and larger responses in more recent years. There has also been a consistent pattern of nickel being identified as a potential or likely cause of observed effects in most of these tests. The pattern in responses corresponds with an increase in aqueous nickel concentrations from 2015 (generally ranged from 5 to 15 µg/L) to 2018 (generally ranged from 10 to 60 µg/L).

Figure 3.5-20: Summary of test results by category at CM_MC2.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; TSS = total suspended solids; None = no water quality constituent was identified.

3.5.7 CM_MC3

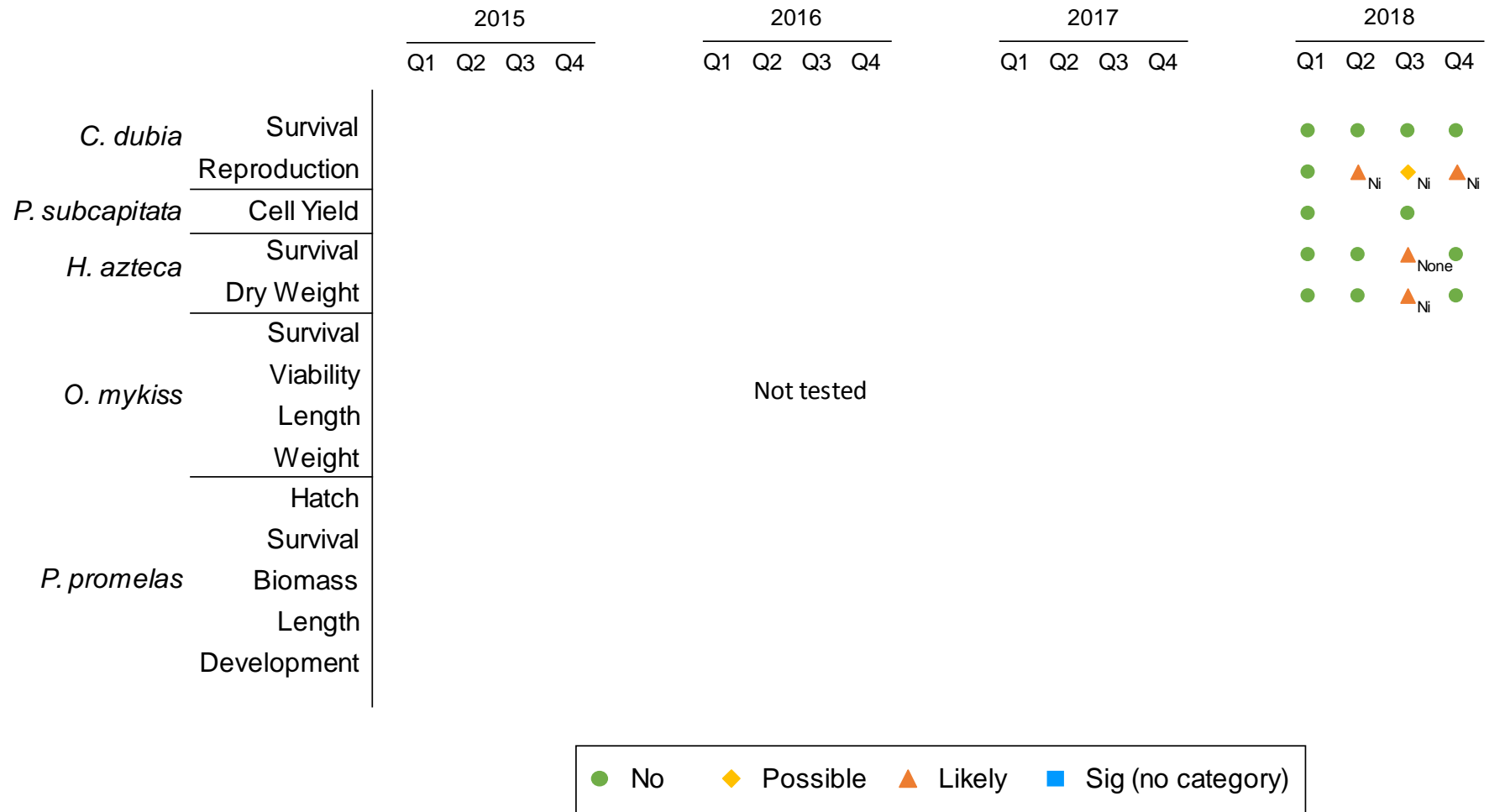
This station, which is approximately 1 kilometer downstream of CM_MC2, is not a Permit location but was added to the program in 2018 to characterize the spatial extent of effects observed in previous CM_MC2 testing.

Results are summarized in Figure 3.5-21. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any quarter (Figure 3.5-1). Mean reproduction was below the local NR in Q3 and below the regional NR in Q2 and Q4 (Figure 3.5-2). Nickel was identified as potentially contributing to observed responses.
- **P. subcapitata.** There was no adverse response on cell yield in any quarter and mean cell yield was within the local and regional NRs (Figure 3.5-3).
- **H. azteca.** Survival and mean dry weight were within the local and regional NRs, except for Q3 (Figure 3.5-6; Figure 3.5-5). Nickel was identified as potentially contributing to the observed response for dry weight.

Overall, CM_MC3 showed fewer and lower magnitude responses relative to CM_MC2. In most tests with adverse responses, nickel was identified as a potential or likely cause.

Figure 3.5-21: Summary of test results by category at CM_MC3.



Note: Results are categorized in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. Ni = nickel; None = no water quality constituent was identified.

3.5.8 EV_MC2

Results for EV_MC2 in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-22. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally within the local and regional NRs, except for Q2 2016 and Q1 2018 (Figure 3.5-2). A potential contributor to the observed response in Q2 2016 was turbidity. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-3). No water quality constituent was identified as potentially contributing to observed responses.
- **H. azteca.** Testing for this species began in Q4 2018. There was no adverse response on survival or dry weight, and both endpoints were within the local and regional NRs (Figure 3.5-4; Figure 3.5-5).
- **O. mykiss.** Mean survival, viability, length and weight were generally within the local and regional NRs (Figure 3.5-6 to Figure 3.5-9). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).

Overall, EV_MC2 has shown few adverse responses over time, with no apparent consistent pattern of responses and no clear evidence of causal factors.

Figure 3.5-22: Summary of test results by category at EV_MC2.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. None = no water quality constituent was identified.

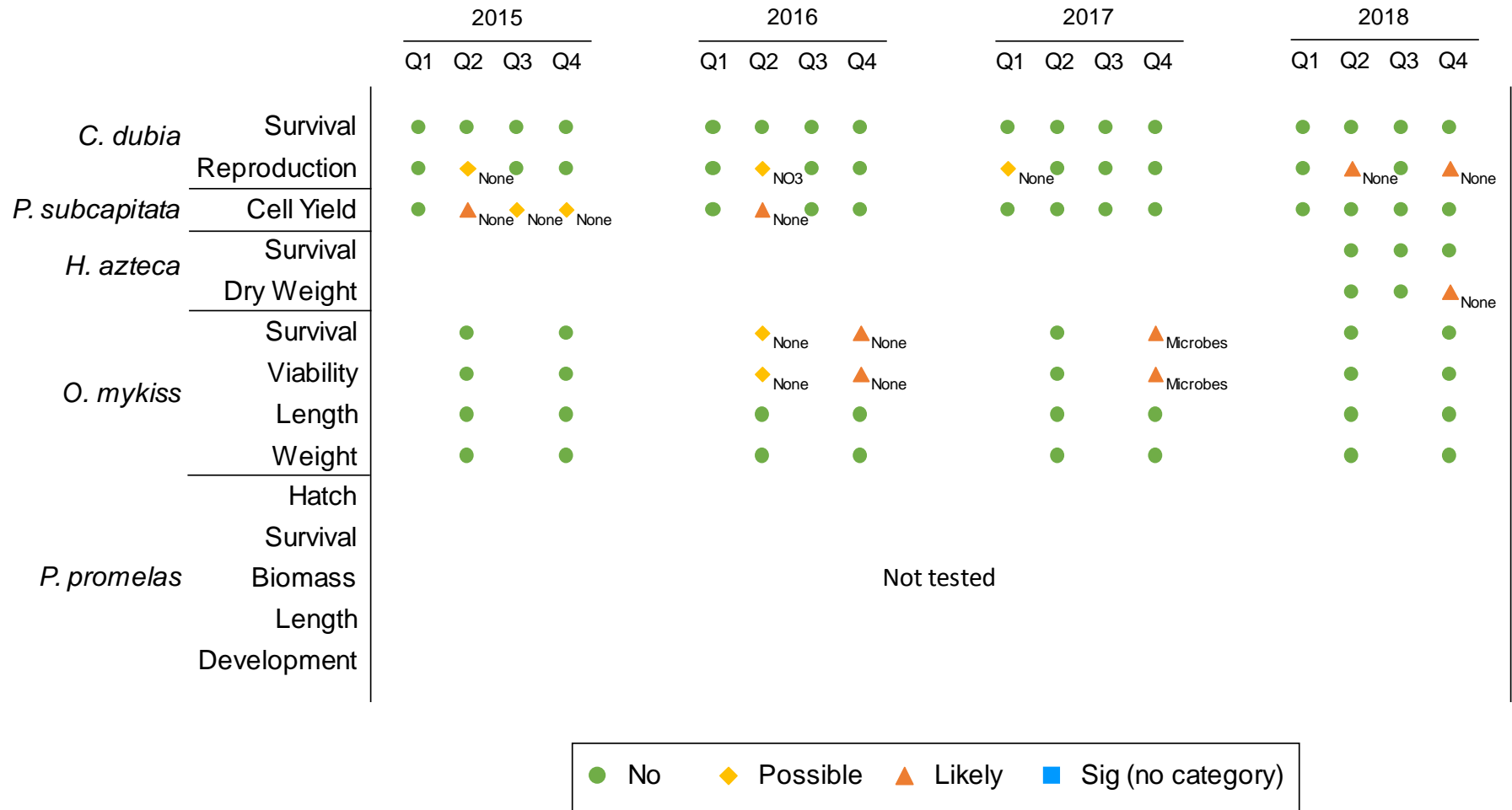
3.5.9 LC_LCDSSLCC

Results for LC_LCDSSLCC in 2015, 2016, 2017, and 2018 are summarized in Figure 3.5-23. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-1). Mean reproduction was generally within the local and regional NR, except for Q2 2016 and Q2 and Q4 2018 (Figure 3.5-2). A potential contributor to the observed response in Q2 2016 was nitrate. No water quality constituent was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs in most quarterly tests (Figure 3.5-3). No water quality constituent was identified as potentially contributing to observed responses.
- **H. azteca.** Testing for this species began in 2018. Survival and dry weight were within the local and regional NRs, except for Q4 2018 (Figure 3.5-4; Figure 3.5-5). No water quality constituent was identified as potentially contributing to the observed response.
- **O. mykiss.** Mean survival, viability, length and weight were within the local and regional NRs (Figure 3.5-6 to Figure 3.5-9). No water quality constituent was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Golder 2018a).

Overall, LC_LCDSSLCC has shown few adverse responses over time, with no apparent consistent pattern of responses and no clear evidence of causal factors.

Figure 3.5-23: Summary of test results by category at LC_LCDSSLCC.



Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), 2017 tests in Golder (2018a), and 2018 tests in Section 3.3.1. Possible, likely, and significant (no category) symbols are annotated with constituent(s) identified as potentially contributing to observed response. NO3 = nitrate; None = no water quality constituent was identified.

4.0 SUMMARY

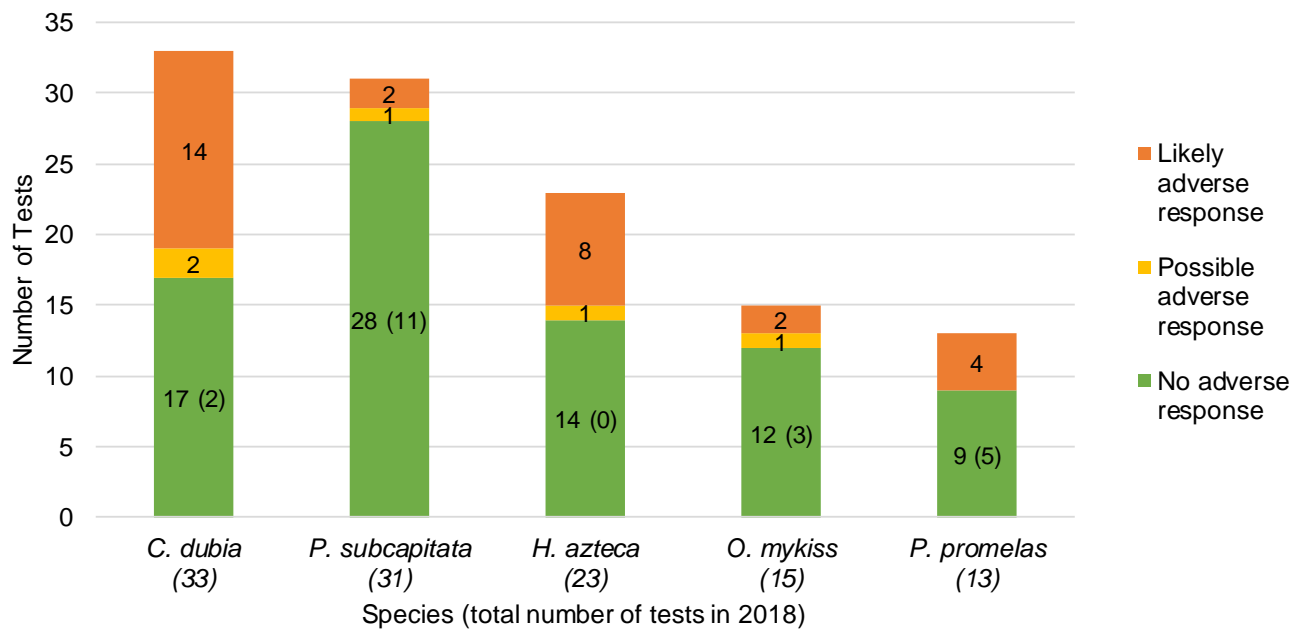
The following bullets summarize results from the 2018 interpretive report.

- **Quality Assurance/Quality Control**—QA/QC information indicated that organism performance in the laboratory control water generally met acceptability criteria for the protocol as it pertains to the health histories and sensitivity of the organisms (Section 3.1). Where deviations occurred that could influence the reliability of the data (e.g., poor egg quality in one of four replicates in Q4 *O. mykiss* testing), actions were taken to address this influence (e.g., exclusion of this replicate from statistical analyses).
- **Sources of Variance**—Key sources of variance that could affect responses observed in test waters were addressed herein, including variation in test organism performance (addressed by control normalization), variation in test organism sensitivity to toxicants (addressed by reviewing reference toxicant results), variation in background water quality characteristics (addressed by developing regional and local NRs), and variation in concentrations of toxicants in test waters (addressed by reviewing CVs) (Section 3.2). Addressing these sources of variance is expected to improve the ability to identify a true toxicological response.
- **Evaluation of 2018 Test Results**—The 2018 test results categorized as “no adverse response”, “possible adverse response”, or “likely adverse response” are illustrated on Figure 4-1. Key findings were:
 - For all species, most tests were categorized as no adverse response. Likely adverse responses were most common for *C. dubia* and least common for *P. subcapitata* and *O. mykiss*.
 - Stations FR_FRCP1 and CM_MC2 had the highest frequency of possible or likely adverse responses.
- **Concentration-Response Analysis**—Constituents identified as potential causes of toxicity in 2018 tests categorized as possible or likely (Section 3.4) are summarized in Table 4-1. Key findings were:
 - Sulphate and TDS were identified in the Q4 FR_FRCP1 test as potentially contributing to observed effects to all test species. For *C. dubia*, this aligned with TIE findings.
 - Nickel was identified in several Michel Creek tests as a potential or likely cause of toxicity to *C. dubia* and *H. azteca*, which generally aligned with TIE findings for *C. dubia* (CM_MC2 and CM_MC3) and *H. azteca* (CM_MC2).
- **Comparison of 2018 Results to Previous Years**—Similarities and differences were summarized between test results in the 2018 program and previous programs (2015 to 2017), focusing on the incidence of adverse responses by season and station (Section 3.5). Key findings were:
 - At FR_FRCP1, there is a trend towards more and larger responses for *C. dubia* and a higher prevalence of adverse responses in Q4 2018 testing relative to previous years. The Q4 result may be related to elevated sulphate and TDS concentrations, which were higher in Q4 2018 testing relative to previously tested concentrations in chronic toxicity monitoring. As discussed in Section 2.2.2.2, water quality under winter low flow conditions at FR_FRCP1 is not representative of upper Fording River mixed conditions which is the primary intent of the compliance point to monitor and evaluate cumulative discharges from Fording River Operations in the receiving environment (Teck 2019c). Instead, FR_FRCP1 water during low flow conditions (e.g., Q4 2018) is primarily Cataract Creek water. Teck has initiated several actions under the AMP response framework, including applying to expedite conveyance of Cataract Creek flows, applying to relocate the Fording River Operations compliance location from FR_FRCP1 to FR_FRABCH, and initiating TIE studies to better understand the cause(s) of toxicity at FR_FRCP1. If the conveyance

channel is on schedule (estimated to be Q2 or Q3 2019), then FR_FRCP1 water would be expected to improve for the next round of low-flow, Q4 testing (October to November 2019).

- At CM_MC2, there is a trend towards more and larger responses for *C. dubia* and *H. azteca*. The trend in responses corresponds with an increase in aqueous nickel concentrations between 2015 (generally ranged from 5 to 15 µg/L) and 2018 (generally ranged from 10 to 60 µg/L). As discussed in Section 2.2.2.2, Teck has already initiated several actions under the AMP response framework. These include expanding monitoring at CMO (including the addition of CM_MC3 to characterize spatial extent of effects at CM_MC2), initiating laboratory and desktop studies to support the development of site-specific effects benchmarks for nickel in the Elk Valley, and evaluating mitigation options for nickel at CMO.
- At other stations, there was no apparent consistent pattern of responses and no clear evidence of causal factors.

Figure 4-1: Summary of 2018 test results by species.



Note: Results are categorized in Section 3.3.1. The number of tests in each category is provided in bars. For the no category (green bars), the first number indicates the total number of tests categorized as no adverse response. The number in brackets indicates how many tests with statistically significant responses relative to one or more references were eventually categorized as “no adverse response” based on the decision rules.

Table 4-1: Summary of Constituents Identified as Potentially Contributing to Observed Responses in 2018

Species	Endpoint	FR_FRCP1	FR_FRABCH	GH_FR1	GH_ERC	EV_HC1	CM_MC2	CM_MC3	EV_MC2	LC_LCDSSLCC
Q1										
<i>C. dubia</i>	Reproduction	Ni, NO ₃ , TDS	-	-	-	-	Ni	-	None	-
<i>P. subcapitata</i>	Cell yield	None	-	-	-	-	-	-	-	-
<i>H. azteca</i>	Dry Weight	NO ₃	-	-	-	-	Ni	-	-	-
	Survival	-	-	-	-	-	None	-	-	-
Q2										
<i>C. dubia</i>	Reproduction	None	-	None	None	-	Ni	Ni	-	None
<i>P. subcapitata</i>	Cell yield	None	-	-	-	-	-	-	-	-
<i>H. azteca</i>	Dry Weight	-	-	-	-	-	Ni	-	-	-
	Survival	-	-	-	-	-	None	-	-	-
Q3										
<i>C. dubia</i>	Reproduction	None	-	-	-	-	Ni	Ni	-	-
<i>H. azteca</i>	Dry Weight	-	-	-	-	-	Ni	Ni	-	-
	Survival	-	-	-	-	-	Ni	None	-	-
<i>P. promelas</i>	Biomass	None	-	-	-	-	-	-	-	-
	Survival	None	-	-	-	-	None	-	-	-
Q4										
<i>C. dubia</i>	Reproduction	Ni, NO ₃ , SO₄ , TDS	-	-	-	-	Ni	Ni	-	None
<i>P. subcapitata</i>	Cell yield	SO₄ , TDS	-	-	-	-	-	-	-	-
<i>H. azteca</i>	Dry Weight	Ni, NO ₃ , SO₄ , TDS, U	NO ₃	-	-	-	Ni	-	-	None
	Survival	Ni, NO ₃ , U	-	-	-	-	None	-	-	-
<i>O. mykiss</i>	Length	NO ₃ , SO₄ , TDS	-	-	-	-	-	-	-	-
	Survival	NO ₃ , SO₄ , TDS	None	None	-	-	-	-	-	-
	Viability	NO ₃ , SO₄ , TDS	None	None	-	-	-	-	-	-
	Weight	NO ₃ , SO₄ , TDS	-	-	-	-	-	-	-	-
<i>P. promelas</i>	Biomass	SO₄ , TDS	None	-	-	-	-	-	-	-
	Length	SO₄ , TDS	-	-	-	-	-	-	-	-
	Survival	SO₄ , TDS	None	-	-	-	-	-	-	-

Notes:

Bold = Primary explanatory variable identified (i.e., sulphate and TDS).
 Species and endpoint shown if one or more tests identified as likely or possible for that quarter.
 Constituents were identified in Section 3.4.1 to Section 3.1.5.
 '-' = test was categorized as no adverse response;
 Ni = nickel; NO₃ = nitrate; SO₄ = sulphate; TDS = total dissolved solids; U = uranium;
 None = no water quality constituent was identified.

5.0 UNCERTAINTY

Sources of uncertainty associated with the interpretation of the quarterly and semi-annual toxicity testing program were:

- **Pairing of water quality and response data**—For the *H. azteca*, *P. promelas*, and *O. mykiss* tests, refresh water samples were collected on a weekly basis for the duration of the test. Refresh water samples, as well as the mean concentration over the test, were compared to chronic BC WQGs. In the concentration-response analysis, effects data for these tests were paired with the mean concentration of the weekly samples to conduct correlations. If concentrations of water quality constituents were higher (or lower) in one of the weekly samples, then examination of weekly samples may have resulted in different conclusions regarding constituents retained for graphical analysis. This uncertainty is not expected to affect the overall interpretation of the quarterly and semi-annual toxicity testing program because weekly refresh samples were screened against chronic BC WQGs and EVWQP benchmarks, so constituents potentially contributing to observed effects were captured in the overall concentration-response analysis. In addition, results of other testing of Elk Valley waters confirmed that variations over the span of a few weeks tend to be low (Golder 2018a).
- **Mixture effects**—The concentration-response analysis presented in Section 3.4 evaluated individual water quality constituents potentially contributing to observed test responses. Although Σ TUs were used in the concentration-response analysis as an exposure metric for mixtures, it cannot be ruled out that some constituents may act in combination in such a way that is not captured by the Σ TU calculations. A qualitative multiple-stressor analysis was completed in Chapter 8 of the EVWQP to assess potential interactions among the four EVWQP constituents. Although mechanisms of action have not been definitively determined, the available information indicates that these constituents likely have different mechanisms of action:
 - Selenium produces adverse effects following dietary accumulation of seleno-amino acids into protein-rich tissues.
 - Although the specific mechanism of action is uncertain, nitrate may exhibit toxicity following uptake and conversion to nitrite, which can then impair oxygen transport. In the Elk Valley, nitrate is not likely to contribute meaningfully to the osmotic pressure that may be important for sulphate toxicity, because it is present at low concentrations relative to the total ionic content of mine-influenced water.
 - Sulphate appears to act primarily on the iono-regulatory organs of freshwater organisms, and may exert stress because of general osmoregulatory pressure or disruption of cellular membrane function in conjunction with other components of TDS.

In addition to those constituents discussed in the EVWQP, nickel was also identified herein as a likely cause of toxicity in some tests. Potential mechanisms for nickel toxicity on aquatic organisms include disruption of trace element and ion homeostasis (e.g., calcium, magnesium, and iron), allergic reactions at respiratory epithelia, disruption of energy metabolism, and oxidative stress (Brix et al. 2017).

Notwithstanding the different mechanisms of action, conceptually it is possible that effects from multiple constituents could operate in an additive manner where they ultimately affect the same toxicological endpoint (e.g., nitrate and TDS could separately influence *O. mykiss* survival via different toxicological pathways).

Most water quality constituents evaluated in the concentration-response analysis had concentrations below water quality guidelines or orders of magnitude below effect concentrations. Based on the information above (i.e., different mechanisms of action and most concentrations below water quality guidelines or toxicological

benchmarks), there is a low potential for additive effects of multiple constituents. It is unlikely that combined effects among the constituents would occur, and the approach taken in the assessment of evaluating each substance independently is expected to provide a reliable assessment of the overall potential for adverse effects from water quality.

- **Microbial Influence**—For fathead minnows, the uncertainty related to microbial activity (i.e., sporadic mortality phenomenon) has been substantially reduced through use of the 10 µg/L or 20 µg/L copper amendment (Appendix B). Survival was still affected in the Q2 reference and test sites waters, and the timing of mortalities suggested insufficient control of microbial effects in this case. However, the implementation of copper amendment has greatly reduced this source of variance (that is unrelated to mining activity) and thereby reduced the incidence of false positive toxicity findings. As a result, the incidence of toxicity to fathead minnows decreased substantially from 2015 to 2018, to the extent that fathead minnows currently yield one of the lowest rate of significant results among the five species tested in quarterly or semi-annual chronic testing.

For other test species, particularly rainbow trout, the potential for sporadic mortality remains. Although routine testing does not indicate the same potential for microbial confounding of *C. dubia* toxicity relative to *P. promelas* (Downey et al. 2000), the other tests in the Permit-based testing program may be influenced by microbial factors, particularly chronic tests of salmonids (i.e., rainbow trout). Previous semi-annual testing (e.g., Q4 2017) and other testing programs with rainbow trout in Elk Valley water (e.g., Fall 2016 nitrate/sulphate supplemental investigation) have observed significant sudden and sporadic mortality in a number of replicates during days 13–24. The observation of mortality within a specific time window matches the sporadic mortality phenomenon observed for fathead minnow testing (but with a different timing of onset). In conjunction with sporadic mortalities, observations of fungal growth on dead embryos were observed, indicative of microbial presence. Such observations were not apparent in 2018 semi-annual tests, but the potential for future interferences remains. Preliminary findings from copper- and argentine-amended tests indicated that copper additions up to 40 µg/L would not be expected to result in direct toxicity (Section 3.3.1.4). However, because of the lack of microbial effects in 2018 testing, the effectiveness of such copper amendments to ameliorate microbial responses is not known.

The lack of microbial response in 2018 was unexpected, particularly for Q4, relative to previous semi-annual testing. However, the timing of microbial interferences is highly variable, so it is difficult to anticipate specific seasons or stations where microbial responses are more likely to occur. One possible explanation for the change in frequency of microbial responses is the egg source that was used for Q4 2018 testing, which was different than previous testing (James Elphick, pers. comm.). Recommendation to investigate this explanation is provided in Section 6.0.

6.0 RECOMMENDATIONS

Recommendations for future quarterly and semi-annual toxicity testing programs are:

- **Maintain modified *P. promelas* test procedures**—Nautilus conducted *P. promelas* quarterly tests with reference water treated with 10 µg/L or test site water treated with 10 µg/L and 20 µg/L (Appendix B). Due to the efficacy and minimal impact on control performance, copper treatment is recommended as a method to effectively mitigate toxicity due to microbial/fungal interference, while still allowing a relevant measure of the presence of other toxicants in the samples. In most testing conducted to date, a copper amendment of 10 µg/L has effectively mitigated toxicity due to microbial effects. However, a subset of *P. promelas* tests conducted in 2018 that indicated a higher copper dose (20 µg/L) was required to address microbial influences. For future testing, only a single amendment level is recommended for copper-treated *P. promelas* tests. A copper amendment between 10 and 20 µg/L is recommended as a suitable compromise between the effectiveness of the treatment (ability to eliminate microbial interference) and the specificity of the treatment (ability to target microbes without causing toxicity from excessive copper). Consistent with the January 2018 amendment to Permit 107517, ameliorating factors that influence copper toxicity (e.g., hardness, DOC) will be considered when determining the copper amendment.
- ***O. mykiss* test procedures**—Nautilus conducted *O. mykiss* tests in Q2 and Q4 with one reference and one test site treated with argentine only, argentine and copper, copper only (Section 3.3.1.4). The lack of microbial response in 2018 testing precluded an evaluation of the effectiveness of these treatments to curtail microbial growth. However, preliminary findings indicated that copper (up to 40 µg/L) is preferred to argentine to avoid direct toxicity of the amendment itself. The reason for reduced microbial effects in 2018 is not known, but it could be related to the different egg source used in Q4 testing relative to previous years. If copper amendment does not sufficiently curtail microbial growth in future tests, then the egg source should be considered, either in combination with copper or on its own. Copper additions up to 20 µg/L are approved for testing with rainbow trout; therefore, testing with higher copper doses (e.g., 40 µg/L) would occur in addition to the approved amendment.
- **Continue toxicity testing with Elk River, Fording River, Michel Creek, and South Line Creek reference waters**—Test organism responses references were usually comparable within a given season. However, in some quarterly tests, responses were significantly different in reference waters. Inclusion of all four references provided useful information about the natural variability in reference responses and important context for the interpretation of test site results.
- **Conduct nickel spiking study with *H. azteca* at various hardness levels**—Nautilus conducted a nickel spiking study with Michel Creek water in 2018. The thresholds for adverse effects of nickel to *H. azteca* may be somewhat under-estimated from the 2018 test (i.e., the IC_x may be lower), since test organisms were exposed to a ten-fold lower dose of nickel during the second half of the exposure (Nautilus 2018). A repeat of this test is planned for Q2 2019. The repeated test will provide useful information about the nickel threshold at the tested hardness (intended to match conditions at CM_MC2), but it will not allow for extrapolation to thresholds at different hardness values. Therefore, nickel testing with *H. azteca* at several hardness levels is recommended to evaluate how chronic toxicity of nickel varies with different water quality conditions in the Elk Valley. The approach for this study could follow that used for *C. dubia* (Teck 2019b), with the overall goal of developing a hardness-based dose-response curve that could estimate nickel effect sizes in chronic toxicity tests.

7.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Golder Associates Ltd.

Original Signed By

Vanessa Aberle, MSc
Environmental Scientist

Original Signed By

Emily-Jane Costa, MSc
Environmental Scientist

Original Signed By

Gary Lawrence, MRM, RP Bio
Associate, Senior Environmental Scientist

8.0 REFERENCES

- ASTM (American Society for Testing and Materials). 2013. *Standard guide for conducting early life-stage toxicity tests with fishes*. E1241-05, 29 p.
- BC MoE. 2008. Ambient Water Quality Guidelines for Iron. February 2008.
- Borgmann U, Couillard Y, Doyle P, Dixon DG. 2005. Toxicity of sixty-three metals and metalloids to *Hyalella azteca* at two levels of water hardness. *Environmental Toxicology and Chemistry* 24: 641-652.
- Brix KV, Schlekot CE and Garman ER. 2017. The mechanisms of nickel toxicity in aquatic environments: An adverse outcome pathway analysis. *Environmental Toxicology and Chemistry* 36: 1128-1137
- CCME (Canadian Council of Ministers of the Environment). 2011. Canadian water quality guidelines for the protection of aquatic life: Uranium. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.
- Costa EA, AM de Bruyn. 2017. Estimating species sensitivity distributions for nitrite from limited data. Society of Environmental Toxicology and Chemistry, SETAC North America 38th Annual Meeting. Minneapolis, MN. November 2017.
- Downey PJ, Fleming K, Guinn R, Chapman N, Varner P, Cooney JD. 2000. Sporadic mortality in chronic toxicity tests using *Pimephales Promelas* (Rafinesque): Cases of characterization and control. *Environmental Toxicology and Chemistry* 19(1): 248–255.
- Emery, R, DC Klopfer and JRS Skalski. 1981. *The incipient toxicity of lithium to freshwater organisms representing a salmonid habitat*. Prepared for the United States Department of Energy. Prepared by Battelle Memorial Institute. July 1981.
- Environment Canada. 1998. *Biological test method: toxicity tests using early life stages of salmonid fish (rainbow trout)*. Environmental Protection Series EPS 1/RM/28. Second Edition, July 1998. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 102 pp.
- Environment Canada. 2007a. *Biological test method: test of reproduction and survival using the cladoceran Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.
- Environment Canada. 2007b. *Biological test method: growth inhibition test using a freshwater alga*. EPS 1/RM/25, Second Edition, March 2007.
- Environment Canada. 2016. Federal Environmental Quality Guidelines Vanadium. May 2016. Available at: <http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=48D3A655-1>
- Environment Canada. 2017. Federal Environmental Quality Guidelines Cobalt. May 2017, Available at: <http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=92F47C5D-1>
- EU (European Union). 2008. European Union Risk Assessment Report – Nickel. May 2008. Available at: <https://echa.europa.eu/documents/10162/cefda8bc-2952-4c11-885f-342aacf769b3>
- Golder (Golder Associates Ltd.). 2013. *Phase I Report: Elk Valley Mixture Toxicity Study*. Submitted to Teck Coal Limited. July 2013.
- Golder. 2016. Annual Interpretive Report—2015 Chronic Toxicity Testing Program. Submitted to Nick Manklow, Teck Coal Limited. 31 March 2016.

- Golder. 2017. Annual Interpretive Report—2016 Chronic Toxicity Testing Program. Submitted to Nick Manklow, Teck Coal Limited. 31 March 2017.
- Golder. 2018a. Annual Interpretive Report—2017 Chronic Toxicity Testing Program. Submitted to Nick Manklow, Teck Coal Limited. 6 April 2018 (Updated July 2018).
- Golder. 2018b. Final Interpretive Report – Chronic Toxicity Testing of Nitrate and Sulphate to Support Permit Requirements. Submitted to Nick Manklow, Teck Coal Limited. 31 March 2018.
- Kszos LA, Beauchamp JJ, Stewart AJ. 2003. Toxicity of lithium to three freshwater organisms and the antagonistic effect of sodium. *Ecotoxicology* 12: 427–437.
- McPherson CA, Lawrence GS, Elphick JR, Chapman PM. 2014. Development of a strontium chronic effects benchmark for aquatic life in freshwater. *Environmental Toxicology and Chemistry* 33: 2742-2478.
- MoE. 2016. Letter to Teck Coal Limited. Re: Copper amendment for microbial control in the Fish Early-Life Stage Toxicity Test. 23 December 2016.
- Mount DR, Gulley DD, Hockett JR, Garrison TD, Evans JM. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia*, *Daphnia magna* and *Pimephales promelas* (fathead minnows). *Environmental Toxicology and Chemistry* 16: 2009-2019
- Mount DR, Erickso RJ, Highland TL, Hockett JR, Hoff DJ, Jenson CT, Norberg-King TJ, Peterson KN, Polaske ZM, Wisniewski S. 2016. The acute toxicity of major ion salts to *Ceriodaphnia dubia*: I. influence of background water chemistry. *Environmental Toxicology and Chemistry* 35: 3039-3057
- Nautilus. 2018. Toxicity Identification Evaluation for CM_MC2. Prepared for Teck Coal Limited. September 2018.
- Norberg-King TJ, Hockett R, Mount DR, Ivey C, Ingersoll C, Kemble N, Brumbaugh B, Hammer E, Soucek D, Taylor L. 2014. *Inter-lab testing of Hyalella azteca water and sediment methods: 3. Results from 10- to 42-d tests conducted with the new water-only method*. Proceedings of SETAC, Vancouver, BC, Canada, November 9–13, 2014.
- Teck (Teck Coal Limited). 2014. Elk Valley water quality plan. Submitted to the British Columbia Ministry of Environment, July 22, 2014. Approved on November 18, 2014. Sparwood, BC. 290 pp.
- Teck. 2016a. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. July 2016.
- Teck. 2016b. Reference: 107517 Section 9.8 Chronic Toxicity Testing Program—Acceptance Request: Fathead Minnow Chronic Toxicity Testing to Include Copper Treatment. Letter submitted to Jeanien Carmody-Fallows (Authorizations Section Head, Mining Operations, BC Ministry of Environment, Smithers, BC) from Nick Manklow (Lead, Adaptive Water Management, Teck Coal Limited, Sparwood BC). 21 December 2016.
- Teck. 2018a. Chronic Toxicity Program - EMC Meeting—16 October 2018. PowerPoint Presentation.
- Teck. 2019a. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. Prepared by Teck Coal Limited. December 2019.
- Teck. 2019b. Chronic Toxicity Program – Conference Call—5 February 2019. PowerPoint Presentation.
- Teck. 2019c. Permit 107517 Annual Water Quality Monitoring Report. 19 March 2019.

Tidepool Scientific Software. 2013. *CETIS comprehensive environmental toxicity information system, version 1.8.7.16* Tidepool Scientific Software, McKinleyville, CA. 275 pp.

US EPA (United States Environmental Protection Agency). 1996. *Ecological Effects Test Guidelines*. OPPTS 850.1400 Fish Early-Life Stage Toxicity Test. EPA-712-C-96-121, Public Draft.

US EPA. 2000. *Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates*. EPA 600/R-99/064. March 2000.

US EPA. 2010. Final Report on Acute and Chronic Toxicity of Nitrate, Nitrite, Boron, Manganese, Fluoride, Chloride and Sulfate to Several Aquatic Animal Species. Region 5, Chicago, IL, USA. EPA 905-R-10-002.

APPENDIX A

Summary of Regulatory Requirements for Chronic Toxicity Testing

Permit #107517 issued under the Environmental Management Act (Elk Valley EMA Permit) – Section 9.8

9.8 CHRONIC TOXICITY TESTING PROGRAM

The Permittee must develop and implement a toxicity testing program for receiving environments affected by coal mining operations. The purpose of the program is to evaluate chronic toxicity at the compliance points and other locations throughout the Elk Valley.

The toxicity testing program must include, at a minimum, the following elements:

- i. Once every three years beginning in 2015, bioassays to evaluate the survival and development (incidence of deformities) of westslope cutthroat trout using gametes obtained from fish utilizing habitats in the Fording River, tributaries, and associated lentic habitats (e.g., Fording River oxbow). The concentrations of selenium in the eggs of each female spawned must be measured;
- ii. Quarterly or semi-annual surface-water chronic toxicity testing using a suite of toxicity tests:

The following toxicity test must be conducted during each semi-annual (spring and fall) sampling event:

- 30-day early life-stage test with the rainbow trout (*Oncorhynchus mykiss*; EPS1/RM/28) using <24-hour post-fertilization eggs; **endpoints:** survival, hatching, growth, deformity, behaviour;

The following toxicity tests must be conducted during each quarterly sampling event at all compliance points:

- 7-day water-only test with the cladoceran, *Ceriodaphnia dubia* (EPS1/RM/21); **endpoints:** survival, reproduction;
- 72-hour test with the alga, *Pseudokirchneriella subcapitata* (EPS1/RM/25); **endpoints:** growth inhibition;

The following toxicity tests must be conducted during each quarterly sampling event at compliance points in the Fording River (specifically FRO and GHO Fording) and Michel Creek (CMO):

- 28-day water-only test with amphipod, *Hyaella Azteca* (adapted from USEPA 2000); **endpoints:** survival, growth; and
 - 30-day early life-stage test with the fathead minnow, *Pimephales promelas* (USEPA 1996) using <24-hour post-fertilization eggs; **endpoints:** survival, hatching, growth, deformity.
- iii. Toxicity testing methods must be consistent with Environment Canada's, U.S. Environmental Protection Agency's, or ASTM's approved biological test methods;
- iv. A Quality Assurance/Quality Control component; and
- v. A proposed schedule of dates that coincide with water quality sampling and that target predicted worst-case times such as low flow, during flocculant use, or when discharge quality is expected to be reduced.

The suite of toxicity tests will be reviewed on an annual basis by the EMC and recommendations provided to the Director for consideration.

9.8.1 Sulphate Toxicity at High Hardness Concentrations

The Permittee must develop with input from the EMC, and implement a toxicity testing program specifically to assess sulphate toxicity at high hardness concentrations. Results will be used to support finalization of long term sulphate site performance objectives.

The following toxicity test shall be conducted as a component of the Sulphate toxicity testing program.

- 30-day early life-stage test with the fathead minnow, *Pimephales promelas* (USEPA 1996) using <24-hour post-fertilization eggs; **endpoints:** survival, hatching, growth, deformity.
- Other sensitive species (amphibian, trout, water flea, etc.) shall be included.

Monitoring results and interpretation must be compiled into a written report and submitted to the satisfaction of the Director by December 31, 2017.

9.8.2 Sublethal Toxicity Study

The Permittee must develop with input from the EMC, and implement a sublethal toxicity study to confirm that surface waters meeting the Site Performance Objectives for the order stations are not toxic to sensitive aquatic receptors. The Permittee must submit the study design to the Director by March 31, 2015.

Letter from the British Columbia (B.C.) Ministry of Environment (MOE) approving the study design for the Regional Aquatic Effects Monitoring Program (RAEMP)

Excerpt of toxicity testing requirements:

Teck shall work in collaboration with the Ministry and Ktunaxa Nation representatives ideally in a monitoring committee forum to prioritize the following studies for discussion and implementation. Recommendations from the monitoring committee must include brief study designs and be submitted to the Director for approval. These studies shall consider, at a minimum, the following studies previously recommended by the Technical Advisory Committee (TAC) established for the ABMP.

Nitrate Toxicity

Additional toxicity testing to study the effects of nitrate, including:

- a. Amphibian toxicity testing to assess the sensitivity of representative species to nitrate using long-term metamorphosis tests;
- b. Chronic toxicity testing to assess the sensitivity of invertebrates to nitrate using long-term tests; and
- c. Early life stage rainbow trout toxicity testing to assess the relationship between water hardness and nitrate toxicity across a range of hardness representative of the Elk and Fording Rivers.

APPENDIX B

**Nautilus Reports -
Quarterly and Semi-Annual Chronic Toxicity
Testing and
Summary of Acute Toxicity Testing**

Appendix B-1

First Quarter 2018 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca* and *Pimephales promelas*



**Toxicity testing on Elk Valley samples
with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata,
Hyalella azteca and *Pimephales
promelas***

First Quarter 2018 Results

Final Report

July 26, 2018

Submitted to: **Teck Coal Ltd.**
Sparwood, BC

TABLE OF CONTENTS

	Page
Signature Page.....	iii
Summary	iv
1.0 Introduction	4
2.0 Methods.....	7
3.0 Results.....	12
3.1 <i>Ceriodaphnia dubia</i>	12
3.2 <i>Pseudokirchneriella subcapitata</i>	12
3.3 <i>Hyalella azteca</i>	12
3.4 <i>Pimephales promelas</i>	13
4.0 QA/QC.....	16
5.0 References.....	17

List of Tables

Table 1.	Summary of toxicity testing program.....	5
Table 2.	Test conditions: <i>Ceriodaphnia dubia</i> survival and reproduction test.	8
Table 3.	Test conditions: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.	9
Table 4.	Test conditions: <i>Hyalella azteca</i> survival and growth test.	10
Table 5.	Test conditions: <i>Pimephales promelas</i> survival and growth test.....	11
Table 6.	Results: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	14
Table 7.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	15
Table 8.	Results: <i>Hyalella azteca</i> survival and growth test.	15
Table 9.	Results: <i>Pimephales promelas</i> survival and growth test.	16
Table 10.	Reference toxicant test results.	16

List of Figures

Figure 1.	Chronic toxicity monitoring locations.	6
-----------	---	---

List of Appendices

- APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data
- APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data
- APPENDIX C – *Hyalella azteca* Toxicity Test Data
- APPENDIX D – *Pimephales promelas* Toxicity Test Data
- APPENDIX E – Chain-of-Custody Forms

SIGNATURE PAGE



Report By:
Emma Marus, B.Sc.
Laboratory Biologist



Reviewed By:
James Elphick, R.P.Bio.
Environmental Toxicologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Summaries of sample information and test results from the toxicity tests conducted on samples collected from the Elk Valley to meet requirements of the quarterly toxicity testing program required under BC Ministry of Environment and Sustainability permit number 107517 in the first quarter of 2018 are provided in the tables below.

Sample and Test Type Information

Sample IDs	FR_UFR1 (site control), GH_ER2 (site control), CM_MC1 (site control) FR_FRCP1, GH_FR1, GH_ERC*, EV_MC2*, EV_HC1*, CM_MC2, CM_CM3+ and LC_LCDSSLCC*
Sample collection dates in Calgary	February 19, 27 and March 6, 13 and 20, 2018
Sample collection dates in Burnaby	February 27 and March 6, 13 and 20, 2018
Sample receipt dates	February 20, 28 and March 7, 14 and 21, 2018
Sample receipt temperatures	Ranged from -1.0 to 11.0°C ¹
Test types	<i>Ceriodaphnia dubia</i> 7-d survival and reproduction <i>Pseudokirchneriella subcapitata</i> 72-h growth inhibition <i>Hyalella azteca</i> 28-d survival and growth <i>Pimephales promelas</i> 32-d survival and growth

* Tested with *C. dubia* and *P. subcapitata* only

† Tested with *C. dubia*, *P. subcapitata* and *H. azteca* only.

¹ All samples received in the Calgary location were above 0°C, and samples received on February 20, 2018 in the Burnaby location were below 0°C (frozen or partially frozen). Consequently, samples were re-collected and testing postponed by one week in Burnaby.

Summary of Results

Endpoint	Mean ± SD					
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1
<i>C. dubia</i>						
Survival (%)	100	100	80	100	80	100
Reproduction	20.0 ± 3.7	17.6 ± 4.8	13.6 ± 9.1	15.4 ± 3.4	4.1 ± 4.6* ^α [†]	15.8 ± 2.4*
<i>P. subcapitata</i>						
Cell Yield (x 10 ⁴ cells/mL)	28.5 ± 2.2	167.1 ± 9.4 [§]	158.3 ± 8.3 [§]	157.0 ± 9.0 [§]	66.5 ± 5.3 [§] ^α ^β [†]	137.5 ± 2.4 [§] ^α ^β [†]
<i>H. azteca</i>						
Survival (%)	100.0 ± 0.0	98.0 ± 4.5	96.0 ± 5.5	100 ± 0.0	86.0 ± 26.1* [†]	96.0 ± 5.5
Dry weight (mg)	0.34 ± 0.06	0.27 ± 0.02	0.27 ± 0.03	0.24 ± 0.04*	0.13 ± 0.04* ^α ^β [†]	0.27 ± 0.06

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

[§] Result was significantly greater than the laboratory control

Summary of Results (continued)

Endpoint	Mean ± SD					
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	CM_MC3	LC_LCDSSLCC
<i>C. dubia</i>						
Survival (%)	100	100	100	100	100	100
Reproduction	14.6 ± 5.9	11.2 ± 4.5* ^α	11.9 ± 5.4*	9.5 ± 3.7* ^{α†}	17.3 ± 4.0	14.9 ± 3.8*
<i>P. subcapitata</i>						
Cell Yield (x 10 ⁴ cells/mL)	167.8 ± 8.7 [§]	167.3 ± 3.3 [§]	154.5 ± 9.7 [§]	145.0 ± 7.5 ^{§αβ}	145.8 ± 7.3 ^{§α}	164.3 ± 10.3 [§]
<i>H. azteca</i>						
Survival (%)	NT	NT	NT	36.0 ± 35.8* ^{αβ†}	98.0 ± 4.5	NT
Dry weight (mg)	NT	NT	NT	0.05 ± 0.02* ^{αβ†}	0.28 ± 0.03	NT

SD = Standard Deviation, NT = Not Tested

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

[§] Result was significantly greater than the laboratory control

Summary of Results (continued)

Endpoint	Mean ± SD						
	Lab Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1	CM_MC2
<i>P. promelas</i>							
10 µg/L Cu							
Hatch (%)	98.3 ± 3.3	100 ± 0.0	98.3 ± 3.3	98.3 ± 3.3	100 ± 0.0	100 ± 0.0	98.3 ± 3.3
Survival (%)	95.0 ± 6.4	85.0 ± 8.4	73.3 ± 37.7*	95.0 ± 3.3	84.8 ± 12.6	86.7 ± 12.2	91.7 ± 6.4
Biomass (mg)	1.62 ± 0.22	1.58 ± 0.16	1.39 ± 0.14	1.39 ± 0.08	1.54 ± 0.16	1.57 ± 0.06	1.59 ± 0.04
Length (mm)	10.4 ± 0.6	10.0 ± 0.6	11.3 ± 1.4	9.2 ± 0.7*	10.4 ± 0.6	10.1 ± 0.1 ^α	9.8 ± 0.3 ^α
Normal development (%)	98.3 ± 3.3	98.3 ± 3.3	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	98.3 ± 3.3
20 µg/L Cu							
Hatch (%)	100 ± 0.0	NT	NT	NT	93.3 ± 5.4	93.3 ± 7.7	93.3 ± 3.3
Survival (%)	93.3 ± 0.0	NT	NT	NT	78.3 ± 17.5	85.0 ± 14.8	91.7 ± 16.7
Biomass (mg)	1.38 ± 0.09	NT	NT	NT	1.48 ± 0.11	1.41 ± 0.20	1.67 ± 0.35
Length (mm)	10.5 ± 0.3	NT	NT	NT	10.5 ± 0.6	10.4 ± 0.4	10.1 ± 0.5
Normal development (%)	100 ± 0.0	NT	NT	NT	100 ± 0.0	100 ± 0.0	100 ± 0.0

SD = Standard Deviation, NT = Not Tested

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

1.0 INTRODUCTION

Nautilus Environmental conducted toxicity tests for Teck Coal Ltd. on samples collected from various locations in the Elk Valley as part of a quarterly toxicity testing program required under BC Ministry of Environment and Sustainability permit number 107517. Test species required to be tested quarterly include a cladoceran (*Ceriodaphnia dubia*), a unicellular green alga (*Pseudokirchneriella subcapitata*), an amphipod (*Hyaella azteca*), and the fathead minnow (*Pimephales promelas*).

Water samples used for testing were collected on February 19, 2018 and transported in 20-L plastic containers in coolers containing ice packs. On February 20, 2017, samples were received at temperatures ranging from -1.0 (frozen or partially frozen) to 11.0°C. Only the Burnaby location received samples that were below 0°C, while temperature of samples received at the Calgary location were above 0°C. Consequently, testing in Burnaby using *C. dubia*, *P. subcapitata* and *H. azteca* was initiated on the following week with samples that were collected on February 27, 2018. Sample collection was extended one additional week for the *H. azteca* test. There were no changes to the start date of the *P. promelas* test, which was performed in Calgary. All samples were stored in the dark at $4 \pm 2^\circ\text{C}$ prior to testing. Table 1 summarizes the toxicity tests that were conducted on each sample as well as sample collection dates. Samples were collected weekly on the dates shown in Table 1 for the duration of the 28-d *H. azteca* and 32-d *P. promelas* tests.

This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through D. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management System database. These samples were collected by Teck personnel at the same time the samples were collected for toxicity testing. The chain-of-custody forms are provided in Appendix E.

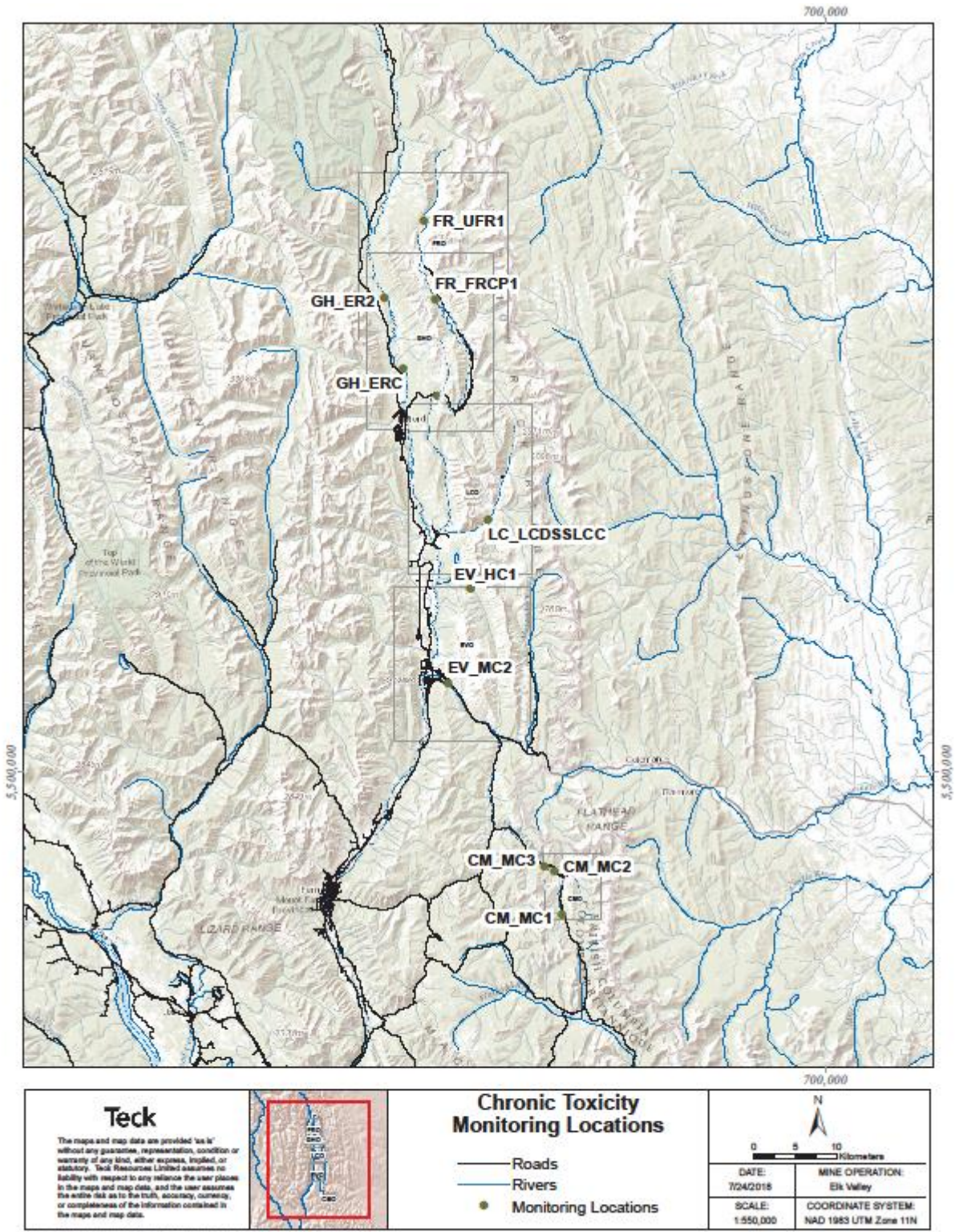
Table 1. Summary of toxicity testing program.

Sample ID	EMS Location ID	Species Tested	Sample Collection Dates †
FR_UFR1 *	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
GH_ERC	E300090	<i>C. dubia</i> and <i>P.</i> <i>subcapitata</i>	February 27, 2018
EV_MC2	E300091	<i>C. dubia</i> and <i>P.</i> <i>subcapitata</i>	February 27, 2018
EV_HC1	E102682	<i>C. dubia</i> and <i>P.</i> <i>subcapitata</i>	February 27, 2018
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	February 19, 27 and March 6, 13, 20, 2018
CM_MC3		<i>C. dubia</i> , <i>P. subcapitata</i> and <i>H. azteca</i>	February 27 and March 6, 13, 20, 2018
LC_LCDSSLCC	E297110	<i>C. dubia</i> and <i>P.</i> <i>subcapitata</i>	February 27, 2018

* Site water controls

† The *P. promelas* test began with samples collected on February 19, 2018 and the *C. dubia*, *P. subcapitata* and *H. azteca* tests began with samples collected on February 27, 2018.

Figure 1. Chronic toxicity monitoring locations.



2.0 METHODS

Methods for the toxicity tests using *C. dubia*, *P. subcapitata*, *H. azteca* and *P. promelas* are summarized in Tables 2 through 5. Laboratory control water was 20% Perrier water prepared with deionized water for *C. dubia*; deionized water supplemented with nutrients for *P. subcapitata*; dechlorinated City of Calgary municipal tap water for *P. promelas*; and reconstituted water prepared by addition of reagent grade salts to dechlorinated Metro Vancouver municipal tap water for *H. azteca* according to a recipe provided in Environment Canada (2013).

For the *H. azteca* tests, all of the site waters were supplemented with 25 mg/L chloride and 0.02 mg/L bromide using NaCl and NaBr, respectively, according to recommendations of the *Hyaella* Advisory Group (chaired by Chris Ingersoll, USGS) (Norberg-King et al., 2014), since low concentrations of these halides are known to impair growth of this species. The laboratory control water contained approximately 75 mg/L chloride and 0.8 mg/L bromide, respectively.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Kszos et al., 1997; Downey et al. 2000). Results of toxicity tests and Toxicity Identification Evaluation efforts conducted in 2015 indicated that artefactual toxicity (i.e., adverse effects that were not associated with toxicants in the sample) had occurred in fathead minnow tests using ambient water samples from the Elk Valley and amendment of the samples with a low dose of copper appeared to counteract the adverse effect. Consequently, the *P. promelas* tests were tested on the samples with addition of 10 µg/L copper, in order to reduce the potential adverse effects caused by fungi and microbes in the samples. Three of the site waters (FR_FRCP1, GH_FR1 and CM_MC2) were also tested using 20 µg/L copper to evaluate whether a higher concentration of copper was necessary to control microbial growth in these samples, which contained a higher hardness than the other samples. Copper-amended control water treatments using the same concentrations were also evaluated to test whether copper itself caused any adverse response.

Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013), and involved comparison of results to both the laboratory and site water controls.

Table 2. Test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	<i>Ceriodaphnia dubia</i>
Organism source	In-house culture
Organism age	<24 hour old neonates, produced within a 12 hour window
Test type	Static-renewal
Test duration	7 ± 1 day
Test vessel	20-mL glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Control water	20% Perrier water and 80% deionized water + 5 µg/L Se and 2 µg/L vitamin B12
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with <i>Pseudokirchneriella subcapitata</i> and YCT (3:1 ratio)
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival and reproduction checked daily
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and reproduction ≥80% survival; ≥15 young per surviving control producing three
Test acceptability criteria for controls	broods; ≥60% of controls producing three or more broods; no ephippia present
Reference toxicant	Sodium chloride (NaCl)

Table 3. Test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	<i>Pseudokirchneriella subcapitata</i> , strain CPCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Full strength sample diluted to 95.2% (v/v) by addition of nutrients, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control and site control
Number of organisms	10,000 cells/mL
Control water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007b), EPS 1/RM/25
Statistical software	CETIS Version 1.8.7
Test endpoints	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as ZnSO ₄)

Table 4. Test conditions: *Hyalella azteca* survival and growth test.

Test species	<i>Hyalella azteca</i>
Organism source	Aquatic Research Organisms, NH
Organism age	7- to 8-days old
Test type	Static-renewal
Test duration	28 days
Test vessel	375-mL glass container
Test volume	300 mL
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	5 per treatment
Number of organisms	10 per replicate
Control water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples were supplemented with 25 mg/L Cl and 0.02 mg/L Br.
Test solution renewal	Twice daily (~80% renewal)
Test temperature	23 ± 1°C
Feeding	1 mL of YCT daily to each container. Tetramin daily, with amounts increasing weekly: Week 1: 0.25 mg, Week 2: 0.5 mg, Week 3: 1 mg, Week 4: 1.5 mg in each test container.
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; hardness and alkalinity measured at test termination; total ammonia measured at test initiation and termination
Test protocol	Modified from US EPA (2000), as described in Norberg-King et al. (2014)
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	Mean control survival of ≥80% survival
Reference toxicant	Sodium chloride (NaCl)

Table 5. Test conditions: *Pimephales promelas* survival and growth test.

Test species	<i>Pimephales promelas</i>
Organism source	Aquatox, Hot Springs, AR
Organism age	<24 hours
Test type	Static-renewal
Test duration	From egg stage until 28 days post hatch
Test vessel	1-L plastic container
Test volume	1 L
Test concentrations	100% (undiluted) sample amended with 10 or 20 µg/L Cu, plus laboratory control and control amended with 10 or 20 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control water	Dechlorinated City of Calgary municipal tapwater
Test solution renewal	Daily (80% renewal)
Test temperature	25 ± 1°C
Feeding	Twice a day, after hatch, with newly hatched brine shrimp (<i>Artemia nauplii</i>)
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None unless dissolved oxygen fell to less than 60% saturation
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; survival checked daily
Test protocol	US EPA (1996) and ASTM (2013)
Statistical software	CETIS Version 1.8.7
Test endpoints	Hatch, survival, length, biomass, normal development (which assesses incidence of deformities)
Test acceptability criteria for controls	>66% hatch, ≥70% post-hatch survival
Reference toxicant	Sodium chloride (NaCl)

3.0 RESULTS

3.1 *Ceriodaphnia dubia*

Results of the toxicity tests using *C. dubia* are provided in Table 6. The Fording River (FR_UFR1), Elk River (GH_ER2) and Michel Creek (CM_MC1) site waters were not statistically different from the laboratory control for this species, indicating that there were no adverse effects associated with the upstream Fording River, Elk River and Michel Creek stations.

There were no adverse effects on survival; survival ranged from 80 to 100% in all samples and control treatments. Reproduction was significantly reduced in six samples (FR_FRCP1, GH_FR1, EV_MC2, EV_HC1, CM_MC2 and LC_LCDSSLCC) compared to the laboratory control. Compared to site control FR_UFR1, reproduction was significantly reduced in three (FR_FRCP1, EV_MC2 and CM_MC2) out of eight samples. Compared to site control CM_MC1, reproduction was significantly reduced in two (FR_FRCP1 and CM_MC2) out of eight samples. None of the samples exhibited reproduction that was statistically significantly reduced in comparison to GH_ER2. Sample FR_FRCP1 produced the greatest reduction in reproduction, with an 80% reduction of reproduction relative to the laboratory control.

3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 7. In these tests, the three site water controls produced 5.5 to 5.8-fold greater growth than the laboratory control. This finding is not unusual, since the higher ionic strength associated with the site water controls would be expected to stimulate cell growth of this species relative to the very low ionic strength associated with the laboratory control water.

There were no adverse effects on cell yield in any of the samples compared to the laboratory control; stimulation ranged between 133.3 to 488.6%. Cell growth was statistically significantly reduced in four of the samples (FR_FRCP1, GH_FR1, CM_MC2 and CM_MC3) compared to site control FR_UFR1; two of the samples (FR_FRCP1 and GH_FR1) relative to site control CM_MC1; and three of the samples (FR_FRCP1, GH_FR1 and CM_MC2) compared to site control GH_ER2.

3.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 8. Survival in the site water controls was similar to the laboratory control for this species, indicating that there was no adverse

effect associated with the three upstream sites for this endpoint. Dry weight in site water controls FR_UFR1 and GH_ER2 was not statistically different compared to the laboratory control; however, dry weight of *H. azteca* in site water control CM_MC1 was statistically lower compared to the laboratory control for this endpoint, with an average dry weight of 0.24 mg compared to 0.34 mg in the laboratory control.

There were no adverse effects on survival or dry weight associated with samples GH_FR1 and CM_MC3 relative to any of the control treatments. Samples FR_FRCP1 and CM_MC2 produced survival and dry weight results that were statistically lower than the laboratory control and each of the three site controls. The greatest effect was with CM_MC2, which produced 36% survival and a dry weight of 0.05 mg per amphipod, compared to the control which had 100% survival and dry weight of 0.34 mg per amphipod.

3.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 9. Data for two replicates from sample GH_ER2 were excluded from the statistical analyses as a result of having observed adverse effects in these replicates on Day 21 of exposure, following a failure of the thermostat in the test chamber to control the temperature to within $25 \pm 1^\circ\text{C}$; room temperature increased to 29°C overnight, and these two replicates, which were proximate to the heater in the test room, experienced complete mortality.

There were no adverse effects associated with upstream site controls FR_UFR1 and CM_MC1 as results for survival, hatch, biomass and normal development (i.e., incidence of deformities) were similar between these two site waters and the laboratory control, with the exception of length for CM_MC1, which produced a statistically lower length of 9.2 mm compared to 10.4 mm in the laboratory control. Survival of *P. promelas* in the GH_ER2 site water control was statistically lower compared to the laboratory control, but there were no differences in the other test endpoints for this sample.

There were no adverse effects on survival, hatch, biomass length or normal development in any of the 10 µg/L copper-amended samples relative to the copper-amended site water controls and laboratory control. There were also no differences relative to the site controls, with the exception of length of GH_FR1 and CM_MC2, which was statistically lower than that observed in the 10 µg/L copper-treated site control GH_ER2, but similar to that observed in the other two site water controls. The samples that were amended with 20 µg/L copper performed similarly to control treatments and to the samples amended with 10 µg/L copper.

Table 6. Results: *Ceriodaphnia dubia* survival and reproduction test.

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	20.0 ± 3.7
FR_UFR1 (Site Control)	100	17.6 ± 4.8
GH_ER2 (Site Control)	80	13.6 ± 9.1
CM_MC1 (Site Control)	100	15.4 ± 3.4
FR_FRCP1	80	4.1 ± 4.6 * ^α †
GH_FR1	100	15.8 ± 2.4 *
GH_ERC	100	14.6 ± 5.9
EV_MC2	100	11.2 ± 4.5 * ^α
EV_HC1	100	11.9 ± 5.4 *
CM_MC2	100	9.5 ± 3.7 * ^α †
CM_MC3	100	17.3 ± 4.0
LC_LCDSSLCC	100	14.9 ± 3.8 *

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

† Result was significantly lower than the site control CM_MC1

Table 7. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Sample ID	Cell Yield (x 10 ⁴ cells/mL)		Stimulation relative to laboratory control (%)
	(Mean ± SD)		
Laboratory Control	28.5 ± 2.2		-
FR_UFR1 (Site Control)	167.1 ± 9.4 [§]		486.4
GH_ER2 (Site Control)	158.3 ± 8.3 [§]		455.3
CM_MC1 (Site Control)	157.0 ± 9.0 [§]		450.9
FR_FRCP1	66.5 ± 5.3 ^{§αβ†}		133.3
GH_FR1	137.5 ± 2.4 ^{§αβ†}		382.5
GH_ERC	167.8 ± 8.7 [§]		488.6
EV_MC2	167.3 ± 3.3 [§]		486.8
EV_HC1	154.5 ± 9.7 [§]		442.1
CM_MC2	145.0 ± 7.5 ^{§αβ}		408.8
CM_MC3	145.8 ± 7.3 ^{§α}		411.4
LC_LCDSSLCC	164.3 ± 10.3 [§]		476.3

SD = Standard Deviation

[§] Result was significantly greater than the laboratory control^α Result was significantly lower than the site control FR_UFR1^β Result was significantly lower than the site control GH_ER2[†] Result was significantly lower than the site control CM_MC1**Table 8. Results: *Hyalella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	100.0 ± 0.0	0.34 ± 0.06
FR_UFR1 (Site Control)	98.0 ± 4.5	0.27 ± 0.02
GH_ER2 (Site Control)	96.0 ± 5.5	0.27 ± 0.03
CM_MC1 (Site Control)	100.0 ± 0.0	0.24 ± 0.04 [*]
FR_FRCP1	86.0 ± 26.1 ^{*†}	0.13 ± 0.04 ^{*αβ†}
GH_FR1	96.0 ± 5.5	0.27 ± 0.06
CM_MC2	36.0 ± 35.8 ^{*αβ†}	0.05 ± 0.02 ^{*αβ†}
CM_MC3	98.0 ± 4.5	0.28 ± 0.03

SD = Standard Deviation

^{*} Result was significantly lower than the laboratory control^α Result was significantly lower than the site control FR_UFR1^β Result was significantly lower than the site control GH_ER2[†] Result was significantly lower than the site control CM_MC1

Table 9. Results: *Pimephales promelas* survival and growth test.

Sample ID	(Mean ± SD)				
	Hatch (%)	Survival (%)	Biomass (mg)	Length (mm)	Normal development (%)
Laboratory Control	98.3 ± 3.3	95.0 ± 3.3	1.54 ± 0.15	10.5 ± 0.3	100 ± 0.0
10 µg/L Cu treatment					
Laboratory Control [+Cu]	98.3 ± 3.3	95.0 ± 6.4	1.62 ± 0.22	10.4 ± 0.6	98.3 ± 3.3
FR_UFR1 (Site Control) [+Cu]	100 ± 0.0	85.0 ± 8.4	1.58 ± 0.16	10.0 ± 0.6	98.3 ± 3.3
GH_ER2 (Site Control) [+Cu]	98.3 ± 3.3	73.3 ± 37.7 *	1.39 ± 0.14	11.3 ± 1.4	100 ± 0.0
CM_MC1 (Site Control) [+Cu]	98.3 ± 3.3	95.0 ± 3.3	1.39 ± 0.08	9.2 ± 0.7 *	100 ± 0.0
FR_FRCP1 [+Cu]	100 ± 0.0	84.8 ± 12.6	1.54 ± 0.16	10.4 ± 0.6	100 ± 0.0
GH_FR1 [+Cu]	100 ± 0.0	86.7 ± 12.2	1.57 ± 0.06	10.1 ± 0.1 ^α	100 ± 0.0
CM_MC2 [+Cu]	98.3 ± 3.3	91.7 ± 6.4	1.59 ± 0.04	9.8 ± 0.3 ^α	98.3 ± 3.3
20 µg/L Cu treatment					
Laboratory Control [+Cu]	100 ± 0.0	93.3 ± 0.0	1.38 ± 0.09	10.5 ± 0.3	100 ± 0.0
FR_FRCP1 [+Cu]	93.3 ± 5.4	78.3 ± 17.5	1.48 ± 0.11	10.5 ± 0.6	100 ± 0.0
GH_FR1 [+Cu]	93.3 ± 7.7	85.0 ± 14.8	1.41 ± 0.20	10.4 ± 0.4	100 ± 0.0
CM_MC2 [+Cu]	98.3 ± 3.3	91.7 ± 16.7	1.67 ± 0.35	10.1 ± 0.5	100 ± 0.0

SD = Standard Deviation

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the test protocols. The tests met all control acceptability criteria and water quality parameters remained within the ranges specified in the protocols throughout the tests, with the exception of temperature in the *P. promelas* test, which exceeded the range of $25 \pm 1^\circ\text{C}$ on day 21 of the test as a result of a fault in the thermostat controlling the temperature in the test room. An adverse effect related to this short-term exceedance was observed in two replicates of GH_ER2 which were proximate to the heater in the room, and the data for these replicates were excluded. Otherwise, the deviation in temperature did not appear to adversely impact the test results, since the control performance was well within the required range.

There were no deviations from test methodologies, other than the planned modification to the *H. azteca* method and addition of copper in the *P. promelas* tests, as described in Section 2.0. Results of the reference toxicant tests conducted during the testing program are summarized in Table 10. Results for these tests fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate. The reference toxicant tests were performed under the same conditions as those used for the samples. Uncertainty associated with these tests is best described by the standard deviations around the means.

Table 10. Reference toxicant test results.

Test species	Endpoint	Historical mean (2 SD Range)	CV (%)	Test date
<i>C. dubia</i>	Survival (LC50): 2.0 g/L NaCl	2.0 (1.8 – 2.3)	7	February 21, 2018
	Reproduction (IC50): 1.1 g/L NaCl	1.4 (1.0 – 1.9)	19	
<i>P. subcapitata</i>	Growth (IC50): 29.1 µg/L Zn	32.8 (26.2 – 41.1)	12	February 20, 2018
<i>H. azteca</i>	Survival (LC50): 6.0 g/L NaCl	5.8 (5.0 – 6.6)	7	March 2, 2018
<i>P. promelas</i>	Survival (LC50): 10.2 g/L NaCl	7.2 (4.6 – 11.5)	15	February 27, 2018
	Biomass (IC25): 3.3 g/L NaCl	3.5 (1.5 – 8.3)	29	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration

5.0 REFERENCES

- ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 p.
- ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates and amphibians. E729-80, 25p
- Downey PJ, Flemmin K, Guinn R, Chapman N, Varner P, Cooney JD. 2000. Sporadic mortality in chronic toxicity tests using *Pimephales promelas* (Rafinesque): Cases of characterization and control. *Environ Toxicol Chem* 19:248-255.
- Environment Canada. 2013. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyalella azteca*. EPS 1/RM/33, Second Edition, January 2013.
- Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.
- Environment Canada. 2007b. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.
- Grothe DR, Johnson DE. 1996. Bacterial interference in whole-effluent toxicity tests. *Environ Toxicol Chem* 15:761-764.
- Kszos LA, Stewart AJ, Sumner JR. 1997. Evidence that variability in ambient fathead minnow short-term chronic tests is due to pathogenic infection. *Environ Toxicol Chem* 6:351-356
- Norberg-King TJ, Hockett R, Mount DR, Ivey C, Ingersoll C, Kemble N, Brumbaugh B, Hammer E, Soucek D, Taylor L. 2014. Inter-lab testing of *Hyalella azteca* water and sediment methods: 3. Results from 10- to 42-d tests conducted with the new water-only method. Proceedings of SETAC, Vancouver, BC, Canada, November 09 - 13, 2014.
- USEPA. 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. EPA 600/R-99/064. March 2000.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.8.7.16 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client: Teck Coal
 Work Order No.: 180298

Start Date/Time: March 01, 2018 @ 1400h
 Set up by: EL CW/EMM
 JS

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Feb 27, 2018
 Date Received: Feb 28, 2018
 Sample Volume: 1 x 20L per sample

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T (°C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: 022218
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 28
 Mortality (%) in previous 7 d: 0
 Individual female # used ≥ 8 young on test day: 21, 22, 24, 25, 28, 29, 37, 39

NaCl Reference Toxicant Results:

Reference Toxicant ID: C1177
 Stock Solution ID: 18N201
 Date Initiated: Feb 21/2018

7-d LC50 (95% CL): 2.0 (1.7 - 2.3) g/L NaCl
 7-d IC50 (95% CL): 1.1 (0.7 - 1.3) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.3) g/L NaCl CV (%): 7
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.4 (1.0 - 1.9) g/L NaCl CV (%): 19

Test Results:

	Survival (%)	Reproduction (Mean \pm SD)	
Negative Control	100	20 \pm 3.7	b = reproduction significantly less than site control CAL_MCI
(site control) FR_UFRI_WS_201802271040_N_28	100	17.6 \pm 4.8	
(site control) CU_MCI_Q1_WS_20180227_N	100	15.4 \pm 3.4	
(site control) CH_ER2_WS_2018-02-27_N	80	13.6 \pm 9.1	
* = reproduction significantly less than lab control FR_FRCP1_WS_201802271326_N_29	80	4.1 \pm 4.6 *ab	
CH_FR1_WS_2018-02-27_N	100	15.8 \pm 2.4 *	
a = reproduction significantly less than site control FR_UFRI CH_ERC_WS_2018-02-27_N	100	14.6 \pm 5.9	
EL_MCI2_WS_2018-02-27_N	100	11.2 \pm 4.5 *a	
EL_HCI_WS_2018-02-27-N	100	11.9 \pm 5.4 *	

Reviewed by: John

Date reviewed: Apr. 23/18

Ceriodaphnia dubia Summary Sheet

Client: Teck Coal
 Work Order No.: 180298

Start Date/Time: March 01, 2018 @ 1400h
 Set up by: cw/emm

Sample Information:

Sample ID: various: see results for IDs ^{as table}
 Sample Date: Feb 27, 2018
 Date Received: Feb 28, 2018
 Sample Volume: 1 x 20L per sample

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: 022218
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 28
 Mortality (%) in previous 7 d: 0
 Individual female # used ≥ 8 young on test day: 21, 22, 24, 25, 28, 29, 37, 39

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cd177
 Stock Solution ID: 18Na01
 Date Initiated: Feb 21/2018

7-d LC50 (95% CL): 2.0 (1.7-2.3) g/L NaCl
 7-d IC50 (95% CL): 1.1 (0.7-1.3) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8-2.3) g/L NaCl CV (%): 7
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.4 (1.0-1.9) g/L NaCl CV (%): 19

Test Results:

^{as}
~~* = reproduction~~
 * = reproduction significantly less than lab control
 a = reproduction significantly less than site control
 FR-UFRI
 = reproduction significantly less than site control
 CM_MCI

	Survival (%)	Reproduction (Mean \pm SD)
Negative Control	100	20 \pm 3.7
CM_MCI-Q1-W5-20180227-N	100	9.5 \pm 3.7 * a b
LC-W5-SLEC-W5-Q1-2018-N	100	14.9 \pm 3.8 *
CM_MCI-Q1-W5-20180227-N	100	17.3 \pm 4.0
		±
		±
		±
		±

Reviewed by: JGM

Date reviewed: Apr 23/18

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK Coal
 Sample ID: VARIOUS pass/fails
 Work Order #: 180298

Start Date & Time: Mar 1/2018 @ 1400h
 Stop Date & Time: Mar 7/2018 @ 1400h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration Control	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.5	24.0	24.5	24.0	25.0		
DO (mg/L)	8.2	7.5	8.2	7.5	8.1	7.6	8.1	7.2	8.3	7.0	8.0	7.7		
pH	8.2	8.3	8.2	7.9	8.0	8.0	8.2	7.9	8.3	7.8	8.0	7.7		
Cond. (µS/cm)	218	220		221		217		209		220		219		
Initials	CW	CW		A		A		CW		EMM		EMM		

FR_UFR1 Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0		
DO (mg/L)	8.1	8.4	8.3	8.5	8.1	7.5	8.1	7.1	8.0	7.0	8.0	7.1		
pH	8.2	8.3	8.1	8.2	8.1	8.2	8.2	8.2	8.1	8.1	8.1	7.9		
Cond. (µS/cm)	369	365		370		363		372		370		373		
Initials	CW	CW		A		A		CW		EMM		EMM		

CM-MCI Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0		
DO (mg/L)	8.3	7.6	8.3	8.0	8.1	7.7	8.2	7.1	8.1	7.0	8.0	7.1		
pH	8.1	8.3	8.0	8.2	8.1	8.3	8.1	8.2	8.0	8.1	8.0	8.0		
Cond. (µS/cm)	306	303		305		300		315		305		310		
Initials	CW	CW		A		A		CW		EMM		EMM		

GH-ER2 Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0		
DO (mg/L)	8.3	7.5	8.3	8.0	8.1	7.6	8.2	8.2	8.0	8.1	8.1	7.7		
pH	8.1	8.3	7.9	8.2	8.0	8.3	8.2	8.2	8.0	8.1	8.1	8.0		
Cond. (µS/cm)	336	330		335		333		338		337		330		
Initials	CW	CW		A		A		CW		EMM		EMM		

Thermometer: 4 DO meter/probe: 1, 2 pH meter/probe: 1, 2 Conductivity meter/probe: 1, 2

	Control	FR_UFR1	CM-MCI	GH-ER2
Hardness*	100	174	150	192
Alkalinity*	98	130	138	144

Analysts: EMM, AWD, CW
EC, JS
 Reviewed by: JK
 Date reviewed: Apr. 17/18

* mg/L as CaCO3

Sample Description: See COC for sample descriptions

Comments: Broodboard Used: 022218(21, 22, 24, 25, 28, 29, 37, 39)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK Coal
 Sample ID: various pass/fails
 Work Order #: 180298

Start Date & Time: Mar 1/2018 @ 1400h
 Stop Date & Time: Mar 7/2018 @ 1900h
 CER #: 4
 Test Species: Ceriodaphnia dubia

FR-FRCPI Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	25.0	
DO (mg/L)	8.1	7.6	8.3	7.5	8.1	7.6	8.2	8.2	8.1	7.1	8.1	7.3		
pH	8.1	8.2	8.0	8.1	8.0	8.2	8.1	8.0	8.1	8.1	8.1	7.9		
Cond. (µS/cm)	1583	1588		1586		1587		1601		1590		1670		
Initials	CW	CW		A		A		CW		EMM		EMM		

GH-FRI Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.5	24.0	25.0		
DO (mg/L)	8.1	7.4	8.3	7.5	8.0	7.5	8.1	7.3	8.0	7.3	8.1	7.3		
pH	8.1	8.4	8.0	8.1	8.1	8.1	8.1	8.3	8.1	8.2	8.1	8.2		
Cond. (µS/cm)	931	914		911		921		926		922		930		
Initials	CW	CW		A		A		CW		EMM		EMM		

GH-ERC Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.5	24.0	25.0		
DO (mg/L)	8.2	7.6	8.3	7.5	8.1	7.6	8.1	7.3	8.2	7.0	8.0	7.3		
pH	8.1	8.3	7.9	8.1	8.0	8.2	8.1	8.2	8.0	8.1	8.0	8.1		
Cond. (µS/cm)	360	358		354		354		370		363		369		
Initials	CW	CW		A		A		CW		EMM		EMM		

EV-MC2 Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	25.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0		
DO (mg/L)	8.3	7.6	8.2	7.5	8.1	7.4	8.2	7.4	8.2	7.1	8.1	7.7		
pH	8.1	8.4	8.0	8.2	8.1	8.2	8.3	8.3	8.1	8.2	8.1	8.1		
Cond. (µS/cm)	700	704		696		706		711		710		712		
Initials	CW	CW		A		A		CW		EMM		EMM		

Thermometer: 4 DO meter/probe: 1, 2 pH meter/probe: 1, 2 Conductivity meter/probe: 1, 2

	FR-FRCPI	GH-FRI	GH-ERC	EV-MC2
Hardness*	830	490	196	64320
Alkalinity*	190	150	154	190

Analysts: EMM, AWD, CW, EC, JTS
 Reviewed by: JTS
 Date reviewed: Mar 23/18

Sample Description: See COC for sample descriptions

Comments: Broodboard Used: 022218 (21, 22, 24, 25, 28, 29, 37, 39)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK Coal
 Sample ID: VARIOUS pass/fails
 Work Order #: 180298

Start Date & Time: Mar 1/2018 @ 1900h
 Stop Date & Time: Mar 7/2018 @ 1400h
 CER #: 4
 Test Species: Ceriodaphnia dubia

EV-HCl Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.5	24.0	25.0	25.0	
DO (mg/L)	8.4	7.5	8.2	7.5	8.1	7.5	8.2	7.3	8.2	7.2	8.1	7.2	7.2	
pH	8.2	8.4	8.1	8.2	8.0	8.3	8.1	8.1	8.1	8.2	8.1	8.2	8.2	
Cond. (µS/cm)	782	772		773		785		788		780		789		
Initials	CW	CW		A		A		CW		EM		EM		

CM-MC2 Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0	25.0	
DO (mg/L)	8.3	7.6	8.2	7.5	8.1	7.6	8.1	7.4	8.0	7.2	8.2	7.1	7.1	
pH	8.2	8.4	8.1	8.2	8.0	8.3	8.1	8.1	8.3	8.1	8.3	8.1	8.1	
Cond. (µS/cm)	1058	1049		1047		1070		1063		1070		1069		
Initials	CW	CW		A		A		CW		EM		EM		

LC-LC55LCC Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0	25.0	
DO (mg/L)	8.3	7.7	8.3	7.5	8.2	7.4	8.1	7.2	8.3	7.2	8.2	7.1	7.1	
pH	8.2	8.4	8.1	8.2	8.0	8.2	8.0	8.0	8.2	8.1	8.2	8.1	8.1	
Cond. (µS/cm)	1013	1023		1009		1013		1026		1013		1020		
Initials	CW	CW		A		A		CW		EM		EM		

CM-MC3 Concentration 100% (v/v)	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	24.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	24.0	25.0	25.0	
DO (mg/L)	8.4	7.5	8.3	7.6	8.3	7.5	8.2	7.4	8.2	7.0	8.2	7.2	7.2	
pH	8.1	8.3	7.9	8.2	8.0	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.2	
Cond. (µS/cm)	528	525		529		535		527		537		540		
Initials	CW	CW		A		A		CW		EM		EM		

Thermometer: 4 DO meter/probe: L12 pH meter/probe: L12 Conductivity meter/probe: L12

	Control	CM-MC2	LC-LC55LCC	CM-MC3
Hardness*	560 ± 25	640	75 (134) 670	300
Alkalinity*	192	180	204	110

Analysts: EMM, AWD, CW;
EC, JS
 Reviewed by: EMM
 Date reviewed: Apr. 23/18

Sample Description: see coc for samples descriptions

Comments: Broadboard Used: 022218 (21, 22, 29, 25, 28, 29, 37, 39)

Chronic Freshwater Toxicity Test C. dubia Reproduction Data

Client: Teck Coal
 Sample ID: various pass/fails
 Work Order: 18028798
 or

Start Date & Time: Mar 1 / 2018 @ 1400h
 Stop Date & Time: Mar 7 / 2018 @ 1900h
 Set up by: CW/EMM

1% (V/V)

Days	Concentration: Lab Control											Init	Concentration: FR-VFR1											Init	Concentration: CM-MC1											Init
	A	B	C	D	E	F	G	H	I	J	A		B	C	D	E	F	G	H	I	J	A	B		C	D	E	F	G	H	I	J				
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
2	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A
3	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	24	/	/	/	/	/	/	/	/	/	/	A
4	4	4	5	3	3	4	4	3	5	3	3	CW	✓	✓	✓	5	✓	6	4	✓	2	5	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	✓	CW	
5	10	10	6	9	8	✓	7	7	6	6	6	CW	6	6	✓	✓	7	✓	9	6	10	✓	CW	6	3	5	4	4	7	5	5	7	7	✓	CW	
6	10	8	8	10	12	7	9	11	10	8	8	EMM	8	7	9	13	10	14	10	14	13	12	EMM	9	8	10	9	8	11	10	9	12	8	EMM		
7																																				
8																																				
Total	2	22	19	22	23	11	20	21	24	17	EMM	14	13	9	18	17	29	23	20	25	17	JS	19	11	15	13	12	18	15	14	22	15	EMM			

Days	Concentration: GH-ER2											Init	Concentration: FR-FRCP1											Init	Concentration: GH-FR1											Init
	A	B	C	D	E	F	G	H	I	J	A		B	C	D	E	F	G	H	I	J	A	B		C	D	E	F	G	H	I	J				
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
2	/	X	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A
3	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	X	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A
4	✓	/	5	5	✓	4	✓	3	✓	/	/	CW	2	✓	✓	✓	✓	/	✓	/	2	3	CW	✓	✓	4	✓	✓	✓	3	3	2	✓	CW		
5	9	/	✓	✓	6	7	4	5	✓	/	/	CW	✓	4	✓	✓	✓	/	4	/	✓	✓	CW	4	2	✓	4	5	2	5	4	6	4	CW		
6	10	/	14	16	12	10	11	13	2	/	/	EMM	7	✓	2	✓	✓	/	✓	/	8	9	EMM	13	12	11	16	11	9	10	8	9	11	EMM		
7																																				
8																																				
Total	19	OK	19	21	18	21	15	21	2	OK	JS	9	4	2	0	0	OK	4	OK	10	12	JS	17	14	15	20	16	11	18	15	17	15	JS			

Days	Concentration: GH-ERC											Init	Concentration: EV-MC2											Init	Concentration: EV-FRC1											Init
	A	B	C	D	E	F	G	H	I	J	A		B	C	D	E	F	G	H	I	J	A	B		C	D	E	F	G	H	I	J				
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
2	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A
3	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A
4	4	6	✓	✓	✓	✓	✓	✓	4	4	4	CW	✓	4	4	2	✓	4	4	✓	3	✓	CW	✓	3	✓	✓	✓	✓	✓	✓	5	✓	CW		
5	7	✓	✓	6	4	3	5	6	6	✓	✓	CW	4	✓	✓	✓	4	✓	✓	✓	✓	3	CW	2	✓	5	4	4	6	6	2	✓	✓	CW		
6	11	14	✓	9	13	12	9	8	3	12	EMM	EMM	9	11	12	9	9	8	9	✓	6	7	EMM	7	9	11	10	13	11	8	7	9	✓	EMM		
7																																				
8																																				
Total	22	20	0	15	17	15	14	14	13	16	JS	13	15	16	11	13	12	13	0	9	10	JS	6	12	16	14	17	17	14	9	14	0	JS			

Notes: X = mortality.

Sample Description: Same as water quality page
 Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JCW

Date reviewed: Apr. 17/18

CETIS Summary Report

Report Date: 02 Apr-18 10:55 (p 1 of 2)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Batch ID: 16-9781-0939 Test Type: Reproduction-Survival (7d) Analyst: Jill Sones
 Start Date: 01 Mar-18 14:00 Protocol: EC/EPS 1/RM/21 Diluent: 20% Perrier Water
 Ending Date: 07 Mar-18 14:00 Species: Ceriodaphnia dubia Brine:
 Duration: 6d 0h Source: In-House Culture Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C) ✓		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C) ✓		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C) ✓		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C) ✓		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C) ✓		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C) ✓		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C) ✓		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C) ✓		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C) ✓		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C) ✓		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C) ✓		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

6d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	10	1	1	1	1	1	0	0	0.0%	0.0%
FR_UFR1	10	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC1	10	1	1	1	1	1	0	0	0.0%	0.0%
GH_ER2	10	0.8	0.4984	1	0	1	0.1333	0.4216	52.7%	20.0%
FR_FRCP1	10	0.8	0.4984	1	0	1	0.1333	0.4216	52.7%	20.0%
GH_FR1	10	1	1	1	1	1	0	0	0.0%	0.0%
GH_ERC	10	1	1	1	1	1	0	0	0.0%	0.0%
EV_MC2	10	1	1	1	1	1	0	0	0.0%	0.0%
EV_HC1	10	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC2	10	1	1	1	1	1	0	0	0.0%	0.0%
LC_LCDSSLCC	10	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC3	10	1	1	1	1	1	0	0	0.0%	0.0%

CETIS Summary Report

Report Date: 02 Apr-18 10:55 (p 2 of 2)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

6d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	0	1	1	1	1	1	1	1	0
FR_FRCP1	1	1	1	1	1	0	1	0	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 1 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-4708-4524	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 29 Mar-18 12:25	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① Lab Control		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Lab Control		CM_MC1	1	1.0000	Exact	Non-Significant Effect
Lab Control		GH_ER2	0.2368	1.0000	Exact	Non-Significant Effect
Lab Control		FR_FRCP1	0.2368	1.0000	Exact	Non-Significant Effect
Lab Control		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Lab Control		GH_ERC	1	1.0000	Exact	Non-Significant Effect
Lab Control		EV_MC2	1	1.0000	Exact	Non-Significant Effect
Lab Control		EV_HC1	1	1.0000	Exact	Non-Significant Effect
Lab Control		CM_MC2	1	1.0000	Exact	Non-Significant Effect
Lab Control		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
Lab Control		CM_MC3	1	1.0000	Exact	Non-Significant Effect

① lab control = 20% Perrier

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 2 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-4708-4524 Endpoint: 6d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 29 Mar-18 12:25 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Negative Contr	10	0	10	1	0	0.0%
FR_UFR1	10	0	10	1	0	0.0%
CM_MC1	10	0	10	1	0	0.0%
GH_ER2	8	2	10	0.8	0.2	20.0%
FR_FRCP1	8	2	10	0.8	0.2	20.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	0	1	1	1	1	1	1	1	0
FR_FRCP1	1	1	1	1	1	0	1	0	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 3 of 12)
Test Code: 180298 | 05-3452-0964

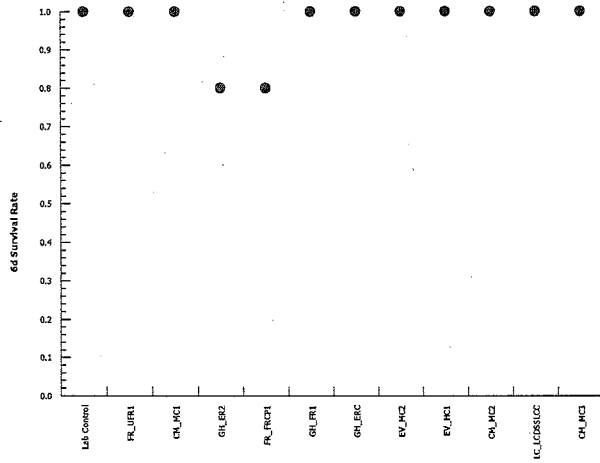
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-4708-4524 Endpoint: 6d Survival Rate
Analyzed: 29 Mar-18 12:25 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 4 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-3427-7376	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 29 Mar-18 12:28	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① FR_UFR1		Lab Control	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ER2	0.2368	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.2368	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ERC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC3	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1 = site control

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 5 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-3427-7376 Endpoint: 6d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 29 Mar-18 12:28 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	10	0	10	1	0	0.0%
FR_UFR1 Site Control	10	0	10	1	0	0.0%
CM_MC1	10	0	10	1	0	0.0%
GH_ER2	8	2	10	0.8	0.2	20.0%
FR_FRCP1	8	2	10	0.8	0.2	20.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	0	1	1	1	1	1	1	1	0
FR_FRCP1	1	1	1	1	1	0	1	0	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 6 of 12)
Test Code: 180298 | 05-3452-0964

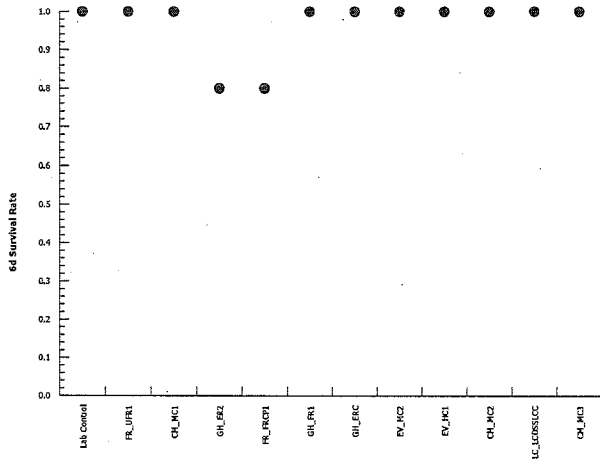
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-3427-7376 Endpoint: 6d Survival Rate
Analyzed: 29 Mar-18 12:28 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 10 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 20-9651-1927	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 29 Mar-18 12:34	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		Lab Control	1	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.709	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_ERC	1	1.0000	Exact	Non-Significant Effect
GH_ER2		EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2		EV_HC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC3	1	1.0000	Exact	Non-Significant Effect

① GH_ER2 = site control

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 11 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 20-9651-1927 Endpoint: 6d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 29 Mar-18 12:34 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	10	0	10	1	0	-25.0%
FR_UFR1	10	0	10	1	0	-25.0%
CM_MC1	10	0	10	1	0	-25.0%
GH_ER2 Site Control	8	2	10	0.8	0.2	0.0%
FR_FRCP1	8	2	10	0.8	0.2	0.0%
GH_FR1	10	0	10	1	0	-25.0%
GH_ERC	10	0	10	1	0	-25.0%
EV_MC2	10	0	10	1	0	-25.0%
EV_HC1	10	0	10	1	0	-25.0%
CM_MC2	10	0	10	1	0	-25.0%
LC_LCDSSLCC	10	0	10	1	0	-25.0%
CM_MC3	10	0	10	1	0	-25.0%

6d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	0	1	1	1	1	1	1	1	0
FR_FRCP1	1	1	1	1	1	0	1	0	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 12 of 12)
Test Code: 180298 | 05-3452-0964

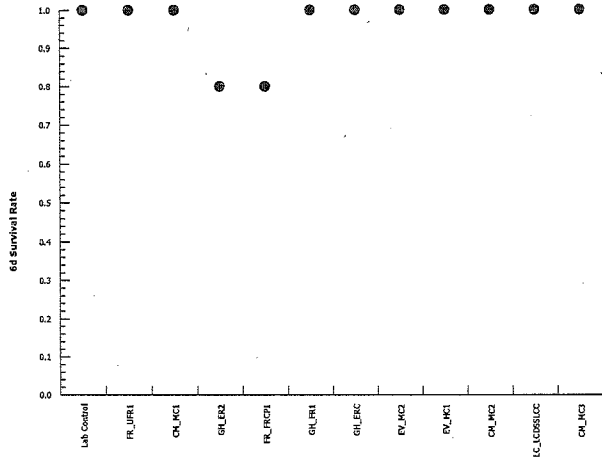
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 20-9651-1927 Endpoint: 6d Survival Rate
Analyzed: 29 Mar-18 12:34 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 7 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test Nautilus Environmental

Analysis ID: 17-8872-9390	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 29 Mar-18 12:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		Lab Control	1	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ER2	0.2368	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_FRCP1	0.2368	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ERC	1	1.0000	Exact	Non-Significant Effect
CM_MC1		EV_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC3	1	1.0000	Exact	Non-Significant Effect

① CM_MC1 = site control

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 8 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-8872-9390 Endpoint: 6d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 29 Mar-18 12:31 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	10	0	10	1	0	0.0%
FR_UFR1	10	0	10	1	0	0.0%
CM_MC1 Site Control	10	0	10	1	0	0.0%
GH_ER2	8	2	10	0.8	0.2	20.0%
FR_FRCP1	8	2	10	0.8	0.2	20.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	0	1	1	1	1	1	1	1	0
FR_FRCP1	1	1	1	1	1	0	1	0	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

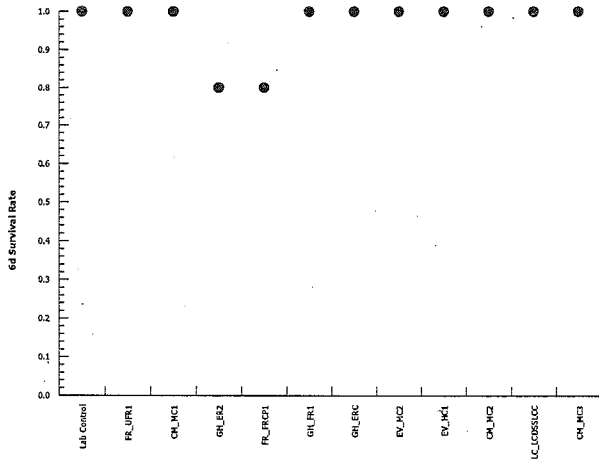
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-8872-9390 Endpoint: 6d Survival Rate
Analyzed: 29 Mar-18 12:31 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Summary Report

Report Date: 20 Apr-18 16:41 (p 1 of 2)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Batch ID: 16-9781-0939 Test Type: Reproduction-Survival (7d) Analyst: Jill Sones
 Start Date: 01 Mar-18 14:00 Protocol: EC/EPS 1/RM/21 Diluent: 20% Perrier Water
 Ending Date: 07 Mar-18 14:00 Species: Ceriodaphnia dubia Brine:
 Duration: 6d 0h Source: In-House Culture Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	10	20	17.32	22.68	11	24	1.183	3.742	18.71%	0.0%
FR_UFR1	10	17.6	14.19	21.01	9	25	1.507	4.766	27.08%	12.0%
CM_MC1	10	15.4	12.99	17.81	11	22	1.067	3.373	21.9%	23.0%
GH_ER2	10	13.6	7.077	20.12	0	21	2.884	9.119	67.05%	32.0%
FR_FRCP1	10	4.1	0.7882	7.412	0	12	1.464	4.63	112.9%	79.5%
GH_FR1	10	15.8	14.05	17.55	11	20	0.7717	2.44	15.45%	21.0%
GH_ERC	10	14.6	10.41	18.79	0	22	1.851	5.854	40.09%	27.0%
EV_MC2	10	11.2	8.004	14.4	0	16	1.413	4.467	39.89%	44.0%
EV_HC1	10	11.9	8.004	15.8	0	17	1.722	5.446	45.76%	40.5%
CM_MC2	10	9.5	6.818	12.18	3	14	1.186	3.749	39.46%	52.5%
LC_LCDSSLCC	10	14.9	12.17	17.63	8	21	1.206	3.814	25.6%	25.5%
CM_MC3	10	17.3	14.46	20.14	10	23	1.257	3.974	22.97%	13.5%

CETIS Summary Report

Report Date: 20 Apr-18 16:41 (p 2 of 2)
Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	21	22	19	22	23	11	20	21	24	17
FR_UFR1	14	13	9	18	17	20	23	20	25	17
CM_MC1	19	11	15	13	12	18	15	14	22	15
GH_ER2	19	0	19	21	18	21	15	21	2	0
FR_FRCP1	9	4	2	0	0	0	4	0	10	12
GH_FR1	17	14	15	20	16	11	18	15	17	15
GH_ERC	22	20	0	15	17	15	14	14	13	16
EV_MC2	13	15	16	11	13	12	13	0	9	10
EV_HC1	6	12	16	14	17	17	14	9	14	0
CM_MC2	6	14	10	9	11	11	5	3	12	14
LC_LCDSSLCC	16	18	10	13	16	21	17	8	14	16
CM_MC3	13	15	21	18	16	10	17	21	23	19

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 10 of 12)

Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-1114-3656	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 29 Mar-18 12:36	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	27.4%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		FR_UFR1	87.5	72	3	18	0.3994	Asymp	Non-Significant Effect
		CM_MC1	73	72	3	18	0.0574	Asymp	Non-Significant Effect
		GH_ER2	78	72	2	18	0.1303	Asymp	Non-Significant Effect
		FR_FRCP1	56	72	0	18	0.0011	Asymp	Significant Effect
		GH_FR1	69	72	3	18	0.0265	Asymp	Significant Effect
		GH_ERC	73	72	3	18	0.0574	Asymp	Non-Significant Effect
		EV_MC2	61.5	72	1	18	0.0047	Asymp	Significant Effect
		EV_HC1	63	72	1	18	0.0069	Asymp	Significant Effect
		CM_MC2	59	72	1	18	0.0025	Asymp	Significant Effect
		LC_LCDSSLCC	68.5	72	2	18	0.0239	Asymp	Significant Effect
		CM_MC3	82.5	72	4	18	0.2373	Asymp	Non-Significant Effect

① Lab control = 20% Perrier

CETIS Analytical Report

Report Date: 29 Mar-18 12:37 (p 11 of 12)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-1114-3656 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 29 Mar-18 12:36 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1965.225	178.6568	11	7.473	<0.0001	Significant Effect
Error	2582.1	23.90833	108			
Total	4547.325		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.76	24.72	0.0191	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9416	0.9706	<0.0001	Non-normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	20	17.32	22.68	21	11	24	1.183	18.71%	0.0%
FR_UFR1	10	17.6	14.19	21.01	17.5	9	25	1.507	27.08%	12.0%
CM_MC1	10	15.4	12.99	17.81	15	11	22	1.067	21.9%	23.0%
GH_ER2	10	13.6	7.077	20.12	18.5	0	21	2.884	67.05%	32.0%
FR_FRCP1	10	4.1	0.7882	7.412	3	0	12	1.464	112.9%	79.5%
GH_FR1	10	15.8	14.05	17.55	15.5	11	20	0.7717	15.45%	21.0%
GH_ERC	10	14.6	10.41	18.79	15	0	22	1.851	40.09%	27.0%
EV_MC2	10	11.2	8.004	14.4	12.5	0	16	1.413	39.89%	44.0%
EV_HC1	10	11.9	8.004	15.8	14	0	17	1.722	45.76%	40.5%
CM_MC2	10	9.5	6.818	12.18	10.5	3	14	1.186	39.46%	52.5%
LC_LCDSSLCC	10	14.9	12.17	17.63	16	8	21	1.206	25.6%	25.5%
CM_MC3	10	17.3	14.46	20.14	17.5	10	23	1.257	22.97%	13.5%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	21	22	19	22	23	11	20	21	24	17
FR_UFR1	14	13	9	18	17	20	23	20	25	17
CM_MC1	19	11	15	13	12	18	15	14	22	15
GH_ER2	19	0	19	21	18	21	15	21	2	0
FR_FRCP1	9	4	2	0	0	0	4	0	10	12
GH_FR1	17	14	15	20	16	11	18	15	17	15
GH_ERC	22	20	0	15	17	15	14	14	13	16
EV_MC2	13	15	16	11	13	12	13	0	9	10
EV_HC1	6	12	16	14	17	17	14	9	14	0
CM_MC2	6	14	10	9	11	11	5	3	12	14
LC_LCDSSLCC	16	18	10	13	16	21	17	8	14	16
CM_MC3	13	15	21	18	16	10	17	21	23	19

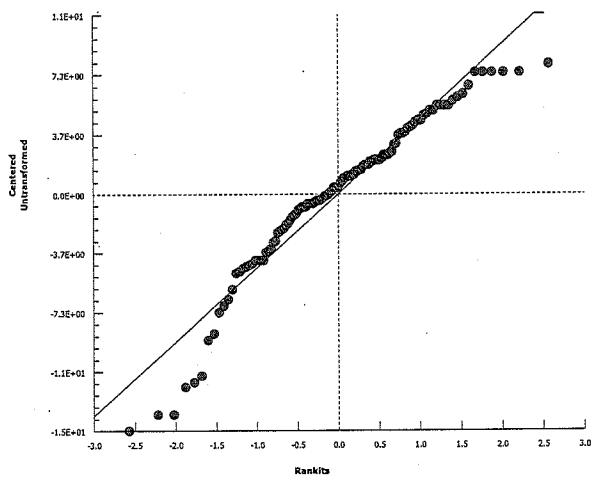
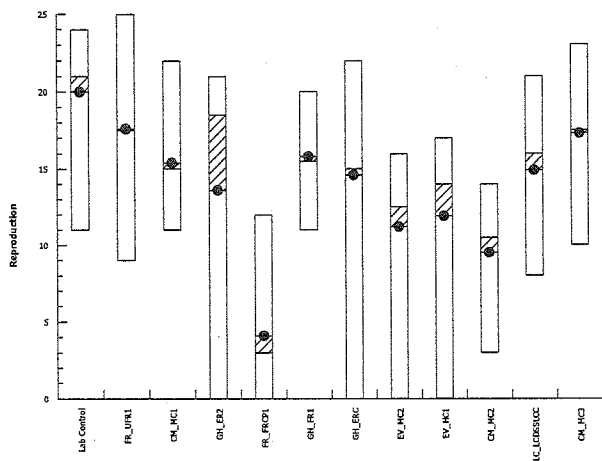
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-1114-3656 Endpoint: Reproduction
 Analyzed: 29 Mar-18 12:36 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 1 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 15-3814-5816	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 20 Apr-18 16:32	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	31.2%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		Lab Control	122.5	72	3	18	0.9989	Asymp	Non-Significant Effect
		CM_MC1	89.5	72	3	18	0.4721	Asymp	Non-Significant Effect
		GH_ER2	99.5	72	1	18	0.8062	Asymp	Non-Significant Effect
		FR_FRCP1	57.5	72	1	18	0.0016	Asymp	Significant Effect
		GH_FR1	91	72	4	18	0.5276	Asymp	Non-Significant Effect
		GH_ERC	89.5	72	4	18	0.4721	Asymp	Non-Significant Effect
		EV_MC2	69	72	2	18	0.0265	Asymp	Significant Effect
		EV_HC1	75	72	3	18	0.0813	Asymp	Non-Significant Effect
		CM_MC2	64.5	72	2	18	0.0098	Asymp	Significant Effect
		LC_LCDSSLCC	86.5	72	4	18	0.3642	Asymp	Non-Significant Effect
		CM_MC3	103.5	72	4	18	0.8927	Asymp	Non-Significant Effect

① FR_UFR1 = site control

CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 2 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 15-3814-5816 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Apr-18 16:32 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1965.225	178.6568	11	7.473	<0.0001	Significant Effect
Error	2582.1	23.90833	108			
Total	4547.325		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.76	24.72	0.0191	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9416	0.9706	<0.0001	Non-normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	20	17.32	22.68	21	11	24	1.183	18.71%	0.0%
FR_UFR1	10	17.6	14.19	21.01	17.5	9	25	1.507	27.08%	12.0%
CM_MC1	10	15.4	12.99	17.81	15	11	22	1.067	21.9%	23.0%
GH_ER2	10	13.6	7.077	20.12	18.5	0	21	2.884	67.05%	32.0%
FR_FRCP1	10	4.1	0.7882	7.412	3	0	12	1.464	112.9%	79.5%
GH_FR1	10	15.8	14.05	17.55	15.5	11	20	0.7717	15.45%	21.0%
GH_ERC	10	14.6	10.41	18.79	15	0	22	1.851	40.09%	27.0%
EV_MC2	10	11.2	8.004	14.4	12.5	0	16	1.413	39.89%	44.0%
EV_HC1	10	11.9	8.004	15.8	14	0	17	1.722	45.76%	40.5%
CM_MC2	10	9.5	6.818	12.18	10.5	3	14	1.186	39.46%	52.5%
LC_LCDSSLCC	10	14.9	12.17	17.63	16	8	21	1.206	25.6%	25.5%
CM_MC3	10	17.3	14.46	20.14	17.5	10	23	1.257	22.97%	13.5%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	21	22	19	22	23	11	20	21	24	17
FR_UFR1	14	13	9	18	17	20	23	20	25	17
CM_MC1	19	11	15	13	12	18	15	14	22	15
GH_ER2	19	0	19	21	18	21	15	21	2	0
FR_FRCP1	9	4	2	0	0	0	4	0	10	12
GH_FR1	17	14	15	20	16	11	18	15	17	15
GH_ERC	22	20	0	15	17	15	14	14	13	16
EV_MC2	13	15	16	11	13	12	13	0	9	10
EV_HC1	6	12	16	14	17	17	14	9	14	0
CM_MC2	6	14	10	9	11	11	5	3	12	14
LC_LCDSSLCC	16	18	10	13	16	21	17	8	14	16
CM_MC3	13	15	21	18	16	10	17	21	23	19

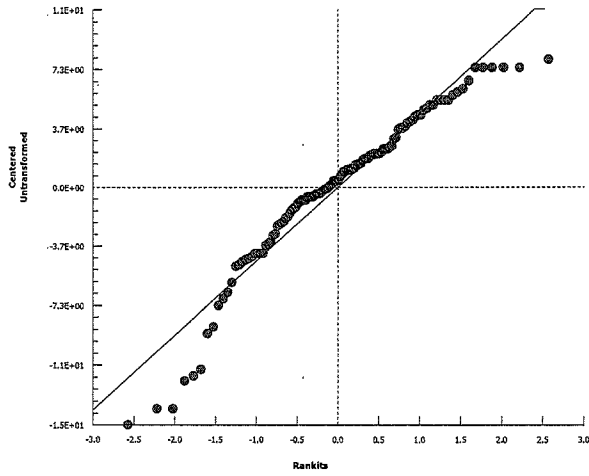
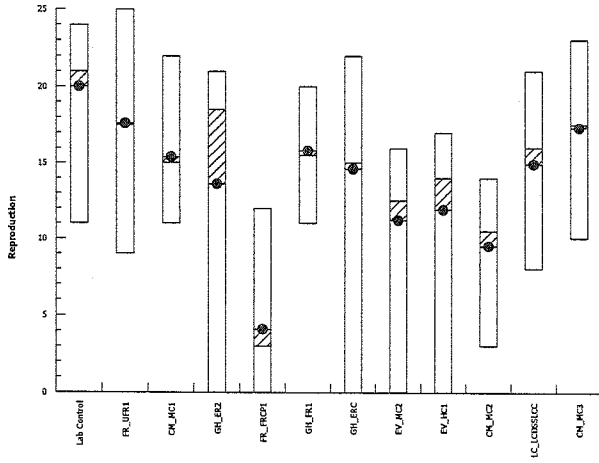
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 15-3814-5816 Endpoint: Reproduction
Analyzed: 20 Apr-18 16:32 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 7 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-4495-2013 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Apr-18 16:37 Analysis: Nonparametric-Control vs Treatments Official Results: Yes
 Batch ID: 16-9781-0939 Test Type: Reproduction-Survival (7d) Analyst: Jill Sones
 Start Date: 01 Mar-18 14:00 Protocol: EC/EPS 1/RM/21 Diluent: 20% Perrier Water
 Ending Date: 07 Mar-18 14:00 Species: Ceriodaphnia dubia Brine:
 Duration: 6d 0h Source: In-House Culture Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	40.4%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		Lab Control	132	72	2	18	1.0000	Asymp	Non-Significant Effect
		FR_UFR1	110.5	72	1	18	0.9716	Asymp	Non-Significant Effect
		CM_MC1	98	72	3	18	0.7652	Asymp	Non-Significant Effect
		FR_FRCP1	76.5	72	2	18	0.1036	Asymp	Non-Significant Effect
		GH_FR1	95	72	2	18	0.6708	Asymp	Non-Significant Effect
		GH_ERC	97	72	2	18	0.7354	Asymp	Non-Significant Effect
		EV_MC2	84.5	72	2	18	0.2976	Asymp	Non-Significant Effect
		EV_HC1	86	72	1	18	0.3470	Asymp	Non-Significant Effect
		CM_MC2	85	72	0	18	0.3137	Asymp	Non-Significant Effect
		LC_LCDSSLCC	96	72	2	18	0.7039	Asymp	Non-Significant Effect
		CM_MC3	110	72	4	18	0.9684	Asymp	Non-Significant Effect

① GH_ER2 = site control

CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 8 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-4495-2013 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Apr-18 16:37 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1965.225	178.6568	11	7.473	<0.0001	Significant Effect
Error	2582.1	23.90833	108			
Total	4547.325		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.76	24.72	0.0191	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9416	0.9706	<0.0001	Non-normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	20	17.32	22.68	21	11	24	1.183	18.71%	0.0%
FR_UFR1	10	17.6	14.19	21.01	17.5	9	25	1.507	27.08%	12.0%
CM_MC1	10	15.4	12.99	17.81	15	11	22	1.067	21.9%	23.0%
GH_ER2	10	13.6	7.077	20.12	18.5	0	21	2.884	67.05%	32.0%
FR_FRCP1	10	4.1	0.7882	7.412	3	0	12	1.464	112.9%	79.5%
GH_FR1	10	15.8	14.05	17.55	15.5	11	20	0.7717	15.45%	21.0%
GH_ERC	10	14.6	10.41	18.79	15	0	22	1.851	40.09%	27.0%
EV_MC2	10	11.2	8.004	14.4	12.5	0	16	1.413	39.89%	44.0%
EV_HC1	10	11.9	8.004	15.8	14	0	17	1.722	45.76%	40.5%
CM_MC2	10	9.5	6.818	12.18	10.5	3	14	1.186	39.46%	52.5%
LC_LCDSSLCC	10	14.9	12.17	17.63	16	8	21	1.206	25.6%	25.5%
CM_MC3	10	17.3	14.46	20.14	17.5	10	23	1.257	22.97%	13.5%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	21	22	19	22	23	11	20	21	24	17
FR_UFR1	14	13	9	18	17	20	23	20	25	17
CM_MC1	19	11	15	13	12	18	15	14	22	15
GH_ER2	19	0	19	21	18	21	15	21	2	0
FR_FRCP1	9	4	2	0	0	0	4	0	10	12
GH_FR1	17	14	15	20	16	11	18	15	17	15
GH_ERC	22	20	0	15	17	15	14	14	13	16
EV_MC2	13	15	16	11	13	12	13	0	9	10
EV_HC1	6	12	16	14	17	17	14	9	14	0
CM_MC2	6	14	10	9	11	11	5	3	12	14
LC_LCDSSLCC	16	18	10	13	16	21	17	8	14	16
CM_MC3	13	15	21	18	16	10	17	21	23	19

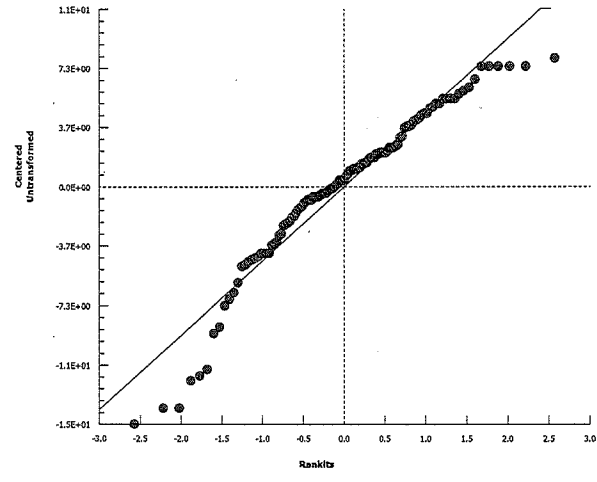
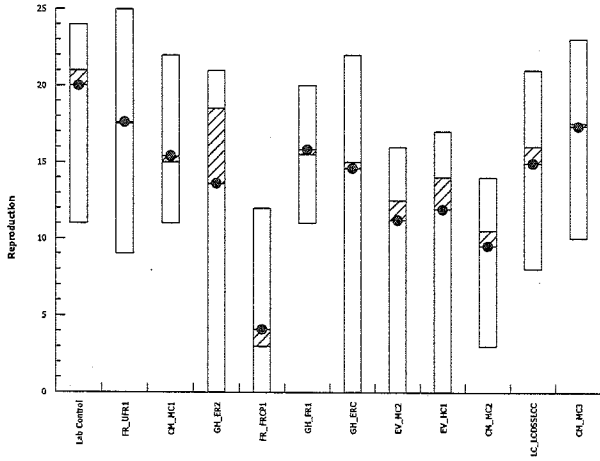
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-4495-2013 Endpoint: Reproduction
Analyzed: 20 Apr-18 16:37 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 4 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental**

Analysis ID: 00-4839-6698	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 20 Apr-18 16:35	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 16-9781-0939	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 01 Mar-18 14:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Mar-18 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 0h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	19-2928-0633	01 Mar-18	01 Mar-18	14h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	51h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	51h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	51h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	49h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	48h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	50h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	51h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	52h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	51h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	62h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	50h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	35.6%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① CM_MC1		Lab Control	137	72	3	18	1.0000	Asymp	Non-Significant Effect
		FR_UFR1	120.5	72	3	18	0.9979	Asymp	Non-Significant Effect
		GH_ER2	112	72	3	18	0.9797	Asymp	Non-Significant Effect
		FR_FRCP1	56.5	72	1	18	0.0012	Asymp	Significant Effect
		GH_FR1	113	72	4	18	0.9840	Asymp	Non-Significant Effect
		GH_ERC	108	72	4	18	0.9523	Asymp	Non-Significant Effect
		EV_MC2	77	72	4	18	0.1120	Asymp	Non-Significant Effect
		EV_HC1	88	72	2	18	0.4173	Asymp	Non-Significant Effect
		CM_MC2	64.5	72	3	18	0.0098	Asymp	Significant Effect
		LC_LCDSSLCC	105.5	72	3	18	0.9237	Asymp	Non-Significant Effect
		CM_MC3	121	72	4	18	0.9982	Asymp	Non-Significant Effect

① CM_MC1 = site control

CETIS Analytical Report

Report Date: 20 Apr-18 16:41 (p 5 of 9)
 Test Code: 180298 | 05-3452-0964

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 00-4839-6698 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Apr-18 16:35 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1965.225	178.6568	11	7.473	<0.0001	Significant Effect
Error	2582.1	23.90833	108			
Total	4547.325		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.76	24.72	0.0191	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9416	0.9706	<0.0001	Non-normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	20	17.32	22.68	21	11	24	1.183	18.71%	0.0%
FR_UFR1	10	17.6	14.19	21.01	17.5	9	25	1.507	27.08%	12.0%
CM_MC1	10	15.4	12.99	17.81	15	11	22	1.067	21.9%	23.0%
GH_ER2	10	13.6	7.077	20.12	18.5	0	21	2.884	67.05%	32.0%
FR_FRCP1	10	4.1	0.7882	7.412	3	0	12	1.464	112.9%	79.5%
GH_FR1	10	15.8	14.05	17.55	15.5	11	20	0.7717	15.45%	21.0%
GH_ERC	10	14.6	10.41	18.79	15	0	22	1.851	40.09%	27.0%
EV_MC2	10	11.2	8.004	14.4	12.5	0	16	1.413	39.89%	44.0%
EV_HC1	10	11.9	8.004	15.8	14	0	17	1.722	45.76%	40.5%
CM_MC2	10	9.5	6.818	12.18	10.5	3	14	1.186	39.46%	52.5%
LC_LCDSSLCC	10	14.9	12.17	17.63	16	8	21	1.206	25.6%	25.5%
CM_MC3	10	17.3	14.46	20.14	17.5	10	23	1.257	22.97%	13.5%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	21	22	19	22	23	11	20	21	24	17
FR_UFR1	14	13	9	18	17	20	23	20	25	17
CM_MC1	19	11	15	13	12	18	15	14	22	15
GH_ER2	19	0	19	21	18	21	15	21	2	0
FR_FRCP1	9	4	2	0	0	0	4	0	10	12
GH_FR1	17	14	15	20	16	11	18	15	17	15
GH_ERC	22	20	0	15	17	15	14	14	13	16
EV_MC2	13	15	16	11	13	12	13	0	9	10
EV_HC1	6	12	16	14	17	17	14	9	14	0
CM_MC2	6	14	10	9	11	11	5	3	12	14
LC_LCDSSLCC	16	18	10	13	16	21	17	8	14	16
CM_MC3	13	15	21	18	16	10	17	21	23	19

JS
 Apr 23/18

Ceriodaphnia 7-d Survival and Reproduction Test

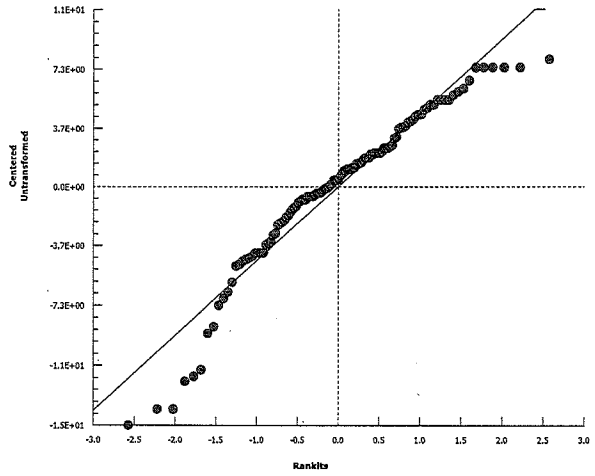
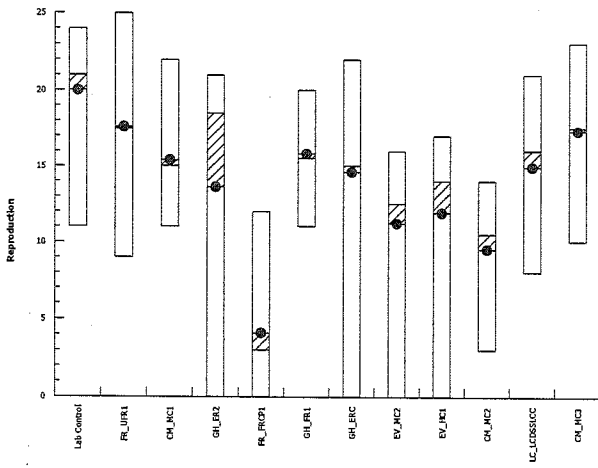
Nautilus Environmental

Analysis ID: 00-4839-6698
Analyzed: 20 Apr-18 16:35

Endpoint: Reproduction
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



Client: Teck Coal

W.O.#: 180298

Hardness and Alkalinity Datasheet

Week 1 refresh samples	Alkalinity						Hardness			
	Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)
FR_UFRI	Feb28/18	Feb28/18	50	6.7	6.9	130	50	8.7	174	EC
CM-MCI	↓	↓	50	7.1	7.3	138	50	7.5	150	↓
GH-ERZ	↓	↓	50	7.4	7.6	144	50	9.6	192	↓
FR-FRCP1	↓	↓	100	2.0	2.1	190	100	8.3	830	↓
GH-FRI	↓	↓	100	1.7	1.9	150	100	4.9	490	↓
CM-MCZ	↓	↓	100	1.7	1.9	150	100	6.4	640	↓
CM-MCZ ₃	↓	↓	100	1.2	1.3	110	100	3.80	300	↓

Notes: ① Diluted to 100 mL w/ p.i. water

Reviewed by: JGh

Date Reviewed: Apr. 17/18

Client: Teek Coal

W.O.#: 180298

Hardness and Alkalinity Datasheet

Alkalinity							Hardness			
Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
20% permey	Mar 1 / 18	Mar 1 / 18	50	5.0	5.1	98	50	5.0	100	←mm
GHEFC	Mar 1 / 18	Mar 1 / 18	50	7.9	8.1	154	50	9.8	196	
EV HCl	↓	↓	50	9.9	10.2	192	100	5.6	^{SS} 42560	
EV MCl	↓	↓	50	9.7	9.9	190	100	3.2	^{SS} 64320	
LCSSLECC	↓	↓	50	10.4	10.6	204	100	6.7	^{SS} 134670	↓
ETSS										

Notes: ① Diluted to 100ml w/ D.I. water

Reviewed by: JOU

Date Reviewed: Apr. 23 / 18

APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 180299

Start Date: Feb 28/18
 Set up by: ML

Sample Information:

Sample ID: Various: see results table for IDs
 Sample Date: Feb 27/18
 Date Received: Feb 28/18
 Sample Volume: Various

Test Organism Information:

Culture Date: Feb 23/18
 Age of culture (Day 0): 5d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC167
 Stock Solution ID: 187201
 Date Initiated: Feb 20/18

72-h IC50 (95% CL): 29.1 (25.2 - 32.7) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 32.8 (26.2 - 41.1) µg/L Zn CV (%) 12

Test Results:

	Cell Yield (Mean ± SD)
Negative Control	28.5 ± 2.2
(site control) FRUFRI-WS-201802271040-N-28	167.1 ± 9.4 *
(site control) CM-MCL-01-WS-20180227-N	157.0 ± 9.0 *
(site control) GH-ER2-WS-2018-02-27-N	158.3 ± 8.3 *
FR-FRCP1-WS-201802271326-N-29	66.5 ± 5.3 *abc
GH-FRI-WS-2018-02-27-N	137.5 ± 2.4 *abc
GH-ERC-WS-2018-02-27-N	167.8 ± 8.7 *
EV-MCZ-WS-2018-02-27-N	167.3 ± 3.3 *
EV-HCL-WS-2018-02-27-N	154.5 ± 9.7 *

c. indicates cell yield that were significantly lower than site control GH-ER2.

a. indicates cell yield that were significantly lower than site control FRUFRI
 b. indicates cell yield that were significantly lower than site control CM-MCL

* indicates cell yield that were significantly greater than the lab control.

Reviewed by: [Signature]

Date reviewed: March 23, 2018

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 180299

Start Date: Feb 28/18
 Set up by: MLJ

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Feb 27/18
 Date Received: Feb 28/18
 Sample Volume: various

Test Organism Information:

Culture Date: Feb 23/18
 Age of culture (Day 0): 5d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC167
 Stock Solution ID: 18Zn01
 Date Initiated: Feb 20/18

72-h IC50 (95% CL): 29.1 (25.2 - 32.7) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 32.8 (26.2 - 41.1) µg/L Zn CV (%): 12

Test Results:

	Cell Yield (Mean ± SD)
Negative Control	28.5 ± 2.2
CM-MC2-Q1WS-20180227-N	145.0 ± 7.5 #ac
LC-LCD SSLCC-WS-Q1-2018-N	164.3 ± 10.3 #
CM-MC3-Q1-WS-20180227-N	145.8 ± 7.3 #a
	±
	±
	±
	±
	±

a. indicates cell yield that were significantly lower than the site control FR-UFRI
 c. indicates cell yield that were significant lower than site control GHLER2.

indicates cell yield that were significantly greater than the lab control

Reviewed by: 

Date reviewed: March 23, 2018

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLG
 Sample ID: various Test Date/Time: Feb 28/18 @ 1500h
 Work Order No.: 180299 CER #: 4
 Test Species: Pseudokirchneriella subcapitata

Culture Date: Feb 23/18 Age of Culture: 5d Culture Health: Good

Culture Count: 1 350 2 355 Average: 352.5 Culture Cell Density (c1): 352.5 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 352.5 \times 10^4 \quad \text{cells/mL}} = 6.24 \text{ mL}$$

Time Zero Counts: 1 21 2 23 Average: 22

No. of Cells/mL: 22 x 10⁴ Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10000 cells/mL

Concentration %(v/v) (95.2%)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	°C				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.0	24.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
FR_WFRI (site)	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
CM_MCI (site)	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
GH_ER2 (site)	7.8	24.0	↓	↓	↓	↓	✓	✓	✓	✓
FR_FRCP1	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
GH_FRI	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
GH_FRC	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
EV_MC2	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
EV_HCI	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
CM_MC2	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.2 Well 2: 7.2

Light intensity (lux): 4140 Date measured: Feb 28/18

Thermometer: 4 Light meter: 1 pH meter/probe: 1/1

Sample Description: all samples: clear, odorless, no particulates

Comments: _____

Reviewed: [Signature] Date reviewed: March 23, 2018

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLG
 Sample ID: various Test Date/Time: Feb 28 18 @ 1500h
 Work Order No.: 180299 CER #: 4
 Test Species: Pseudokirchneriella subcapitata

Culture Date: Feb 23 18 Age of Culture: 5d Culture Health: Good
 Culture Count: 1 350 2 355 Average: 352.5 Culture Cell Density (c1): 352.5 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 352.5 \times 10^4 \text{ cells/mL}} = 6.24 \text{ mL}$$

Time Zero Counts: 1 21 2 23 Average: 22

No. of Cells/mL: 22 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 10,000 cells/mL

Concentration (% (v/v) <i>(95.2%)</i>)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	°C							
			0 h	24 h	48 h	72 h	0 h	24 h	48 h	72 h
Control	7.0	24.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
LC-SS-CC	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MC3	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLG	MLG	MLG	MLG	MLG	A	MLG	MLG	MLG	A

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.8 Well 2: 7.8

Light intensity (lux): 4140 Date measured: Feb 28 18 @ MLG

Thermometer: 4 Light meter: 1 pH meter/probe: 1, 1, 1

Sample Description: all samples: clear colourless, odourless, no particulates

Comments: _____

Reviewed: [Signature] Date reviewed: March 23, 2018

Pseudokirchneriella subcapitata Toxicity Test Data Sheet 72-h Algal Cell Counts

Client: Teck Coal Start Date/Time: Feb 28 18 @ 1500h
 Work Order #: 180299 Termination Date: Feb 3 18 @ 1500h
 Sample ID: various Test set up by: Mar ML

Concentration %(v/v)	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	30					ML
	B	28					
	C	31					
	D	29					
	E	34					
	F	28					
	G	27					
	H	29					
(95.2%) FR-FR1 (site)	A	161					
	B	166					
	C	180					
	D	155					
	EA	171					
	FB	181					
	GC	171					
	HD	160					
(95.2%) CM-MC1 (site)	A	168					
	B	175					
	C	154					
	D	155					
	EA	148					
	FB	151					
	GC	158					
	HD	155					
(95.2%) GH-GR2 (site)	A	147					
	B	165					
	C	168					
	D	158					
	EA	170					
	FB	159					
	GC	149					
	HD	158					
(95.2%) FR-FRCP1	A	63					
	B	65					
	C	75					
	D	67					

Comments: _____

Reviewed by:  Date Reviewed: March 23, 2018

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: Teck Coal Start Date/Time: Feb 28 / 18 @ 1500h
 Work Order #: 180299 Termination Date: Mar 3 / 18 @ 1500h
 Sample ID: Various Test set up by: Mar MLG
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
(95.2%) GH-FR1	A	136					MLG
	B	137					
	C	141					
	D	140					
(95.2%) GH-ERC	A	178					
	B	171					
	C	157					
	D	169					
(95.2%) EV-MC2	A	169					
	B	168					
	C	164					
	D	172					
(95.2%) EV-HC1	A	169					
	B	150					
	C	147					
	D	156					
(95.2%) CM-MC2	A	139					
	B	153					
	C	140					
	D	152					
(95.2%) LCLCDSLCC	A	171					
	B	150					
	C	168					
	D	172					
(95.2%) CM-MC3	A	142					
	B	149					
	C	156					
	D	140					

Comments: _____
 Reviewed by: [Signature] Date Reviewed: March 23, 2018

CETIS Summary Report

Report Date: 19 Mar-18 13:49 (p 1 of 2)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Batch ID: 18-3910-8642 Test Type: Cell Growth Analyst: Mimi Tran
 Start Date: 28 Feb-18 15:00 Protocol: EC/EPS 1/RM/25 Diluent: Deionized Water + nutrients
 Ending Date: 03 Mar-18 15:00 Species: Pseudokirchneriella subcapitata Brine:
 Duration: 72h Source: In-House Culture Age: 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-7171-6490	28 Feb-18	28 Feb-18	15h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	28.5	26.66	30.34	26	33	0.7792	2.204	7.73%	0.0%
FR_UFR1	8	167.1	159.3	175	154	180	3.319	9.387	5.62%	-486.4%
CM_MC1	8	157	149.4	164.6	147	174	3.196	9.04	5.76%	-450.9%
GH_ER2	8	158.3	151.3	165.2	146	169	2.938	8.311	5.25%	-455.3%
FR_FRCP1	4	66.5	58.13	74.87	62	74	2.63	5.26	7.91%	-133.3%
GH_FR1	4	137.5	133.7	141.3	135	140	1.19	2.38	1.73%	-382.5%
GH_ERC	4	167.8	153.9	181.6	156	177	4.366	8.732	5.21%	-488.6%
EV_MC2	4	167.3	162	172.5	163	171	1.652	3.304	1.98%	-486.8%
EV_HC1	4	154.5	139	170	146	168	4.873	9.747	6.31%	-442.1%
CM_MC2	4	145	133	157	138	152	3.764	7.528	5.19%	-408.8%
LC_LCDSSLCC	4	164.3	147.8	180.7	149	171	5.154	10.31	6.28%	-476.3%
CM_MC3	4	145.8	134.2	157.3	139	155	3.637	7.274	4.99%	-411.4%

① Lab control = Deionized water w/nutrients
 FR_UFR1 = site control
 CM_MC1 = site control
 GH_ER2 = site control

CETIS Summary Report

Report Date: 19 Mar-18 13:49 (p 2 of 2)
Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	29	27	30	28	33	27	26	28
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7521-7714	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 19 Mar-18 11:17	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-7171-6490	28 Feb-18	28 Feb-18	15h	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	42.5%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		FR_UFR1	36.5	2.606	9.897	14	<0.0001	CDF	Significant Effect
		CM_MC1	33.83	2.606	9.897	14	<0.0001	CDF	Significant Effect
		GH_ER2	34.16	2.606	9.897	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	8.169	2.606	12.12	10	<0.0001	CDF	Significant Effect
		GH_FR1	23.43	2.606	12.12	10	<0.0001	CDF	Significant Effect
		GH_ERC	29.94	2.606	12.12	10	<0.0001	CDF	Significant Effect
		EV_MC2	29.83	2.606	12.12	10	<0.0001	CDF	Significant Effect
		EV_HC1	27.09	2.606	12.12	10	<0.0001	CDF	Significant Effect
		CM_MC2	25.05	2.606	12.12	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	29.18	2.606	12.12	10	<0.0001	CDF	Significant Effect
		CM_MC3	25.21	2.606	12.12	10	<0.0001	CDF	Significant Effect

CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7521-7714 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.4054	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	140214.4	12746.76	11	220.9	<0.0001	Significant Effect
Error	3000.375	57.69952	52			
Total	143214.7		63			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	19.11	24.72	0.0591	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9911	0.9488	0.9284	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	28.5	26.66	30.34	28	26	33	0.7792	7.73%	0.0%
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	-486.4%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	-450.9%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	-455.3%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	-133.3%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	-382.5%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-488.6%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-486.8%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	-442.1%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	-408.8%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	-476.3%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	-411.4%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	29	27	30	28	33	27	26	28
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

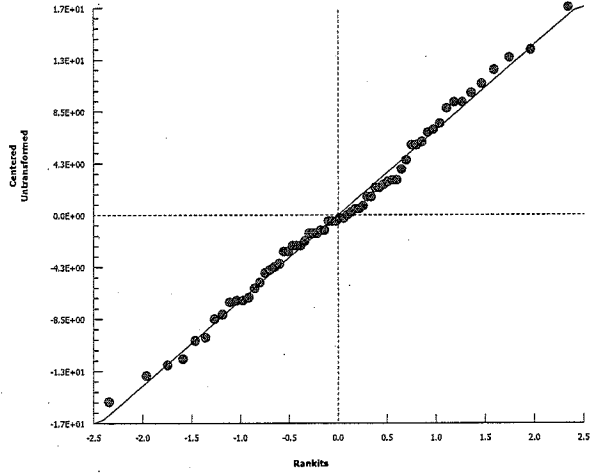
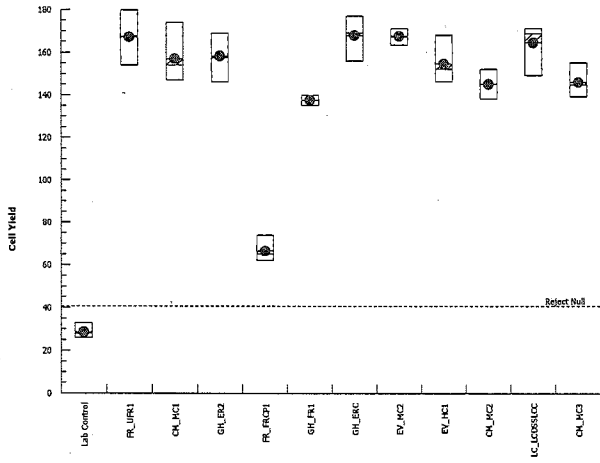
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7521-7714 Endpoint: Cell Yield
 Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

Graphics



ML
 March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 05-8054-7291	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7			
Analyzed: 19 Mar-18 11:17	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:			
Duration: 72h	Source: In-House Culture	Age: 5d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.71%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	2.494	2.59	10.52	14	0.0621	CDF	Non-Significant Effect
		GH_ER2	2.186	2.59	10.52	14	0.1179	CDF	Non-Significant Effect
		FR_FRCP1	20.24	2.59	12.88	10	<0.0001	CDF	Significant Effect
		GH_FR1	5.958	2.59	12.88	10	<0.0001	CDF	Significant Effect
		GH_ERC	-0.1257	2.59	12.88	10	0.9651	CDF	Non-Significant Effect
		EV_MC2	-0.02514	2.59	12.88	10	0.9531	CDF	Non-Significant Effect
		EV_HC1	2.539	2.59	12.88	10	0.0561	CDF	Non-Significant Effect
		CM_MC2	4.45	2.59	12.88	10	0.0003	CDF	Significant Effect
		LC_LCDSSLCC	0.5782	2.59	12.88	10	0.8034	CDF	Non-Significant Effect
		CM_MC3	4.299	2.59	12.88	10	0.0004	CDF	Significant Effect

CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-8054-7291 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.5484	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

ML7
March 23/18

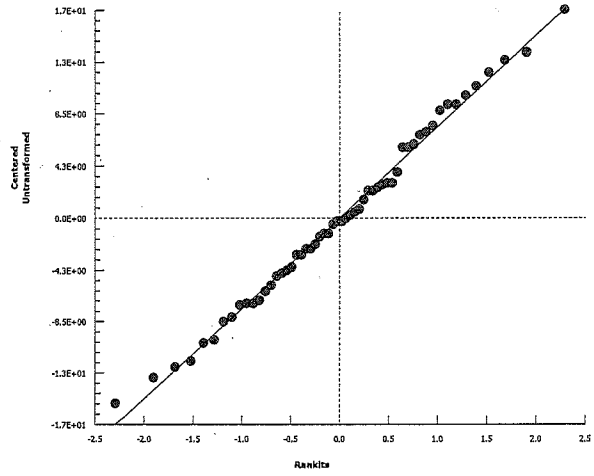
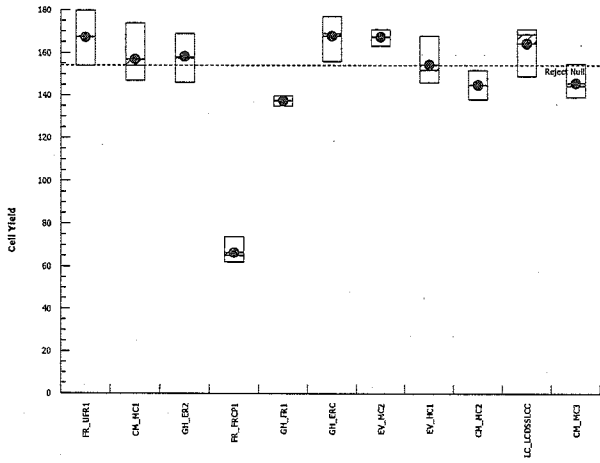
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-8054-7291 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-5210-8961	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 19 Mar-18 11:17	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	7.71%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	-2.494	2.59	10.52	14	1.0000	CDF	Non-Significant Effect
		GH_ER2	-2.186	2.59	10.52	14	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	-20.24	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-5.958	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	0.1257	2.59	12.88	10	0.9291	CDF	Non-Significant Effect
		EV_MC2	0.02514	2.59	12.88	10	0.9459	CDF	Non-Significant Effect
		EV_HC1	-2.539	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		CM_MC2	-4.45	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-0.5782	2.59	12.88	10	0.9925	CDF	Non-Significant Effect
		CM_MC3	-4.299	2.59	12.88	10	1.0000	CDF	Non-Significant Effect

Analyst: MB QA: March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:22 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-5210-8961 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.5484	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

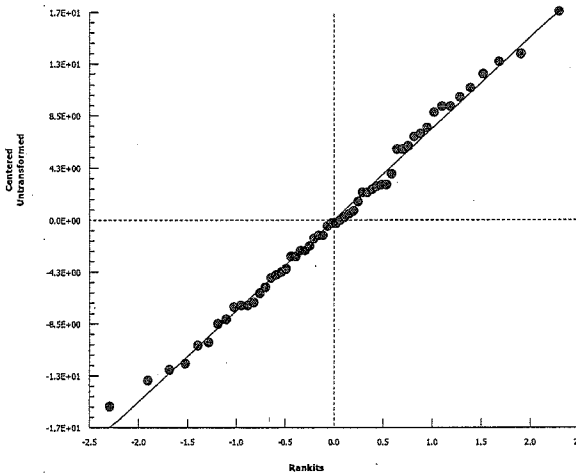
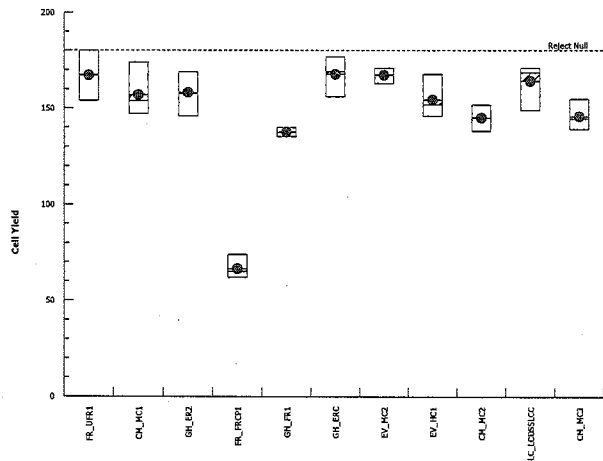
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-5210-8961 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:17 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



Handwritten signature
March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 16-2084-1286	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7			
Analyzed: 19 Mar-18 11:19	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:			
Duration: 72h	Source: In-House Culture	Age: 5d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.14%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	-2.186	2.59	10.52	14	1.0000	CDF	Non-Significant Effect
		CM_MC1	0.3079	2.59	10.52	14	0.8888	CDF	Non-Significant Effect
		FR_FRCP1	18.45	2.59	12.88	10	<0.0001	CDF	Significant Effect
		GH_FR1	4.173	2.59	12.88	10	0.0006	CDF	Significant Effect
		GH_ERC	-1.911	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		EV_MC2	-1.81	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	0.7542	2.59	12.88	10	0.7315	CDF	Non-Significant Effect
		CM_MC2	2.665	2.59	12.88	10	0.0421	CDF	Significant Effect
		LC_LCDSSLCC	-1.207	2.59	12.88	10	0.9995	CDF	Non-Significant Effect
		CM_MC3	2.514	2.59	12.88	10	0.0594	CDF	Non-Significant Effect

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-2084-1286 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:19 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.9049	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 3 of 3)
Test Code: 180299a | 12-1650-5282

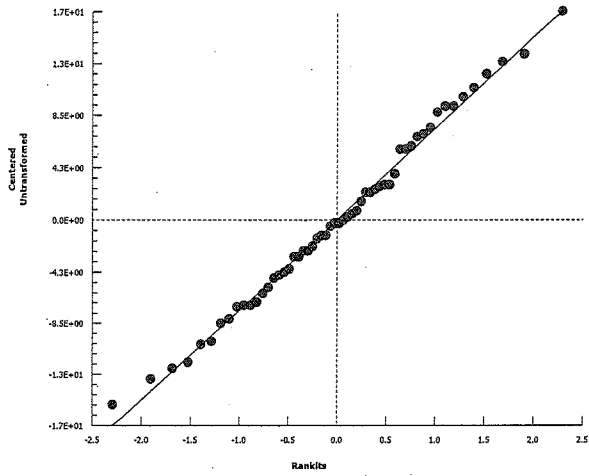
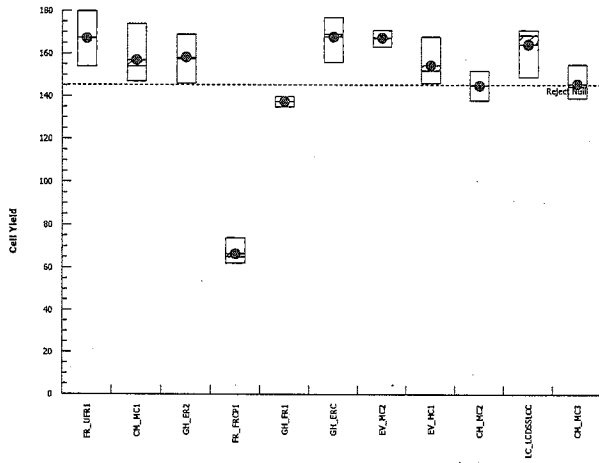
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-2084-1286 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:19 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 01-1320-8604	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 19 Mar-18 11:21	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	8.14%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	2.186	2.59	10.52	14	0.1179	CDF	Non-Significant Effect
		CM_MC1	-0.3079	2.59	10.52	14	0.9804	CDF	Non-Significant Effect
		FR_FRCP1	-18.45	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-4.173	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	1.911	2.59	12.88	10	0.1951	CDF	Non-Significant Effect
		EV_MC2	1.81	2.59	12.88	10	0.2304	CDF	Non-Significant Effect
		EV_HC1	-0.7542	2.59	12.88	10	0.9962	CDF	Non-Significant Effect
		CM_MC2	-2.665	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.207	2.59	12.88	10	0.5085	CDF	Non-Significant Effect
		CM_MC3	-2.514	2.59	12.88	10	1.0000	CDF	Non-Significant Effect

MLT
March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 01-1320-8604 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:21 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :5%)
Control Trend	Mann-Kendall Trend			0.9049	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

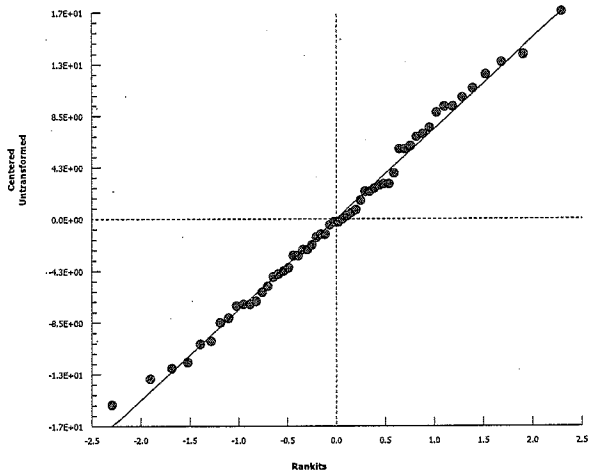
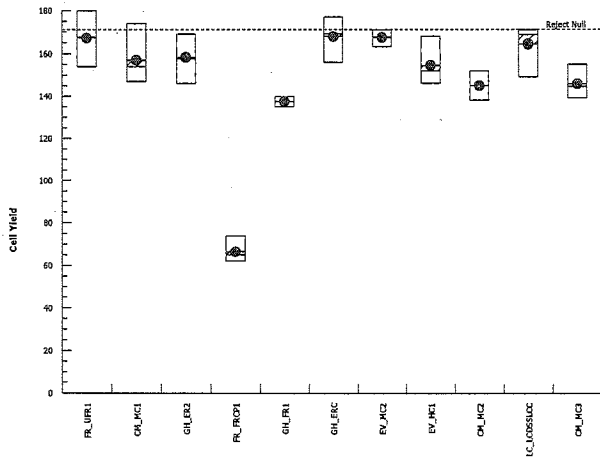
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 01-1320-8604 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:21 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 15-1051-8045	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7			
Analyzed: 19 Mar-18 11:18	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:			
Duration: 72h	Source: In-House Culture	Age: 5d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.2%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	-2.494	2.59	10.52	14	1.0000	CDF	Non-Significant Effect
		GH_ER2	-0.3079	2.59	10.52	14	0.9804	CDF	Non-Significant Effect
		FR_FRCP1	18.2	2.59	12.88	10	<0.0001	CDF	Significant Effect
		GH_FR1	3.922	2.59	12.88	10	0.0014	CDF	Significant Effect
		GH_ERC	-2.162	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		EV_MC2	-2.062	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	0.5028	2.59	12.88	10	0.8304	CDF	Non-Significant Effect
		CM_MC2	2.414	2.59	12.88	10	0.0740	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.458	2.59	12.88	10	0.9998	CDF	Non-Significant Effect
		CM_MC3	2.263	2.59	12.88	10	0.1012	CDF	Non-Significant Effect

Much 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-1051-8045 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:18 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

ML
March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 3 of 3)
Test Code: 180299a | 12-1650-5282

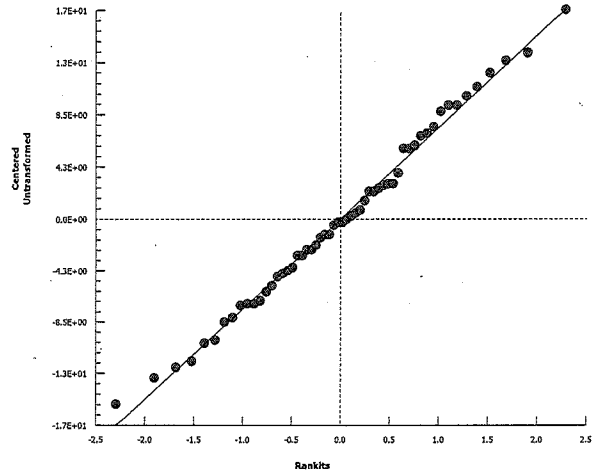
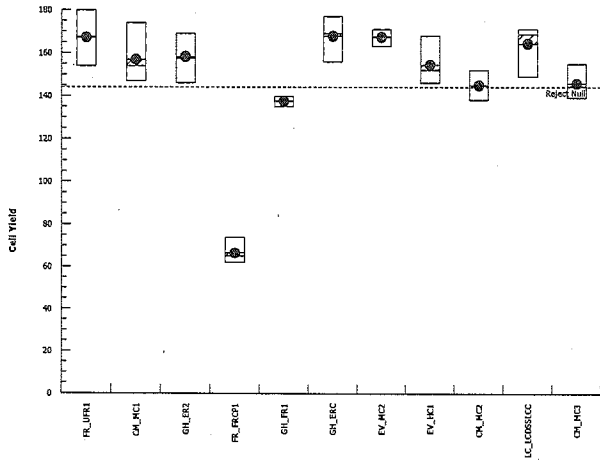
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-1051-8045 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:18 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 1 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 19-8840-0843	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 19 Mar-18 11:18	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-3910-8642	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Feb-18 15:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 03 Mar-18 15:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	28h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	28h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	28h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	26h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	25h (4.5 °C)		
GH_ERC	20-1877-5301	27 Feb-18 12:17	28 Feb-18 09:00	27h (5 °C)		
EV_MC2	00-5355-6338	27 Feb-18 11:15	28 Feb-18 09:00	28h (7.6 °C)		
EV_HC1	03-7506-7178	27 Feb-18 10:00	28 Feb-18 09:00	29h (5.4 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	28h (5.4 °C)		
LC_LCDSSLCC	03-2465-0939	27 Feb-18	28 Feb-18 09:00	39h (3.3 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	27h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-02-27_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-02-27_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_Q1_2018_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	8.2%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	2.494	2.59	10.52	14	0.0621	CDF	Non-Significant Effect
		GH_ER2	0.3079	2.59	10.52	14	0.8888	CDF	Non-Significant Effect
		FR_FRCP1	-18.2	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-3.922	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	2.162	2.59	12.88	10	0.1235	CDF	Non-Significant Effect
		EV_MC2	2.062	2.59	12.88	10	0.1493	CDF	Non-Significant Effect
		EV_HC1	-0.5028	2.59	12.88	10	0.9900	CDF	Non-Significant Effect
		CM_MC2	-2.414	2.59	12.88	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.458	2.59	12.88	10	0.3820	CDF	Non-Significant Effect
		CM_MC3	-2.263	2.59	12.88	10	1.0000	CDF	Non-Significant Effect

March 23/18

CETIS Analytical Report

Report Date: 19 Mar-18 11:23 (p 2 of 3)
 Test Code: 180299a | 12-1650-5282

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 19-8840-0843 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 19 Mar-18 11:18 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35262.46	3526.246	10	53.49	<0.0001	Significant Effect
Error	2966.375	65.91944	45			
Total	38228.84		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.749	23.21	0.5561	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9907	0.9426	0.9421	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	167.1	159.3	175	167.5	154	180	3.319	5.62%	0.0%
CM_MC1	8	157	149.4	164.6	154	147	174	3.196	5.76%	6.06%
GH_ER2	8	158.3	151.3	165.2	157.5	146	169	2.938	5.25%	5.31%
FR_FRCP1	4	66.5	58.13	74.87	65	62	74	2.63	7.91%	60.21%
GH_FR1	4	137.5	133.7	141.3	137.5	135	140	1.19	1.73%	17.73%
GH_ERC	4	167.8	153.9	181.6	169	156	177	4.366	5.21%	-0.37%
EV_MC2	4	167.3	162	172.5	167.5	163	171	1.652	1.98%	-0.07%
EV_HC1	4	154.5	139	170	152	146	168	4.873	6.31%	7.55%
CM_MC2	4	145	133	157	145	138	152	3.764	5.19%	13.24%
LC_LCDSSLCC	4	164.3	147.8	180.7	168.5	149	171	5.154	6.28%	1.72%
CM_MC3	4	145.8	134.2	157.3	144.5	139	155	3.637	4.99%	12.79%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	160	165	179	154	170	180	170	159
CM_MC1	167	174	153	154	147	150	157	154
GH_ER2	146	164	167	157	169	158	148	157
FR_FRCP1	62	64	74	66				
GH_FR1	135	136	140	139				
GH_ERC	177	170	156	168				
EV_MC2	168	167	163	171				
EV_HC1	168	149	146	155				
CM_MC2	138	152	139	151				
LC_LCDSSLCC	170	149	167	171				
CM_MC3	141	148	155	139				

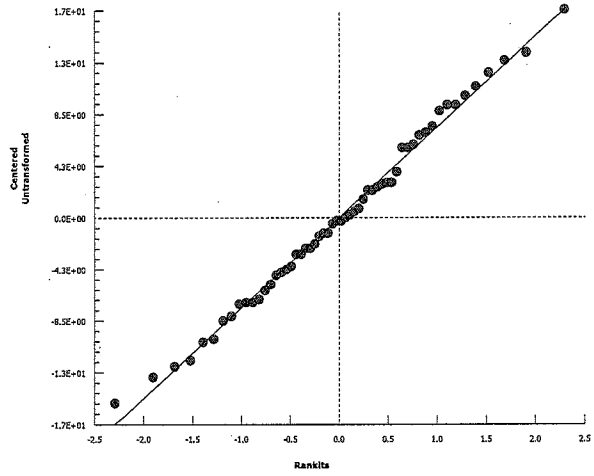
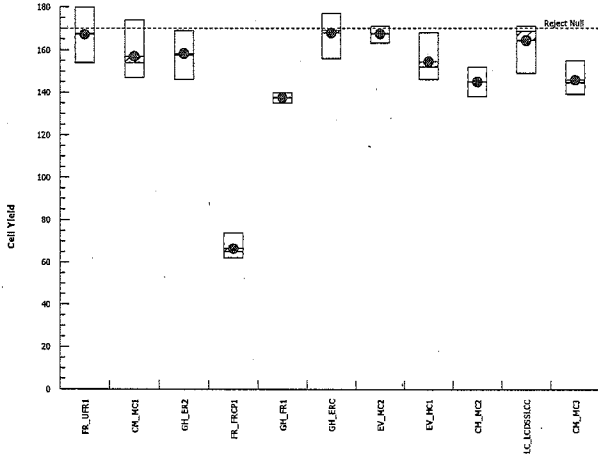
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 19-8840-0843 Endpoint: Cell Yield
Analyzed: 19 Mar-18 11:18 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



APPENDIX C – *Hyalella azteca* Toxicity Test Data

^{water only}
***Hyalella azteca* Sediment Test Summary Sheet**

Client: Teck
 Work Order No.: 180295

Start Date: Mar 2²/18
 Set up by: EL

Sample Information:

Sample ID: (see below)
 Sample Date: Feb 27/18
 Date Received: Feb 28/18
 Sample Volume: 1 X 20L per sample

Test Organism Information:

Species: *Hyalella azteca*
 Supplier: Aquatic Biosystems
 Date received: Mar 23/18
 Age or size (Day 0): 7-8th days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA147
 Stock Solution ID: n/a
 Date Initiated: Mar 2/18

96-h LC50 (95% CL): 6.0 (4.8-7.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.0-6.6) g/L NaCl CV (%): 7

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	100 ± 0.0	0.34 ± 0.06
FR-VFRI	98.0 ± 4.5	0.27 ± 0.02
CM-MCI	100 ± 0.0	① 0.24 ± 0.04
GH-ERZ	96.0 ± 5.5	0.27 ± 0.03
FR-FRCP1	①③ 96.0 ± 26.1	①③ 0.13 ± 0.04 ③④
GH-FR1	96.0 ± 5.5	0.27 ± 0.06
CM-MC2	①② 36.0 ± 35.8 ③④	①② 0.05 ± 0.02 ③④
CM-MC3	98.0 ± 4.5	0.28 ± 0.03

① indicates significant difference compared to control. ② indicates significant difference compared to FR-VFRI

Reviewed by: JOU Date reviewed: Apr. 12/18

③ indicates significant difference compared to CM-MCI. ④ indicates significant difference compared to GH-ERZ

Water only
***Hyalella azteca* Sediment Test Summary Sheet**
EU

Client: Teck
 Work Order No.: 180295

Start Date: Mar 2²/18
 Set up by: EC

Sample Information:

Sample ID: (see below)
 Sample Date: Feb 27/18
 Date Received: Feb 28/18
 Sample Volume: 1 X 20L per sample

Test Organism Information:

Species: Hyalella azteca
 Supplier: Aquatic Biosystems
 Date received: Mar 23/18
 Age or size (Day 0): 7-8th days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA147
 Stock Solution ID: n/a
 Date Initiated: Mar 2/18

96-h LC50 (95% CL): 6.0 (4.8-7.5) g/L NaCl
 96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.0-6.6) g/L NaCl CV (%): 7

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control + EDTA	94.0 ± 8.9	0.38 ± 0.05
CM-MC2 (+EDTA)	98.0 ± 4.5	0.32 ± 0.05
	±	±
	±	±
	±	±
	±	±
	±	±
	±	±

Reviewed by: Jeb

Date reviewed: Apr. 12/18

water only
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality

Client: Teck
 WO #: 180295
 Sample ID: (see below)

Start Date: Feb 18
 Termination Date: Mar 30/18
 CER #: 6
 Test Organism: *H. azteca*

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	22.0	23.0	22.0	22.0	21.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-VFRI	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC1	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ERZ	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-FRI	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC3+EDTA	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Control + EDTA	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2+EDTA	22.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	EL	A	A	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

Temperature (°C)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Control	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-VFRI	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC1	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ERZ	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-FRI	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC3	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Control + EDTA	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2+EDTA	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	EL	A	A	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

Thermometer: CER 6 Light meter: LT 1 Light intensity (Lux): 500-1000

Comments: _____

Reviewed by: JCH Date Reviewed: Apr 4/18

water only
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality

Client: Teck
 WO #: 180295
 Sample ID: (see below)

Start Date: Mar 2 / 18
 Termination Date: Mar 30 / 18
 CER #: 6
 Test Organism: *H. azteca*

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	441	449	442	458	444	455	446	439	438	449	435	452	431	452	429
FR-VFR1	444	377	464	460	475	456	465	456	450	456	456	458	443	454	444
CM-MC1	375	404	392	394	409	383	398	400	418	394	395	405	398	377	384
GH-ER2	402	1661	426	419	421	425	426	414	432	400	421	416	411	411	428
FR-FRCP1	1639	1123	1608	1610	1647	1612	1605	1599	1612	1531	1542	1559	1519	1465	1475
GH-FR1	984	993	994	995	986	1004	998	1010	991	1017	1021	1011	990	994	1026
CM-MC2	1121	597	1131	1107	1127	1112	1114	1088	1041	1117	11543	1134	1117	1101	1109
CM-MC3 + EDTA	599	620	621	626	607	616	623	620	578	574	570	531	558	499	516
Control + EDTA	423	446	447	440	436	442	437	450	427	435	439	433	426	434	425
CM-MC2 + EDTA	1128	1126	1116	1127	1122	1126	1113	1125	1126	1144	1139	1158	1139	1145	1170
Technician Initials	EL	A	A	EL	EL	EL	EL	EL	A	A	EL	EL	EL	EL	EL

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	434	435	438	447	484	484	455	436	435	439	454	444	450	447
FR-VFR1	454	449	436	454	464	451	430	423	423	420	427	428	421	421
CM-MC1	384	385	388	392	408	391	387	385	387	388	387	394	421	431
GH-ER2	406	407	409	415	431	414	417	407	411	421	425	420	419	402
FR-FRCP1	1562	1566	1566	1461	1590	1570	1445	1393	1374	1364	1351	1256	1366	1302
GH-FR1	1046	1054	1084	1086	1135	1048	1078	1064	1073	1072	1074	1060	1090	1034
CM-MC2	1237	1250	1261	1265	1253	1228	1137	1113	1094	1088	1065	1050	1108	1106
CM-MC3	625	635	671	661	675	648	626	608	616	598	588	589	589	576
Control + EDTA	430	432	448	449	451	435	427	428	434	433	432	424	434	435
CM-MC2 + EDTA	1224	1241	1267	1272	1241	1237	1152	1119	1095	1098	1080	1073	1093	1099
Technician Initials	EL	A	EL	EL	EL	EL	EL	A	A	EL	EL	EL	EL	EL

Conductivity meter/probe: C-3 / Cp-3

Comments: _____

Reviewed by: JGA

Date Reviewed: Apr 11 / 18

water only
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality

Client: Teck
 WO #: 180295
 Sample ID: (See below)

Start Date: Feb Mar 2 / 18
 Termination Date: Mar 30 / 18
 CER #: 6
 Test Organism: *H. azteca*

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	7.9	8.0	7.6	7.4	7.3	7.0	7.0	7.0	7.3	7.3	7.0	7.2	7.1	7.2	7.2
FR-UFRI	7.9	7.9	7.7	7.6	7.8	7.5	7.4	7.5	7.4	7.5	7.3	7.3	7.4	7.4	7.8
CM-MC1	7.8	8.0	7.8	7.6	7.8	7.5	7.4	7.5	7.6	7.6	7.3	7.3	7.4	7.5	7.5
GH-ER2	8.0	8.1	7.9	7.6	7.9	7.6	7.5	7.5	7.6	7.7	7.4	7.4	7.4	7.5	7.7
FR-FRCP1	8.1	8.0	7.8	7.8	8.2	7.9	7.6	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.9
GH-FR1	8.0	8.1	8.0	8.0	8.2	8.0	7.8	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.0
CM-MC2	7.9	8.0	8.1	8.0	8.2	8.0	7.9	7.9	7.9	7.9	7.8	7.9	7.9	8.0	7.9
CM-MC3	7.8	8.0	8.1	7.9	8.1	7.9	7.9	7.9	7.9	7.9	7.8	7.9	7.9	8.0	8.0
Control + EDTA	7.5	8.0	7.8	7.6	7.6	7.5	8.0	8.0	7.7	7.8	7.8	8.0	8.1	8.1	8.0
CM-MC2 + EDTA	8.0	8.1	7.9	7.9	8.0	8.0	7.8	7.8	7.8	7.9	7.8	7.8	7.9	8.0	7.9
Technician Initials	EL	A	A	EL	EL	EL	EL	EL	A	A	A	EL	EL	EL	EL

pH

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Control	7.4	7.3	7.6	7.0	7.6	6.8	6.0	7.3	7.3	7.3	6.9	7.1	7.3	7.3	
FR-UFRI	7.5	7.6	7.5	7.6	7.6	7.6	7.6	7.7	7.7	7.9	7.6	7.6	7.8	7.8	
CM-MC1	7.5	7.7	7.6	7.6	7.6	7.6	7.7	7.9	7.8	7.9	7.7	7.7	7.8	7.8	
GH-ER2	7.6	7.7	7.7	7.7	7.7	7.7	7.7	8.0	7.9	7.9	7.7	7.8	7.9	7.9	
FR-FRCP1	7.7	7.9	7.9	7.9	7.8	7.9	8.0	8.1	8.0	8.0	7.6	7.3	8.0	7.9	
GH-FR1	7.9	8.0	8.1	8.0	8.0	8.1	8.1	8.0	8.1	8.2	7.9	8.0	8.1	8.1	
CM-MC2	8.0	8.0	8.0	7.9	8.1	8.0	8.0	8.1	8.0	8.1	7.9	7.9	8.1	8.0	
CM-MC3	8.1	8.0	8.1	8.0	8.1	8.0	8.0	8.0	8.1	8.1	7.9	7.9	8.1	8.0	
Control + EDTA	8.1	8.1	8.0	7.6	7.5	7.5	7.5	7.7	7.5	7.5	7.5	7.1	7.3	7.4	
CM-MC2 + EDTA	8.0	7.9	8.0	8.0	8.0	8.0	8.0	8.1	8.1	8.1	7.9	8.0	8.1	8.1	
Technician Initials	EL	A	EL	EL	EL	EL	EL	A	A	A	EL	EL	EL	EL	

pH meter/probe: pH-3 / p-3

Comments: _____

Reviewed by: JBL

Date Reviewed: Apr. 11 / 18

water only
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment-Water Quality

Client: Teck
 WO #: 180295
 Sample ID: (see below)

Start Date: Mar 2 / 18
 Termination Date: Mar 30 / 18
 CER #: 6
 Test Organism: *H. azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	8.6	7.9	8.1	6.7	7.5	7.2	7.5	7.2	7.4	7.5	6.9	6.1	7.0	7.0	6.9
FR-VFRI	8.6	8.0	8.0	6.8	7.5	7.2	7.5	7.1	7.3	7.4	6.8	6.5	7.1	7.1	7.0
CM-ML1	8.6	8.0	7.8	7.0	7.5	7.2	7.5	7.2	7.4	7.4	7.6	6.8	7.2	7.2	6.8
GH-ER2	8.6	7.9	8.0	7.1	7.5	7.2	7.5	7.3	7.6	7.3	7.9	7.0	7.1	7.2	6.9
FR-FRCPI	8.6	8.0	8.0	7.2	7.5	7.3	7.5	7.4	7.3	7.3	7.1	6.9	7.3	7.2	7.0
GH-FRI	8.6	8.0	7.9	7.1	7.5	7.3	7.4	7.4	7.4	7.4	7.3	7.0	7.3	7.2	7.0
CM-ML2	8.6	8.0	8.1	7.3	7.5	7.3	7.6	7.4	7.6	7.3	7.2	7.0	7.3	7.3	6.9
CM-ML3	8.6	7.9	8.1	7.2	7.6	7.3	7.6	7.4	7.5	7.4	7.3	7.1	7.2	7.2	7.0
Control + EDTA	8.6	8.0	8.1	7.2	7.7	7.7	7.6	7.4	7.5	7.5	7.3	7.0	7.1	7.2	7.0
CM-ML2 + EDTA	8.6	8.0	8.2	7.2	7.7	7.3	7.7	7.5	7.4	7.4	7.3	7.0	7.3	7.2	7.1
Technician Initials	EL	A	A	EL	EL	EL	EL	E	A	A	EL	EL	EL	EL	EL

Dissolved oxygen (mg/L)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	7.0	7.2	7.1	7.1	7.0	6.6	6.6	6.9	7.1	7.3	7.0	7.4	7.5	7.2
FR-VFRI	6.9	7.1	7.0	7.1	7.0	7.1	7.0	7.1	7.1	7.4	7.4	7.3	7.5	7.3
CM-ML1	7.0	7.2	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.5	7.5	7.4	7.6	7.5
GH-ER2	7.1	7.2	7.1	7.4	7.3	7.2	7.2	7.3	7.2	7.5	7.5	7.5	7.7	7.5
FR-FRCPI	7.0	7.1	7.2	7.5	7.4	7.3	7.4	7.2	7.0	7.5	7.5	7.6	7.8	7.5
GH-FRI	7.1	7.2	7.2	7.5	7.5	7.4	7.5	7.4	7.0	7.4	7.5	7.6	7.8	7.5
CM-ML2	7.0	7.1	7.3	7.5	7.7	7.6	7.6	7.4	7.3	7.4	7.5	7.6	7.8	7.6
CM-ML3	7.1	7.2	7.4	7.5	7.7	7.8	7.6	7.3	7.2	7.4	7.5	7.6	7.8	7.6
Control + EDTA	7.2	7.2	7.4	7.8	7.9	7.8	7.6	7.4	7.2	7.5	7.6	7.6	7.8	7.4
CM-ML2 + EDTA	7.1	7.3	7.5	7.8	7.9	7.9	7.6	7.5	7.2	7.4	7.5	7.6	7.8	7.6
Technician Initials	EL	A	EL	EL	EL	EL	EL	A	A	EL	EL	EL	EL	EL

DO meter/probe: DO-3, D-3

Comments: _____

Reviewed by: Jeb

Date Reviewed: Apr 11 / 18

Water only
H. azteca Sediment Toxicity Test Data Sheet
Freshwater Sediment 14-d Survival and Weight

Client: Teck
Work Order No: 180295
Sample ID: (See below)

Start Date: Mar 2 / 18
Termination Date: Mar 30 / 18
Test Organism: Hyalella azteca
Balance: 1

Sample ID	Pan No. <i>TKQ4</i>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	1	A	10	0	0	EC	1026.44	1030.79	10	EC
	2	B	10	0	0		1008.21	1011.85	10	
	3	C	10	0	0		994.47	997.57	10	
	4	D	10	0	0		1002.09	1004.92	10	
	5	E	10	0	0		1027.49	1030.40	10	
FR-UFRI	6	A	9	0	1		1006.65	1009.27	9	
	7	B	10	0	0		1026.80	1029.14	10	
	8	C	10	0	0		1033.64	1036.37	10	
	9	D	10	0	0		1033.11	1035.83	10	
	10	E	10	0	0		1014.08	1016.72	10	
(M.MCI)	11	A	10	0	0		1017.73	1019.53	10	
	12	B	10	0	0		1024.54	1027.44	10	
	13	C	10	0	0		1009.42	1011.97	10	
	14	D	10	0	0		10234.20	1026.8762	10	
	15	E	10	0	0		1030.31	1032.78	10	
GH-ER2	16	A	10	0	0		1007.33	1010.00	10	
	17	B	10	0	0		1015.27	1018.01	10	
	18	C	10	0	0		1019.77	1022.52	10	
	19	D	9	0	1		1019.78	1021.83	9	
	20	E	9	0	1	✓	1001.72	1004.41	9	✓

Comments: Reweighed on Pan # 1 : 1030.82 mg , Pan # 10 : 1016.88 mg

Reviewed by: JOU

Date Reviewed: Apr 11 / 18

Water only
H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment 14-d Survival and Weight

Client: Teck
 Work Order No: 180295
 Sample ID: (see below)

Start Date: Mar 28
 Termination Date: Mar 30 / 18
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	21	A	9	0	1	EL	1029.16	1030.12	9	EL
FR-FRCPI	22	B	10	0	0		1024.18	1026.06	10	
	23	C	4①	0	6		1010.34	1010.67	4	
	24	D	10①	0	0		1016.88	1018.05	2 x 10	
	25	E	10①	0	0		1010.60	1012.25	10	
	GH-FR1	26	A	10	0	0		1035.06	1038.05	10
GH-FR1	27	B	10	0	0		1025.90	1028.62	10	
	28	C	10	0	0		1001.14	1003.74	10	
	29	D	9	0	1		991.864	994.74	9	
	30	E	9②	0	1		1029.18	1030.84	9	
	CM-MC2	31	A	8①	0	2		1006.50	1007.09	8
CM-MC2	32	B	0	1	9		1029.31	-	0	
	33	C	4①	4	2		989.18	989.34	4	
	34	D	6①	2	2		1034.79	1035.08	6	
	35	E	0	1	9		1033.812	-	-	
	MC3	36	A	10	0	0		1042.21	1045.10	10
MC3	37	B	10	0	0		1023.28	1025.95	10	
	38	C	9 x 10	0	10		1021.28	1023.82	10	
	39	D	9	0	1		1031.56	1034.849	9	
	40	E	10	0	0	✓	1030.71	1033.37	10	✓

Comments: ① Organisms appear pale & small ② Organisms appear pale
Revivified on Pan #1 21: 1030.23 mg, Pan #1 25: 1012.36 mg

Reviewed by: JGW Date Reviewed: Apr 11/18

fw water only
H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment ^{EC} 14-d Survival and Weight ₂₈

Client: Teck
 Work Order No: 180295
 Sample ID: (See below)

Start Date: Mar 2/18
 Termination Date: Mar 30/18
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment + EDTA	1	A	10	0	0	EC	1290.26	1294.27	10	EC
	2	B	10	0	0		1286.51	1291.06	10	
	3	C	10	0	0		1262.35	1265.59	10	
	4	D	8	0	2		1285.03	1287.85	8	
	5	E	9	0	1		1282.02	1285.13	9	
MCQ + EDTA	6	A	10	0	0		1296.29	1300.04	10	
	7	B	10 ^⓪	0	0		1270.21	1272.63	10	
	8	C	9	0	1		1274.75	1277.70	9	
	9	D	10	0	0		1285.80	1288.90	10	
	10	E	10	0	0	✓	1285.73	1289.41	10	✓
		A								
		B								
		C								
		D								
		E								
		A								
		B								
		C								
		D								
		E								

Comments: ⓪ Organisms appear pale.
Reweighed on Pan #5: 1285.22 mg

Reviewed by: JG

Date Reviewed: Apr 11/18

Client: Teck

W.O.#: 180295

Hardness and Alkalinity Datasheet

Day 0 Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
Control	Mar 2/18	Mar 26/18	100 [Ⓢ]	0.5	0.6	40	100 [Ⓢ]	2.0	200	EC
FR_VFR1	↓	↓	50	6.7	6.9	130	50	8.7	174	↓
CM_ML1	↓	↓	50	7.1	7.3	138	50	7.5	150	↓
GH_ER2	↓	↓	50	7.4	7.6	144	50	8.5 9.6	192	↓
FR_FRCP1	↓	↓	100 [Ⓢ]	2.0	2.1	190	100 [Ⓢ]	8.3	830	↓
GH_FR1	↓	↓	100 [Ⓢ]	1.7	1.9	150	100 [Ⓢ]	4.9	490	↓
CM_ML2	↓	↓	100 [Ⓢ]	1.7	1.9	150	100 [Ⓢ]	6.4	640	↓
CM_MC3	Mar 2/18	Mar 6/18	100 [Ⓢ]	1.2	1.3	110	100 [Ⓢ]	3.0	300	↓
EDTA+Control	↓	↓	50	2.7	2.8	52	50	6.8	136	↓
EDTA+MC2	↓	↓	50	10.2	10.7	194	100 [Ⓢ]	6.0	600	↓
MHW	Feb 28/18	Feb 18/18	50	2.8	2.9	54	50	6.9	138	EC

Notes: ① Diluted to 100 ml w/ D.I.

Reviewed by: JG Date Reviewed: Apr. 11/18

Client: Teck

W.O.#: 18029S

Hardness and Alkalinity Datasheet

Day 28 Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Control	Mar 30 / 18	Apr 3 / 18	100 [Ⓢ]	0.5	0.6	40	100 [Ⓢ]	1.2	120	EL
FR_VFR1	↓	↓	↓	1.2	1.3	110	↓	2.1	210	↓
CM-MC1	↓	↓	↓	1.5	1.6	140	↓	2.0	200	↓
GH-ER2	↓	↓	↓	1.5	1.6	140	↓	2.0	200	↓
FR-FCP1	↓	↓	↓	2.3	2.4	220	↓	7.0	700	↓
GH-FK1	↓	↓	↓	1.5	1.6	140	↓	5.0	500	↓
CM-MC2	↓	↓	↓	1.4	1.5	130	↓	5.4	540	↓
CM-MC3	Mar 30 / 18	Apr 3 / 18	↓	1.8	1.9	170	↓	3.0	300	↓
Control + EDTA	Mar 30 / 18	Apr 3 / 18	↓	0.5	0.6	40	↓	1.5	150	↓
MC2 + EDTA	↓	↓	↓	2.1	2.2	200	↓	5.2	520	↓

Notes: ① Diluted to 100 ml w/ D.I.

Reviewed by: Jon

Date Reviewed: Apr. 11/18

Day 0

Nautilus Environmental Water Quality Data For Ammonia

Client : Teck

Species : H. azteca

Work Order No: 180295

Sample Type: Overlying water

Date Measured: Mar 2/18

Date	Sample ID	Temperature (°C)	pH	Total Ammonia as N (mg/L)	Unionized Ammonia (mg/L)	Tech. Init.
Mar 2/18	Control	22.0	7.9	0.00	0.00	EL
↓	FR-VFR1	↓	7.9	↓	↓	↓
↓	CM-MC1	↓	7.8	↓	↓	↓
↓	GH-ER2	↓	8.0	↓	↓	↓
↓	FRFR (PI)	↓	8.1	↓	↓	↓
↓	GH-FR1	↓	8.0	↓	↓	↓
↓	CM-MC2	↓	7.9	↓	↓	↓
↓	CM-MC3	↓	7.8	↓	↓	↓
↓	Control + EDTA	↓	7.5	↓	↓	↓
↓	CM-MC2 + EDTA	↓	8.0	↓	↓	↓

Ammonia Salicylate Lot #: A7319

Ammonia Cyanurate Lot #: A7305

Comments: _____

Reviewed by: JM

Date Reviewed: Apr 11/18

Day 28

Nautilus Environmental Water Quality Data For Ammonia

Client : Teck

Species : H. azteca

Work Order No: 180295

Sample Type: Overlying water

Date Measured: Mar 30 / 18

Date	Sample ID	Temperature (°C)	pH	Total Ammonia as N (mg/L)	Unionized Ammonia (mg/L)	Tech. Init.
Mar 30 / 18	Control	22.0	7.3	0.40	0.00	EC
	FR-VFR1		7.8	0.20	0.00	
	CM-MC1		7.8	0.40	0.01	
	GH-ERZ		7.9	0.00	0.01	
	FR-FRCP1		7.9	0.10	0.00	
	GH-FR1		8.1	0.10	0.00	
	CM-MC2		8.0	0.10	0.00	
	CM-MC3		8.1	0.10	0.00	
	Control+EDTA		7.4	0.30	0.00	
	CM-MC2+EDTA		8.1	0.00	0.00	

Ammonia Salicylate Lot #: 4731

Ammonia Cyanurate Lot #: 47305

Comments: _____

Reviewed by: Jou

Date Reviewed: Apr. 12 / 18

CETIS Summary Report

Report Date: 09 Apr-18 13:05 (p 1 of 2)
 Test Code: 180295 | 10-4032-0225

water only
 Hyalella 28-d Survival and Growth ~~Sediment~~ ²⁸ Test ₂₈ *28* **Nautilus Environmental**

Batch ID: 06-2830-0550 Test Type: Growth-Survival (10d)
 Start Date: 02 Mar-18 Protocol: EPA/600/R-99/064 (2000)
 Ending Date: 30 Mar-18 Species: Hyalella azteca
 Duration: 28d 0h Source: Aquatic Biosystems, CO
 Analyst: Eric Cheung
 Diluent: Reconstituted Water
 Brine:
 Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
control	12-8799-2585	02 Mar-18	02 Mar-18	NA	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C) ✓		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C) ✓		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C) ✓		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C) ✓		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C) ✓		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C) ✓		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C) ✓		
Control+EDTA	05-9324-4059	02 Mar-18 ✓	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C) ✓		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
control	Water Sample	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

28 **10d Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
control	5	1	1	1	1	1	0	0	0.0%	0.0%
FR_UFR1	5	0.98	0.9245	1	0.9	1	0.02	0.04472	4.56%	2.0%
CM_MC1	5	1	1	1	1	1	0	0	0.0%	0.0%
GH_ER2	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	4.0%
FR_FRCP1	5	0.86	0.5362	1	0.4	1	0.1166	0.2608	30.32%	14.0%
GH_FR1	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	4.0%
CM_MC2	5	0.36	0	0.8042	0	0.8	0.16	0.3578	99.38%	64.0%
CM_MC3	5	0.98	0.9245	1	0.9	1	0.02	0.04472	4.56%	2.0%
Control+EDTA	5	0.94	0.8289	1	0.8	1	0.04	0.08944	9.52%	6.0%
CM_MC2 (EDTA)	5	0.98	0.9245	1	0.9	1	0.02	0.04472	4.56%	2.0%

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
control	5	0.3366	0.2578	0.4154	0.283	0.435	0.02837	0.06343	18.85%	0.0%
FR_UFR1	5	0.2668	0.2409	0.2927	0.234	0.2911	0.009328	0.02086	7.82%	20.73%
CM_MC1	5	0.2428	0.1934	0.2922	0.18	0.29	0.0178	0.0398	16.39%	27.87%
GH_ER2	5	0.2685	0.2365	0.3005	0.2278	0.2989	0.01153	0.02577	9.6%	20.22%
FR_FRCP1	5	0.1318	0.07791	0.1858	0.08249	0.188	0.01942	0.04343	32.94%	60.83%
GH_FR1	5	0.272	0.1991	0.3449	0.1844	0.3444	0.02626	0.05871	21.59%	19.2%
CM_MC2	3	0.05403	0.01035	0.0977	0.04001	0.07375	0.01015	0.01758	32.54%	83.95%
CM_MC3	5	0.2803	0.2452	0.3154	0.254	0.3255	0.01264	0.02827	10.08%	16.72%
Control+EDTA	5	0.3756	0.3104	0.4409	0.324	0.455	0.0235	0.05256	13.99%	-11.59%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.242	0.375	0.02395	0.05355	16.5%	3.58%

CETIS Summary Report

Report Date: 09 Apr-18 13:05 (p 2 of 2)
 Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

²⁸ 10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	1	1	1	1	1
FR_UFR1	0.9	1	1	1	1
CM_MC1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
FR_FRCP1	0.9	1	0.4	1	1
GH_FR1	1	1	1	0.9	0.9
CM_MC2	0.8	0	0.4	0.6	0
CM_MC3	1	1	1	0.9	1
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	0.435	0.364	0.31	0.283	0.291
FR_UFR1	0.2911	0.234	0.273	0.272	0.264
CM_MC1	0.18	0.29	0.255	0.242	0.247
GH_ER2	0.267	0.274	0.275	0.2278	0.2989
FR_FRCP1	0.1067	0.188	0.08249	0.117	0.165
GH_FR1	0.299	0.272	0.26	0.3444	0.1844
CM_MC2	0.07375		0.04001	0.04832	
CM_MC3	0.289	0.267	0.254	0.3255	0.266
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

²⁸ 10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	10/10	10/10	10/10	10/10	10/10
FR_UFR1	9/10	10/10	10/10	10/10	10/10
CM_MC1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
FR_FRCP1	9/10	10/10	4/10	10/10	10/10
GH_FR1	10/10	10/10	10/10	9/10	9/10
CM_MC2	8/10	0/10	4/10	6/10	0/10
CM_MC3	10/10	10/10	10/10	9/10	10/10
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 1 of 9)
 Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{Water only} Sediment Test			Nautilus Environmental		
Analysis ID: 09-6962-7068	Endpoints: 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 05 Apr-18 8:12	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung			
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water			
Ending Date: 30 Mar-18	Species: Hyaella azteca	Brine:			
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
control	12-8799-2585	02 Mar-18	02 Mar-18	NA	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
control	Water Sample	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
control		FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
control		CM_MC1	1	1.0000	Exact	Non-Significant Effect
control		GH_ER2	0.2475	1.0000	Exact	Non-Significant Effect
control		FR_FRCP1	0.00624	0.0499	Exact	Significant Effect
control		GH_FR1	0.2475	1.0000	Exact	Non-Significant Effect
control		CM_MC2	0	<0.0001	Exact	Significant Effect
control		CM_MC3	0.5	1.0000	Exact	Non-Significant Effect
control		Control+EDTA	0.1212	0.8485	Exact	Non-Significant Effect
control		CM_MC2 (EDTA)	0.5	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
control	Negative Contr	50	0	50	1	0	0.0%
FR_UFR1		49	1	50	0.98	0.02	2.0%
CM_MC1		50	0	50	1	0	0.0%
GH_ER2		48	2	50	0.96	0.04	4.0%
FR_FRCP1		43	7	50	0.86	0.14	14.0%
GH_FR1		48	2	50	0.96	0.04	4.0%
CM_MC2		18	32	50	0.36	0.64	64.0%
CM_MC3		49	1	50	0.98	0.02	2.0%
Control+EDTA		47	3	50	0.94	0.06	6.0%
CM_MC2 (EDTA)		49	1	50	0.98	0.02	2.0%

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 2 of 9)
 Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

Analysis ID: 09-6962-7068
 Analyzed: 05 Apr-18 8:12

Endpoint: ²⁸ 10d Survival Rate
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
 Official Results: Yes

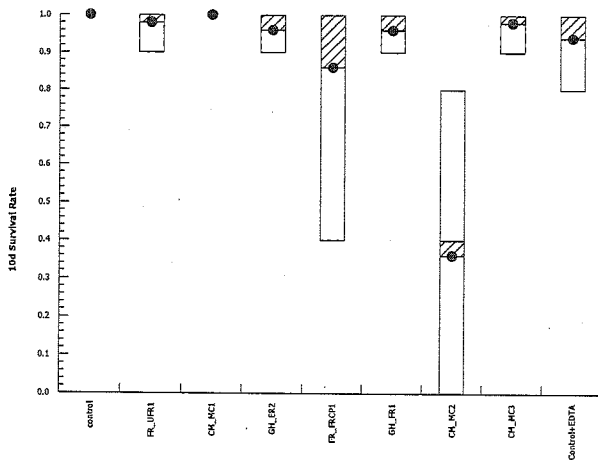
10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	1	1	1	1	1
FR_UFR1	0.9	1	1	1	1
CM_MC1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
FR_FRCP1	0.9	1	0.4	1	1
GH_FR1	1	1	1	0.9	0.9
CM_MC2	0.8	0	0.4	0.6	0
CM_MC3	1	1	1	0.9	1
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	10/10	10/10	10/10	10/10	10/10
FR_UFR1	9/10	10/10	10/10	10/10	10/10
CM_MC1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
FR_FRCP1	9/10	10/10	4/10	10/10	10/10
GH_FR1	10/10	10/10	10/10	9/10	9/10
CM_MC2	8/10	0/10	4/10	6/10	0/10
CM_MC3	10/10	10/10	10/10	9/10	10/10
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 3 of 9)

Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} ~~Sediment Test~~ ₂₈ Nautilus Environmental

Analysis ID: 06-5082-5930	Endpoint: Survival 10d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:14	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyaella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.02972	0.2081	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0	<0.0001	Exact	Significant Effect
FR_UFR1		CM_MC3	0.7525	1.0000	Exact	Non-Significant Effect
FR_UFR1		Control+EDTA	0.3087	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2 (EDTA)	0.7525	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Site Control	49	1	50	0.98	0.02	0.0%
CM_MC1	50	0	50	1	0	-2.04%
GH_ER2	48	2	50	0.96	0.04	2.04%
FR_FRCP1	43	7	50	0.86	0.14	12.24%
GH_FR1	48	2	50	0.96	0.04	2.04%
CM_MC2	18	32	50	0.36	0.64	63.27%
CM_MC3	49	1	50	0.98	0.02	0.0%
Control+EDTA	47	3	50	0.94	0.06	4.08%
CM_MC2 (EDTA)	49	1	50	0.98	0.02	0.0%

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 4 of 9)

Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} Sediment Test ₂₈

Nautilus Environmental

Analysis ID: 06-5082-5930

Endpoint: 10d Survival Rate

CETIS Version: CETISv1.8.7

Analyzed: 05 Apr-18 8:14

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

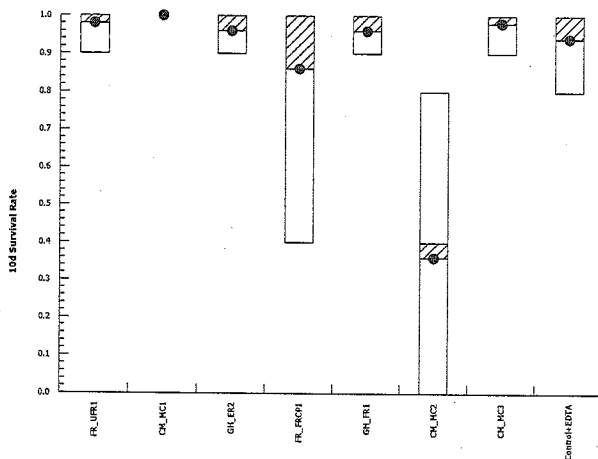
28 _{EL} 10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9	1	1	1	1
CM_MC1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
FR_FRCP1	0.9	1	0.4	1	1
GH_FR1	1	1	1	0.9	0.9
CM_MC2	0.8	0	0.4	0.6	0
CM_MC3	1	1	1	0.9	1
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

28 _{EL} 10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	9/10	10/10	10/10	10/10	10/10
CM_MC1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
FR_FRCP1	9/10	10/10	4/10	10/10	10/10
GH_FR1	10/10	10/10	10/10	9/10	9/10
CM_MC2	8/10	0/10	4/10	6/10	0/10
CM_MC3	10/10	10/10	10/10	9/10	10/10
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 7 of 9)

Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth		<i>water salt</i> Sediment Test	Nautilus Environmental	
Analysis ID: 20-7439-6919	Endpoint: <i>28d</i> 28d Survival Rate	CETIS Version: CETISv1.8.7		
Analyzed: 05 Apr-18 8:16	Analysis: STP 2x2 Contingency Tables	Official Results: Yes		
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung		
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water		
Ending Date: 30 Mar-18	Species: Hyaella azteca	Brine:		
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d		

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.07975	0.5583	Exact	Non-Significant Effect
GH_ER2		GH_FR1	0.6913	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0	<0.0001	Exact	Significant Effect
GH_ER2		CM_MC3	1	1.0000	Exact	Non-Significant Effect
GH_ER2		Control+EDTA	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2 (EDTA)	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	49	1	50	0.98	0.02	-2.08%
CM_MC1	50	0	50	1	0	-4.17%
GH_ER2	48	2	50	0.96	0.04	0.0%
FR_FRCP1	43	7	50	0.86	0.14	10.42%
GH_FR1	48	2	50	0.96	0.04	0.0%
CM_MC2	18	32	50	0.36	0.64	62.5%
CM_MC3	49	1	50	0.98	0.02	-2.08%
Control+EDTA	47	3	50	0.94	0.06	2.08%
CM_MC2 (EDTA)	49	1	50	0.98	0.02	-2.08%

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 8 of 9)
 Test Code: 180295 | 10-4032-0225

Hyalella 28-d Survival and Growth ^{Interim} Sediment Test

Nautilus Environmental

Analysis ID: 20-7439-6919
 Analyzed: 05 Apr-18 8:16

Endpoint: ²⁸ 10d Survival Rate
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
 Official Results: Yes

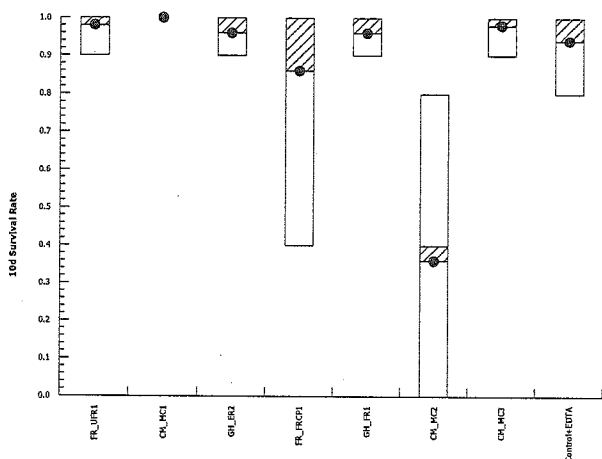
10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9	1	1	1	1
CM_MC1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
FR_FRCP1	0.9	1	0.4	1	1
GH_FR1	1	1	1	0.9	0.9
CM_MC2	0.8	0	0.4	0.6	0
CM_MC3	1	1	1	0.9	1
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	9/10	10/10	10/10	10/10	10/10
CM_MC1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
FR_FRCP1	9/10	10/10	4/10	10/10	10/10
GH_FR1	10/10	10/10	10/10	9/10	9/10
CM_MC2	8/10	0/10	4/10	6/10	0/10
CM_MC3	10/10	10/10	10/10	9/10	10/10
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 5 of 9)
 Test Code: 180295 | 10-4032-0225

Hyalella 28-d Survival and Growth ^{water only} Sediment Test			Nautilus Environmental		
Analysis ID: 05-8251-6967	Endpoint: 28d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 05 Apr-18 8:15	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 06-2830-0550	Test Type: Growth-Survival (28d)	Analyst: Eric Cheung			
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water			
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:			
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ER2	0.2475	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_FRCP1	0.00624	0.0437	Exact	Significant Effect
CM_MC1		GH_FR1	0.2475	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0	<0.0001	Exact	Significant Effect
CM_MC1		CM_MC3	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1		Control+EDTA	0.1212	0.7273	Exact	Non-Significant Effect
CM_MC1		CM_MC2 (EDTA)	0.5	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	49	1	50	0.98	0.02	2.0%
CM_MC1	50	0	50	1	0	0.0%
GH_ER2	48	2	50	0.96	0.04	4.0%
FR_FRCP1	43	7	50	0.86	0.14	14.0%
GH_FR1	48	2	50	0.96	0.04	4.0%
CM_MC2	18	32	50	0.36	0.64	64.0%
CM_MC3	49	1	50	0.98	0.02	2.0%
Control+EDTA	47	3	50	0.94	0.06	6.0%
CM_MC2 (EDTA)	49	1	50	0.98	0.02	2.0%

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 6 of 9)

Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

Analysis ID: 05-8251-6967

Endpoint: ²⁸ 10d Survival Rate

CETIS Version: CETISv1.8.7

Analyzed: 05 Apr-18 8:15

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

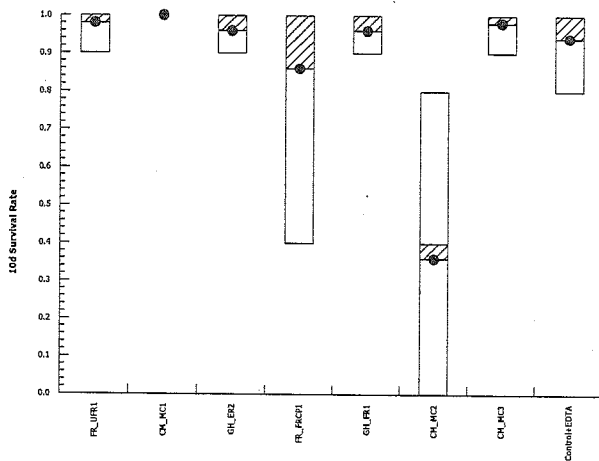
²⁸ 10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9	1	1	1	1
CM_MC1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
FR_FRCP1	0.9	1	0.4	1	1
GH_FR1	1	1	1	0.9	0.9
CM_MC2	0.8	0	0.4	0.6	0
CM_MC3	1	1	1	0.9	1
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

²⁸ 10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	9/10	10/10	10/10	10/10	10/10
CM_MC1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
FR_FRCP1	9/10	10/10	4/10	10/10	10/10
GH_FR1	10/10	10/10	10/10	9/10	9/10
CM_MC2	8/10	0/10	4/10	6/10	0/10
CM_MC3	10/10	10/10	10/10	9/10	10/10
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 9 of 9)
 Test Code: 180295 | 10-4032-0225

Hyalella 28-d Survival and Growth Sediment Test Nautilus Environmental

Analysis ID: 15-3252-2633	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:18	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA	Teck Coal	
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Control+EDTA		CM_MC2 (EDTA)	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control+EDTA Lab Water	47	3	50	0.94	0.06	0.0%
CM_MC2 (EDTA)	49	1	50	0.98	0.02	-4.26%

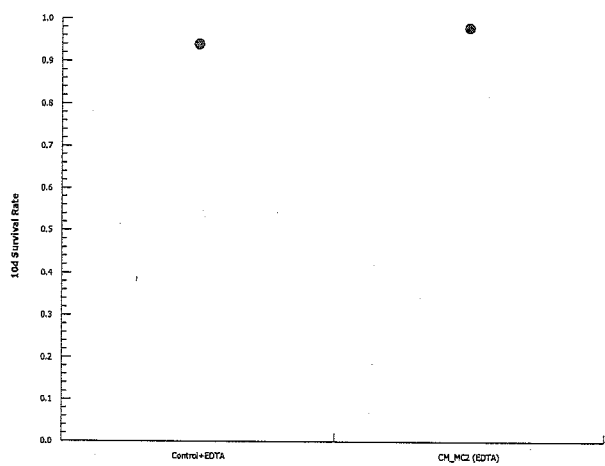
10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	1	1	1	0.8	0.9
CM_MC2 (EDTA)	1	1	0.9	1	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	10/10	10/10	10/10	8/10	9/10
CM_MC2 (EDTA)	10/10	10/10	9/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 1 of 10)

Test Code: 180295 | 10-4032-0225

Water only
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-3409-6737	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:12	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
control	12-8799-2585	02 Mar-18	02 Mar-18	NA	Teck Coal	
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)		
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
control	Water Sample	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	20.9%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
control		FR_UFR1	2.492	2.518	0.071	8	0.0529	CDF	Non-Significant Effect
		CM_MC1	3.35	2.518	0.071	8	0.0067	CDF	Significant Effect
		GH_ER2	2.431	2.518	0.071	8	0.0602	CDF	Non-Significant Effect
		FR_FRCP1	7.313	2.518	0.071	8	<0.0001	CDF	Significant Effect
		GH_FR1	2.308	2.518	0.071	8	0.0776	CDF	Non-Significant Effect
		CM_MC2	8.739	2.518	0.081	6	<0.0001	CDF	Significant Effect
		CM_MC3	2.01	2.518	0.071	8	0.1364	CDF	Non-Significant Effect
		Control+EDTA	-1.393	2.518	0.071	8	0.9987	CDF	Non-Significant Effect
		CM_MC2 (EDTA)	0.4302	2.518	0.071	8	0.7816	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3306172	0.03673525	9	18.74	<0.0001	Significant Effect
Error	0.0744948	0.00196039	38			
Total	0.4051121		47			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.643	21.67	0.3802	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9911	0.9345	0.9728	Normal Distribution

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 2 of 10)

Test Code: 180295 | 10-4032-0225

Hyaella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

Analysis ID: 14-3409-6737
Analyzed: 05 Apr-18 8:12

Endpoint: Mean Dry Weight-mg
Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

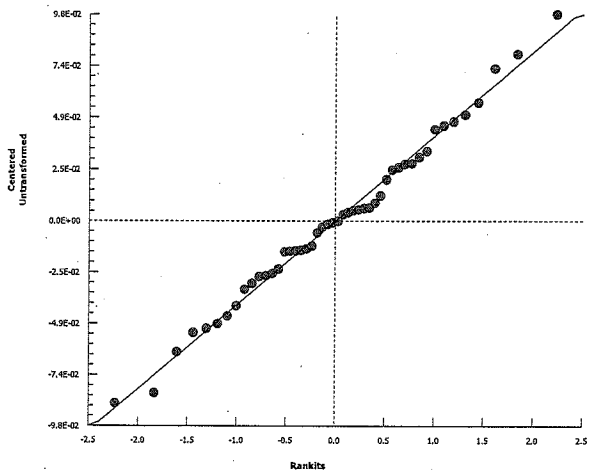
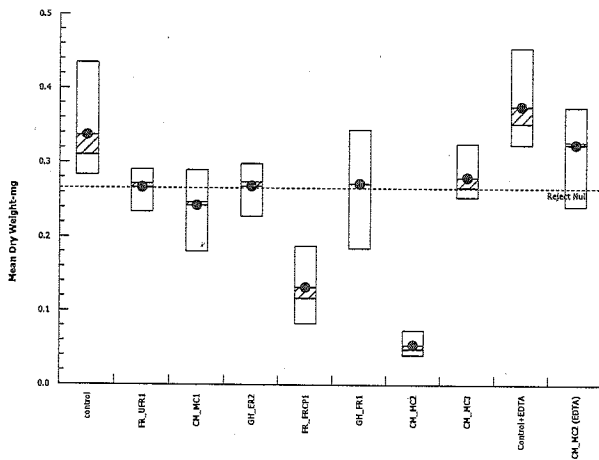
Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
control	5	0.3366	0.2578	0.4154	0.31	0.283	0.435	0.02837	18.85%	0.0%
FR_UFR1	5	0.2668	0.2409	0.2927	0.272	0.234	0.2911	0.009328	7.82%	20.73%
CM_MC1	5	0.2428	0.1934	0.2922	0.247	0.18	0.29	0.0178	16.39%	27.87%
GH_ER2	5	0.2685	0.2365	0.3005	0.274	0.2278	0.2989	0.01153	9.6%	20.22%
FR_FRCP1	5	0.1318	0.07791	0.1858	0.117	0.08249	0.188	0.01942	32.94%	60.83%
GH_FR1	5	0.272	0.1991	0.3449	0.272	0.1844	0.3444	0.02626	21.59%	19.2%
CM_MC2	3	0.05403	0.01035	0.0977	0.04832	0.04001	0.07375	0.01015	32.54%	83.95%
CM_MC3	5	0.2803	0.2452	0.3154	0.267	0.254	0.3255	0.01264	10.08%	16.72%
Control+EDTA	5	0.3756	0.3104	0.4409	0.3525	0.324	0.455	0.0235	13.99%	-11.59%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.3278	0.242	0.375	0.02395	16.5%	3.58%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
control	0.435	0.364	0.31	0.283	0.291
FR_UFR1	0.2911	0.234	0.273	0.272	0.264
CM_MC1	0.18	0.29	0.255	0.242	0.247
GH_ER2	0.267	0.274	0.275	0.2278	0.2989
FR_FRCP1	0.1067	0.188	0.08249	0.117	0.165
GH_FR1	0.299	0.272	0.26	0.3444	0.1844
CM_MC2	0.07375	0.04001	0.04832		
CM_MC3	0.289	0.267	0.254	0.3255	0.266
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 3 of 10)

Test Code: 180295 | 10-4032-0225

water only
Hyalella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 20-4697-3909	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:14	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (20d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	24.5%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	0.9164	2.491	0.065	8	0.5512	CDF	Non-Significant Effect
		GH_ER2	-0.06535	2.491	0.065	8	0.9089	CDF	Non-Significant Effect
		FR_FRCP1	5.15	2.491	0.065	8	<0.0001	CDF	Significant Effect
		GH_FR1	-0.1966	2.491	0.065	8	0.9327	CDF	Non-Significant Effect
		CM_MC2	7.031	2.491	0.075	6	<0.0001	CDF	Significant Effect
		CM_MC3	-0.5146	2.491	0.065	8	0.9704	CDF	Non-Significant Effect
		Control+EDTA	-4.15	2.491	0.065	8	1.0000	CDF	Non-Significant Effect
		CM_MC2 (EDTA)	-2.203	2.491	0.065	8	0.9999	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3009481	0.03761851	8	21.9	<0.0001	Significant Effect
Error	0.05839997	0.001717646	34			
Total	0.3593481		42			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.157	20.09	0.4183	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9853	0.9281	0.8494	Normal Distribution

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 4 of 10)

Test Code: 180295 | 10-4032-0225

Hyalella 28-d Survival and Growth ^{water all} Sediment Test

Nautilus Environmental

Analysis ID: 20-4697-3909
Analyzed: 05 Apr-18 8:14

Endpoint: Mean Dry Weight-mg
Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

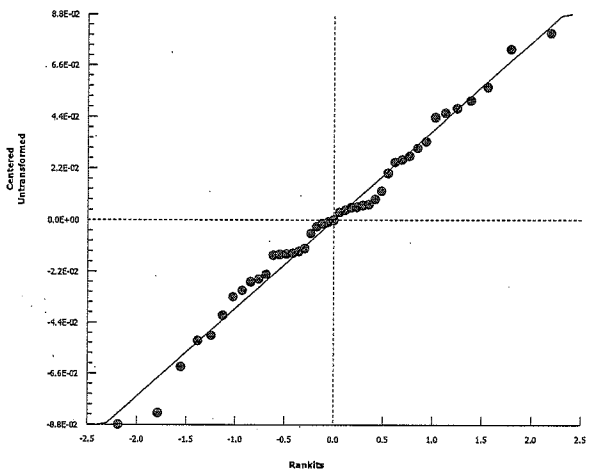
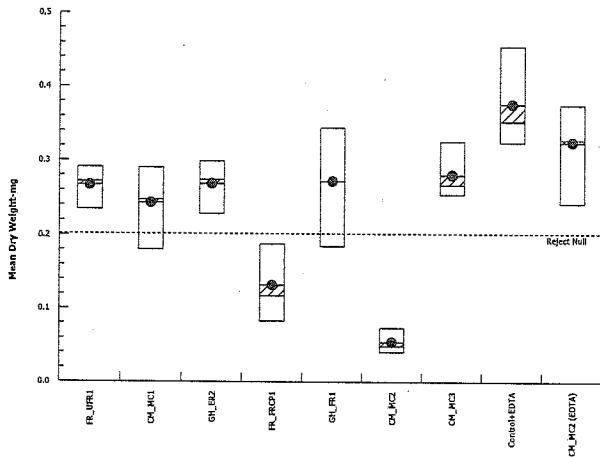
Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.2668	0.2409	0.2927	0.272	0.234	0.2911	0.009328	7.82%	0.0%
CM_MC1	5	0.2428	0.1934	0.2922	0.247	0.18	0.29	0.0178	16.39%	9.0%
GH_ER2	5	0.2685	0.2365	0.3005	0.274	0.2278	0.2989	0.01153	9.6%	-0.64%
FR_FRCP1	5	0.1318	0.07791	0.1858	0.117	0.08249	0.188	0.01942	32.94%	50.59%
GH_FR1	5	0.272	0.1991	0.3449	0.272	0.1844	0.3444	0.02626	21.59%	-1.93%
CM_MC2	3	0.05403	0.01035	0.0977	0.04832	0.04001	0.07375	0.01015	32.54%	79.75%
CM_MC3	5	0.2803	0.2452	0.3154	0.267	0.254	0.3255	0.01264	10.08%	-5.06%
Control+EDTA	5	0.3756	0.3104	0.4409	0.3525	0.324	0.455	0.0235	13.99%	-40.77%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.3278	0.242	0.375	0.02395	16.5%	-21.64%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.2911	0.234	0.273	0.272	0.264
CM_MC1	0.18	0.29	0.255	0.242	0.247
GH_ER2	0.267	0.274	0.275	0.2278	0.2989
FR_FRCP1	0.1067	0.188	0.08249	0.117	0.165
GH_FR1	0.299	0.272	0.26	0.3444	0.1844
CM_MC2	0.07375	0.04001	0.04832		
CM_MC3	0.289	0.267	0.254	0.3255	0.266
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 7 of 10)

Test Code: 180295 | 10-4032-0225

water only
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 18-5828-1271	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:17	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	24.3%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	0.06535	2.491	0.065	8	0.8794	CDF	Non-Significant Effect
		CM_MC1	0.9818	2.491	0.065	8	0.5199	CDF	Non-Significant Effect
		FR_FRCP1	5.215	2.491	0.065	8	<0.0001	CDF	Significant Effect
		GH_FR1	-0.1313	2.491	0.065	8	0.9215	CDF	Non-Significant Effect
		CM_MC2	7.087	2.491	0.075	6	<0.0001	CDF	Significant Effect
		CM_MC3	-0.4493	2.491	0.065	8	0.9646	CDF	Non-Significant Effect
		Control+EDTA	-4.085	2.491	0.065	8	1.0000	CDF	Non-Significant Effect
		CM_MC2 (EDTA)	-2.137	2.491	0.065	8	0.9999	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3009481	0.03761851	8	21.9	<0.0001	Significant Effect
Error	0.05839997	0.001717646	34			
Total	0.3593481		42			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.157	20.09	0.4183	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9853	0.9281	0.8494	Normal Distribution

CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 8 of 10)

Test Code: 180295 | 10-4032-0225

Hyalella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

Analysis ID: 18-5828-1271
 Analyzed: 05 Apr-18 8:17

Endpoint: Mean Dry Weight-mg
 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

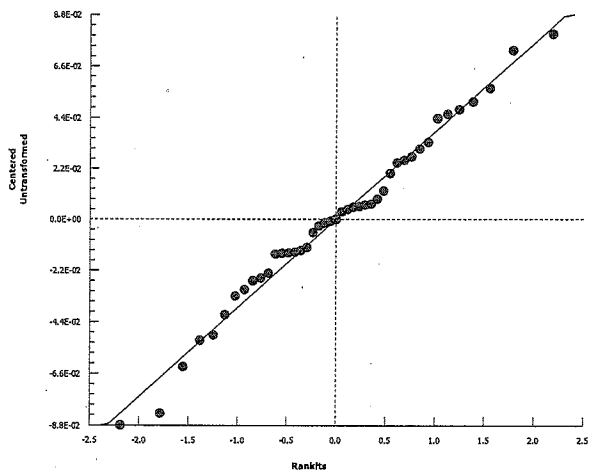
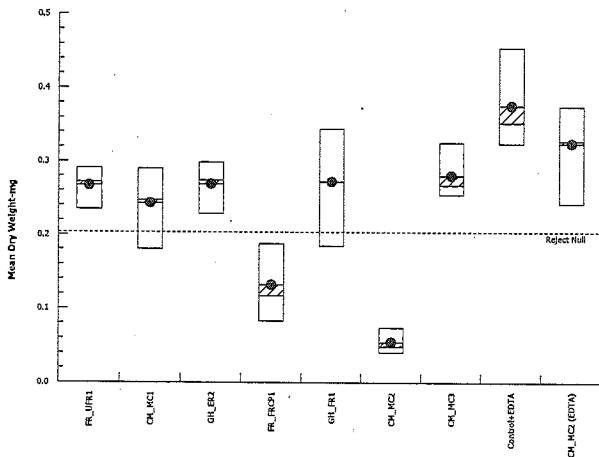
Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.2668	0.2409	0.2927	0.272	0.234	0.2911	0.009328	7.82%	0.0%
CM_MC1	5	0.2428	0.1934	0.2922	0.247	0.18	0.29	0.0178	16.39%	9.0%
GH_ER2	5	0.2685	0.2365	0.3005	0.274	0.2278	0.2989	0.01153	9.6%	-0.64%
FR_FRCP1	5	0.1318	0.07791	0.1858	0.117	0.08249	0.188	0.01942	32.94%	50.59%
GH_FR1	5	0.272	0.1991	0.3449	0.272	0.1844	0.3444	0.02626	21.59%	-1.93%
CM_MC2	3	0.05403	0.01035	0.0977	0.04832	0.04001	0.07375	0.01015	32.54%	79.75%
CM_MC3	5	0.2803	0.2452	0.3154	0.267	0.254	0.3255	0.01264	10.08%	-5.06%
Control+EDTA	5	0.3756	0.3104	0.4409	0.3525	0.324	0.455	0.0235	13.99%	-40.77%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.3278	0.242	0.375	0.02395	16.5%	-21.64%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.2911	0.234	0.273	0.272	0.264
CM_MC1	0.18	0.29	0.255	0.242	0.247
GH_ER2	0.267	0.274	0.275	0.2278	0.2989
FR_FRCP1	0.1067	0.188	0.08249	0.117	0.165
GH_FR1	0.299	0.272	0.26	0.3444	0.1844
CM_MC2	0.07375	0.04001	0.04832		
CM_MC3	0.289	0.267	0.254	0.3255	0.266
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 5 of 10)

Test Code: 180295 | 10-4032-0225

water only
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-7452-0149	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:15	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-8415-6029	27 Feb-18 10:40	28 Feb-18 09:00	61h (3 °C)	Teck Coal	
CM_MC1	08-0266-8182	27 Feb-18 11:05	28 Feb-18 09:00	61h (5.4 °C)		
GH_ER2	08-9837-6814	27 Feb-18 10:56	28 Feb-18 09:00	61h (5 °C)		
FR_FRCP1	13-3308-7683	27 Feb-18 13:26	28 Feb-18 09:00	59h (3 °C)		
GH_FR1	08-2088-3896	27 Feb-18 14:04	28 Feb-18 09:00	58h (4.5 °C)		
CM_MC2	03-9902-6785	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		
CM_MC3	11-6899-5767	27 Feb-18 11:49	28 Feb-18 09:00	60h (5.4 °C)		
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA		
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_201802271040_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q1_WS_20180227_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-02-27_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_201802271326_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-02-27_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q1_WS_20180227_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	26.9%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	-0.9164	2.491	0.065	8	0.9912	CDF	Non-Significant Effect
		GH_ER2	-0.9818	2.491	0.065	8	0.9929	CDF	Non-Significant Effect
		FR_FRCP1	4.234	2.491	0.065	8	0.0006	CDF	Significant Effect
		GH_FR1	-1.113	2.491	0.065	8	0.9954	CDF	Non-Significant Effect
		CM_MC2	6.237	2.491	0.075	6	<0.0001	CDF	Significant Effect
		CM_MC3	-1.431	2.491	0.065	8	0.9985	CDF	Non-Significant Effect
		Control+EDTA	-5.067	2.491	0.065	8	1.0000	CDF	Non-Significant Effect
		CM_MC2 (EDTA)	-3.119	2.491	0.065	8	1.0000	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3009481	0.03761851	8	21.9	<0.0001	Significant Effect
Error	0.05839997	0.001717646	34			
Total	0.3593481		42			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.157	20.09	0.4183	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9853	0.9281	0.8494	Normal Distribution

Apr-11/18

Hyaella 28-d Survival and Growth ^{water only} Sediment Test

Nautilus Environmental

Analysis ID: 13-7452-0149 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 05 Apr-18 8:15 Analysis: Parametric-Control vs Treatments Official Results: Yes

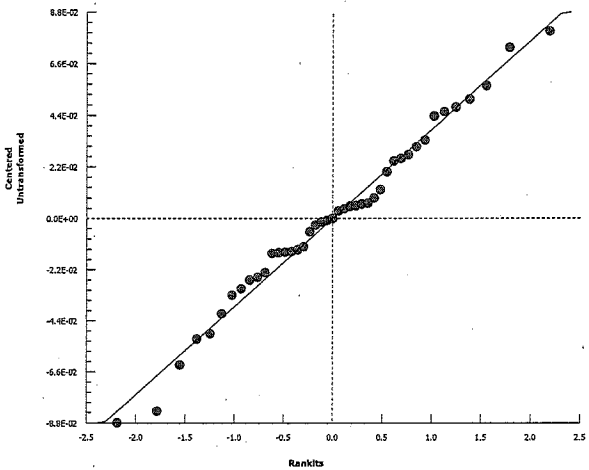
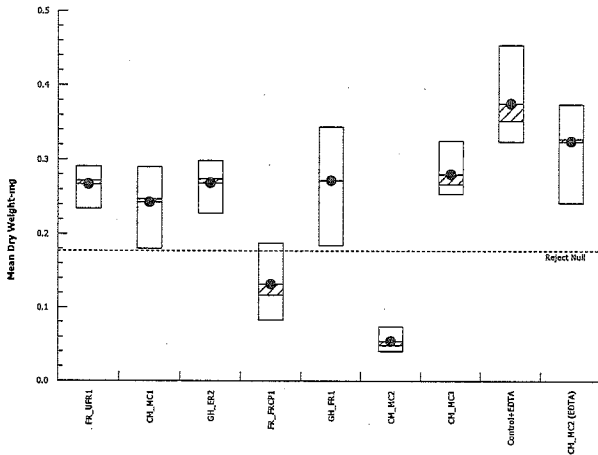
Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.2668	0.2409	0.2927	0.272	0.234	0.2911	0.009328	7.82%	0.0%
CM_MC1	5	0.2428	0.1934	0.2922	0.247	0.18	0.29	0.0178	16.39%	9.0%
GH_ER2	5	0.2685	0.2365	0.3005	0.274	0.2278	0.2989	0.01153	9.6%	-0.64%
FR_FRCP1	5	0.1318	0.07791	0.1858	0.117	0.08249	0.188	0.01942	32.94%	50.59%
GH_FR1	5	0.272	0.1991	0.3449	0.272	0.1844	0.3444	0.02626	21.59%	-1.93%
CM_MC2	3	0.05403	0.01035	0.0977	0.04832	0.04001	0.07375	0.01015	32.54%	79.75%
CM_MC3	5	0.2803	0.2452	0.3154	0.267	0.254	0.3255	0.01264	10.08%	-5.06%
Control+EDTA	5	0.3756	0.3104	0.4409	0.3525	0.324	0.455	0.0235	13.99%	-40.77%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.3278	0.242	0.375	0.02395	16.5%	-21.64%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.2911	0.234	0.273	0.272	0.264
CM_MC1	0.18	0.29	0.255	0.242	0.247
GH_ER2	0.267	0.274	0.275	0.2278	0.2989
FR_FRCP1	0.1067	0.188	0.08249	0.117	0.165
GH_FR1	0.299	0.272	0.26	0.3444	0.1844
CM_MC2	0.07375	0.04001	0.04832		
CM_MC3	0.289	0.267	0.254	0.3255	0.266
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

Graphics



CETIS Analytical Report

Report Date: 09 Apr-18 13:05 (p 9 of 10)
 Test Code: 180295 | 10-4032-0225

water only
Hyalella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 01-6605-0301	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Apr-18 8:18	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 06-2830-0550	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 02 Mar-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 30 Mar-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control+EDTA	05-9324-4059	02 Mar-18	02 Mar-18	NA	Teck Coal	
CM_MC2 (EDTA)	04-2150-7559	27 Feb-18 11:03	28 Feb-18 09:00	61h (5.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2 (EDTA)	Water Sample	Teck Coal	CM_MC2_Q1_WS_20180227_N (

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.6%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control+EDTA		CM_MC2 (EDTA)	1.522	1.86	0.062	8	0.0833	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.006516401	0.006516401	1	2.315	0.1666	Non-Significant Effect
Error	0.0225192	0.002814899	8			
Total	0.0290356		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.038	23.15	0.9720	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9847	0.7411	0.9852	Normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control+EDTA	5	0.3756	0.3104	0.4409	0.3525	0.324	0.455	0.0235	13.99%	0.0%
CM_MC2 (EDTA)	5	0.3246	0.2581	0.391	0.3278	0.242	0.375	0.02395	16.5%	13.59%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	0.401	0.455	0.324	0.3525	0.3456
CM_MC2 (EDTA)	0.375	0.242	0.3278	0.31	0.368

Hyalella 28-d Survival and Growth ^{water only} Sediment Test

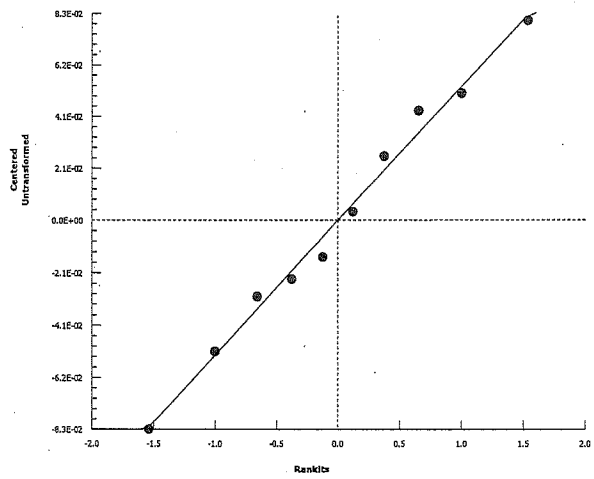
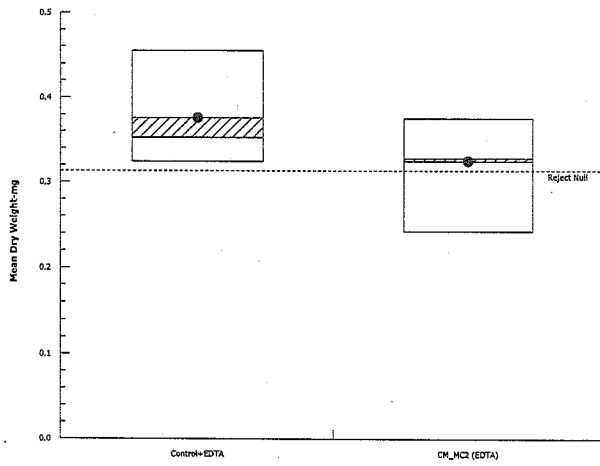
Nautilus Environmental

Analysis ID: 01-6605-0301
Analyzed: 05 Apr-18 8:18

Endpoint: Mean Dry Weight-mg
Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



APPENDIX D – *Pimephales promelas* Toxicity Test Data

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Organism Information

Source: Aquatox

Batch: 20180222 FM

Egg Stage: 13-somites

Organisms Received in Good Condition: Yes or No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review	
					AM	PM		First	Second
2018/02/22	0	1500	LF/ST/AP	2	-	-	30 min	LF	CB
2018/02/23	1	1430	EP/ST/AP	2	-	-	30 min	EP	AP
2018/02/24	2	1330	EP/SS	2	-	-	60 min	SS	EP
2018/02/25	3	1245	CB/LE	2	-	-	120 min	CB	LF
2018/02/26	4	1200	EP	2	-	-	60 min	ST	LF
2018/02/27	5	1350	ST/CB	2	-	-	60 min	SS	LF
2018/02/28	6	1100	CB	2	✓	✓	60 min	EP	CB
2018/03/01	7	1400	EP	2	✓	✓	60 min	ST	CB
2018/03/02	8	1205	ST	2	✓	✓	60 min	ST	CB
2018/03/03	9	1320	SS/EP	2	✓	✓	60 min	SS	EP
2018/03/04	10	1530	AP/EP	2	✓	✓	60 min	CB	AP
2018/03/05	11	1400	NU/EP	2	✓	✓	45 min	CB	AP
2018/03/06	12	1430	NU/AP	2	✓	✓	60 min	ST	EP
2018/03/07	13	1140	LF/EP	2	✓	✓	90 min	AP	LF
2018/03/08	14	1340	ST/AP	2	✓	✓	45 min	SS	LF
2018/03/09	15	1200	NU/LE	2	✓	✓	60 min	SS	EP
2018/03/10	16	145	ST/EP	2	✓	✓	60 min	LF	AP
2018/03/11	17	1230	CB/AP	2	✓	✓	90 min	SS	AP
2018/03/12	18	1200	AP	2	✓	✓	60 min	NU	EP
2018/03/13	19	1340	ST/LE	2	✓	✓	60 min	EP	AP
2018/03/14	20	1130	EP/ST	2	✓	✓	60 min	SS	AP
2018/03/15	21	1430	SS/ST	2	✓	✓	60 min	NU	EP
2018/03/16	22	1430	NU/LE	2	✓	✓	60 min	EP	LF
2018/03/17	23	1130	SS/ST	2	✓	✓	60 min	SS	-
2018/03/18	24	1310	AP/LE	2	✓	✓	60 min	LE	NU
2018/03/19	25	1130	CB/EP	2	✓	✓	60 min	AP	-
2018/03/20	26	1100	AP/ST	2	✓	✓	45 min	LF	CB
2018/03/21	27	1145	AP/LE	2	✓	✓	90 min	CB	ST
2018/03/22	28	1400	EP/MW	2	✓	✓	60 min	CB	SS
2018/03/23	29	1145	CB/MW	2	✓	✓	60 min	CB	MW
2018/03/24	30	1400	LE	2	✓	✓	45 min	SS	ST
2018/03/25	31	1200	AP	2	✓	✓	60 min	NU	AP
2018/03/26	32	1030	EP/NO	2	-	-	-	NU	LE

Reviewed By: GP

Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	1718-0789 10 ug/L		1718-0790 10 ug/L		1718-0791 10 ug/L		1718-0792 10 ug/L		1718-0793 10 ug/L		1718-0794 10 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	15	0	15	0	15	0	15	0	15	0	15	0
b	15	0	15	0	15	0	15	0	15	0	15	0
c	15	0	15	0	15	0	15	0	15	0	15	0
d	30	0	15	0	15	0	30	0	15	0	30	0
e	30	0	30	0	30	0	30	0	15	0	30	0
f	29	1	30	0	30	0	30	0	15	0	29	1

Comments/Observations: *misloaded with 15 only*

Number of Alive Embryos and Hatched Organisms

replicate	1718-0789 10 ug/L			1718-0790 10 ug/L			1718-0791 10 ug/L			1718-0792 10 ug/L		
	Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	0	✓	15	0	✓	15	0	✓	14	1	✓
b	15	0	✓	15	0	✓	14	1	✓	15	0	✓
c	14	1	✓	15	0	✓	15	0	✓	15	0	✓
d	15	0	✓	15	0	✓	15	0	✓	15	0	✓
e	28	2		30	0		30	0		30	0	
f	28	1		30	0		30	0		29	1	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2.

Comments/Observations:

Reviewed By: CTP Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FRT) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

1718-0789 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 2	0	13	0
b 12	0	2	0
c 12	0	3	0
d 8 0	0	8	1

34 18

1718-0790 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 12	0	3	0
b 14	0	1	0
c 15	0	0	0
d 8	0	7	0

1718-0791 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 7	0	8	0
b 12	0	23	0
c 11	0	4	0
d 15	0	0	0

1718-0792 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 11	0	4	0
b 8	0	7	0
c 6 10	0	7	0
d 5	0	10	0

1718-0793 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 3	0	12	0
b 5	0	10	0
c 13	0	2	0
d 2	0	13	0

1718-0794 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 11	0	4	0
b 11	1	3	0
c 7	0	8	0
d 14	0	1	0

1718-0789 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 0	0	15	0
b 12 0	0	12	0
c 12 0	0	13	0
d 1	0	13	0

1718-0790 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 2	0	13	0
b 6	0	9	0
c 7	0	8	0
d 2	0	13	0

* 15 counted on Day 5

1718-0791 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 0	0	15	0
b 1	1	13	0
c 0	0	15	0
d 1	0	14	0

1718-0792 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 2	0	13	0
b 0	0	14	1
c 0	0	15	0
d 1	0	14	0

* seem a Hatched

1718-0793 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 1	0	14	0
b 0	0	15	0
c 0	0	15	0
d 0	0	15	0

Counted on Day 5 including misloaded

1718-0794 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a 2	0	13	0
b 4	0	10	0
c 1	0	14	0
d 4	0	11	0

→ 2 pairs appear attached

Reviewed By: JP

Date Reviewed: 2018/04/10/23

Comments/Observations
 1718-0789 10 ug/L misloaded with
 1718-0789 10 ug/L rep D misloaded with
 1718-0791 10 ug/L rep B misloaded with

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

1718-0789 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	13 ^{90%}	0
0	0	15	0
0	0	13	0 ^{90%}

1718-0790 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	1
0	0	15	0
0	0	15	0
0	0	15	0

1718-0791 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	14	1
0	0	15	0

1718-0792 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	1 ^{90%}
0	0	15	0
0	1	14	0

1718-0793 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0 ^{90%}
0	0	15	0
0	0	15	0
0	0	15	0

1718-0794 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	14	1
0	0	15	0

1718-0789 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched

Post Hatch

1718-0789 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	13 ^{90%}	0
0	0	15	0
0	0	13	0

1718-0790 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	15	0
0	0	15	0
0	0	15	0

1718-0791 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	14	0
0	0	15	0

1718-0792 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	15	0
0	0	14	0

1718-0793 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	15	0
0	0	15	0
0	0	15	0

1718-0794 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	14	0
0	0	15	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	13	15	13(1)	15(14)	15
b	13(14)	14(15)	14	14	15	14
c	15(1)	15	14	15	15(1)	14
d	15(13)	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	15(13)(2)	14	15
b	13(14)	15	14	14	15	14
c	15(1)	15	14	15	13(1)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	14	14	15
b	13(14)	15	14	14	15	14
c	15(1)	15	14	15	13(1)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	15	14	14	15	14
c	15	15	14	15	13(1)	7
d	11	15	15	14	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 11	Day 11	Day 11	Day 11	Day 11	Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15 (CD)	12	15	13	14	15
b	13	15	14	14	15	14
c	15 (CD)	15	14	15	13 (D)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 12	Day 12	Day 12	Day 12	Day 12	Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	15	14	14	15	14
c	15	15	14	15	13 (D)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 13	Day 13	Day 13	Day 13	Day 13	Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	15	14	14	15	13 14 AB
c	15	15	14	15	13 (D)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 14	Day 14	Day 14	Day 14	Day 14	Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	14	14	14	15	14
c	15	14	14	15	13 (D)	7
d	11	15	15	14	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 15	Day 15	Day 15	Day 15	Day 15	Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	12 14 ⁸	15
b	13	14	14	14	13	14
c	15	14	10	15	13(1)	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	14	14	14	15	14
c	15	14	14	15	12	7
d	11	15	15	14	15	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	14	14	14	15	14
c	15	14	14	15	12	7
d	11	15	15	14	14	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	13	14	14	14	15	14
c	15	14	14	15	12	7
d	11	15	15	14	14	15

Comments/Observations:

Reviewed By: JP Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	12	15	13	14	15
b	13(1)	14	14	14	15	14
c	15	13	14	15	12	7
d	11	15	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	15
b	12	14	14	14	15	14
c	15	13	14	15	12	7
d	11	14	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	0
b	12	14	14	14	15	0
c	15	13	14	15	12	7
d	11	14	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	0
b	12	14	14	14	15	0
c	15(1)	13	14	15	12	7
d	10	14	15	14	13	15

Comments/Observations:

Reviewed By: JP Date Reviewed: 2018 04 10 JB

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L, 1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	12	15	13	14	0
b	12	14	14	14	15	0
c	15(1)	13	14	15	12	7
d	10	14	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11 11	15	13	14	0
b	12	14	14	13	15	0
c	15(1)	13	14	15	12	7
d	10	14	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	15(1)	13	14	15	12	7
d	10	14	15	14	13	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	12	7
d	10	13	15	14	13	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/01/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	12	7
d	10	13	15	14	13(1)	14/15 ^{EP}

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 28	Day 28	Day 28	Day 28	Day 28	Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	18	7
d	10	13	14	14	13(1)	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 29	Day 29	Day 29	Day 29	Day 29	Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	11	7
d	10	13	14	14	13(1)	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 30	Day 30	Day 30	Day 30	Day 30	Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	11	7
d	10	13	14	14	12	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164

Sample: 1718-0789 (FR_CP1) 10 ug/L, 1718-0790 (FR_UFR1) 10 ug/L, 1718-0791 (CM_MC1) 10 ug/L,
1718-0792 (CM_MC2) 10 ug/L, 1718-0793 (GH_FR1) 10 ug/L, 1718-0794 (GH_ER2) 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13 14 ¹⁴	14	15	11	7
d	10	13	14	14	12	15

Comments/Observations:

	1718-0789 10 ug/L	1718-0790 10 ug/L	1718-0791 10 ug/L	1718-0792 10 ug/L	1718-0793 10 ug/L	1718-0794 10 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	11	15	13	14	0
b	12	14	14	13	15	0
c	14	13	14	15	11	7
d	10	13	14	14	12	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/03

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client TEC164 Sample 1718-0789 10 ug/L, 1718-0790 10 ug/L, 1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

Date of change 2018/03/28 Day of change 6

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794	
A	1 mL	1 mL	1 mL	1 mL	1 mL	1 mL	
B	1 mL						→
C	1 mL						→
D	1 mL						→

Date of change 2018/03/08 Day of change ~~14~~¹⁵ 14

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794	
A	1.5 mL						→
B	1.5 mL						→
C	1.5 mL					1 mL	
D	1.5 mL						→

Date of change _____ Day of change _____

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794	
A							
B							
C							
D							

Date of change _____ Day of change _____

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794	
A							
B							
C							
D							

*Feeding volume is maintained following a feeding change until a new feeding regime is recorded

Reviewed By: JJP

Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

New Solutions						
Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
0	8.1	8.1	8.1	8.2	8.2	8.3
1	8.2	8.2	8.0	8.3	8.3	8.2
2	8.2	8.2	8.3	8.2	8.3	8.3
3	8.2	8.4	8.4	8.2	8.3	8.4
4	8.1	8.3	8.3	8.1	8.3	8.3
5	7.7	7.1	7.0	7.9	7.9	8.1
6	8.1	8.2	8.2	8.1	8.0	8.2
7	8.1	8.1	8.1	8.0	8.0	8.2
8	8.1	8.2	8.2	8.1	8.0	8.2

Conductance (µS/cm)						
0	1694	416	346	1011	925	375
1	1635	491	326	999	901	381
2	584	551	328	998	901	374
3	1547	457	319	952	864	350
4	1640	460	323	1020	915	360
5	1615	461	321	909	873	354
6	1630	442	315	985	876	352
7	1460	402	331	970	876	404
8	1492	448	337	986	917	432

Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.2	7.2	7.3	7.3	7.3
3	7.1	7.3	7.2	7.2	7.3	7.3
4	7.1	7.2	7.2	7.3	7.3	7.3
5	7.0	6.8	6.8	6.8	6.9	6.9
6	7.0	7.2	7.2	7.1	7.5	7.2
7	7.0	7.0	7.0	7.0	7.0	7.0
8	7.2	7.1	7.0	7.0	7.2	7.2

Temperature (°C) (47.1) 47.1						
0	24.0	24.0	24.0	24.0	24.0	24.0
1	24.0	24.0	24.0	24.0	24.0	24.0
2	24.0	24.0	24.0	24.0	24.0	24.0
3	24.0	24.0	24.0	24.0	24.0	24.0
4	24	25	25	24	24	24
5	26	26	26	26	26	26
6	25	24	24	25	25	25
7	26	26	26	26	26	26
8	25	25	26	26	26	26

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions						
1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794	
10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
0	8.1	8.3	8.3	8.2	8.3	8.3
1	8.0	8.1	7.9	8.0	8.1	8.0
2	8.0	8.2	8.3	8.1	8.1	8.2
3	8.1	8.3	8.3	8.1	8.1	8.3
4	7.7	8.0	8.0	7.8	7.8	7.9
5	8.0	8.2	8.2	7.9	7.9	8.0
6	7.9	8.0	8.2	7.9	7.9	8.1
7	7.9	8.2	8.1	7.9	7.9	8.0
8	7.9	8.2	8.1	7.9	7.9	8.0

Conductance (µS/cm)						
0	1635	453	350	922	901	390
1	1587	471	340	994	873	394
2	1631	474	343	970	869	389
3	1620	470	336	992	880	368
4	1605	498	334	955	859	353
5	1630	451	307	941	891	357
6	1609	650	340	967	930	411
7	1525	639	369	970	904	385
8						

Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.2	7.3	7.3	7.3	7.3	7.3
2	7.2	7.3	7.2	7.2	7.1	7.2
3	7.0	7.1	7.3	7.1	7.1	7.3
4	6.3	6.5	6.6	6.8	7.0	7.1
5	7.0	7.0	7.0	7.1	7.0	6.9
6	6.3	6.4	6.4	6.3	6.3	6.4
7	7.0	7.9	7.0	6.3	6.9	6.8
8						

Temperature (°C)						
0	24.0	24.0	24.0	24.0	24.0	24.0
1	24.0	24.0	24.0	24.0	24.0	24.0
2	24.0	24.0	24.0	24.0	24.0	24.0
3	24.0	24.0	24.0	24.0	24.0	24.0
4	24	24	24	24	24	24
5	25	24	23.4	23.4	23.4	23.4
6	25	25	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

Reviewed by: JP

Date reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

New Solutions						
Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
9	8.0	8.0	8.0	8.0	7.9	8.1
10	8.0	8.1	8.1	8.1	8.0	8.2
11	7.9	8.0	7.8	7.9	8.2	8.0
12	8.0	8.2	8.0	8.1	8.1	8.0
13	8.1	8.2	8.7	8.1	8.3	8.2
14	8.1	8.2	8.2	8.1	8.2	8.1
15	8.0	8.2	8.1	8.1	8.1	8.2
16	8.1	8.2	8.2	8.2	8.3	8.3
17	8.2	8.2	7.9	7.8	8.0	8.0

Conductance (µS/cm)						
9	1550	415	350	1026	926	415
10	1557	389	339	957	917	423
11	1522	413	355	996	915	406
12	1494	405	343	1003	982	420
13	1484	422	348	960	897	417
14	1475	472	387	1018	931	385
15	1411	415	361	973	922	391
16	138	450	360	989	904	302
17	1359	470	385	973	924	386

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	7.2	7.2	7.2	7.2	7.3	7.0
10	7.3	7.2	7.3	7.2	7.3	7.3
11	7.1	7.1	7.1	7.1	7.1	7.1
12	7.2	7.2	7.2	7.2	7.0	7.0
13	7.0	7.1	7.1	7.1	7.1	7.1
14	7.2	7.2	7.3	7.3	7.3	7.1
15	7.1	7.1	7.1	7.1	7.1	7.1
16	7.1	7.1	7.1	7.1	7.1	7.1
17	7.3	7.3	7.3	7.2	7.2	7.2

Temperature (°C)						
9	25	25	25	25	24	25
10	24	25	24	25	24	24
11	24	26	26	26	26	26
12	25	25	25	25	25	25
13	26	26	26	26	26	26
14	25	25	24	24	24	26
15	26	26	26	26	26	26
16	26	26	26	26	26	26
17	24	24	24	25	25	25

DO Levels (60-100% saturation) -
 4.4 to 7.3 mg/L at 24°C
 4.5 to 7.2 mg/L at 25°C
 4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions						
Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
9	7.8	8.1	8.1	7.8	7.9	8.0
10	8.0	8.1	8.1	7.9	8.0	8.1
11	7.9	8.0	7.9	7.8	7.8	7.9
12	7.9	8.1	8.1	8.0	8.0	8.1
13	7.8	8.0	8.0	7.8	7.9	8.0
14	7.9	8.1	8.1	7.9	7.9	8.1
15	7.9	8.0	8.1	7.9	7.9	8.0
16	7.9	8.1	8.2	7.9	7.9	8.0
17	8.1	8.1	8.1	8.0	8.0	8.0

Conductance (µS/cm)						
9	1505	471	370	970	941	472
10	1577	522	381	1000	939	482
11	1482	402	355	1007	921	408
12	646	519	215	1025	880	430
13	489	449	364	982	915	455
14	1327	446	361	984	909	432
15	1416	465	391	1078	945	424
16	148	460	381	970	927	399
17	1389	485	377	987	918	402

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	6.4	6.5	6.5	6.6	6.5	6.6
10	7.0	7.0	7.3	7.3	7.3	7.3
11	6.5	6.6	6.5	6.6	6.6	6.5
12	6.8	6.8	6.6	6.8	6.8	6.6
13	6.6	6.7	6.7	6.7	6.7	6.7
14	6.5	6.6	6.6	6.7	6.7	6.5
15	6.1	5.9	6.0	6.2	6.2	6.3
16	6.9	7.0	6.7	6.5	6.1	5.8
17	7.1	5.9	5.8	5.9	5.9	6.2

Temperature (°C)						
9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	25	24	24	25	25
16	24	24	24	24	24	24
17	24	25	24	24	24	24

Reviewed by JP

Date reviewed 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample 1718-0789 10 ug/L, 1718-0790 10 ug/L, 1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

New Solutions

Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
18	8.3	8.3	8.4	8.3	8.3	8.4
19	8.0	8.1	8.2	8.2	8.2	8.3
20	8.1	8.1	8.1	8.1	8.1	8.3
21	8.1	8.3	8.3	8.3	8.4	8.4
22	8.1	8.4	8.4	8.3	8.4	8.4
23	8.1	8.4	8.3	8.1	8.3	8.1
24	8.1	8.3	8.3	8.0	8.4	8.2
25	8.4	8.4	8.4	8.3	8.4	8.2
26	8.2	8.4	8.3	8.2	8.3	8.4

Old Solutions

Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
18	7.9	8.1	8.2	8.0	8.1	8.2
19	7.9	8.2	8.2	7.9	8.0	8.1
20	8.0	8.0	8.1	7.9	8.0	8.1
21	8.0	8.1	8.1	8.0	8.0	8.2
22	8.0	8.1	8.1	8.1	8.1	8.3
23	7.9	8.1	8.2	8.0	8.1	8.2
24	7.9	8.1	8.2	8.0	8.1	8.2
25	8.0	8.3	8.3	8.1	8.2	8.3
26	7.7	8.0	8.0	8.1	8.2	8.1

Conductance (µS/cm)

18	1391	1457	1472	1000	930	878
19	1416	471	687	1005	810	356
20	1353	1137	1644	967	866	344
21	1348	387	315	982	912	470
22	1306	477	316	973	919	409
23	1358	410	318	960	892	472
24	420	406	311	945	918	415
25	411	378	309	985	908	415
26	1448	404	313	982	977	400

Conductance (µS/cm)

18	1423	488	705	979	917	403
19	1453	519	722	1007	926	406
20	1399	562	637	945	857	353
21	1297	446	635	959	897	354
22	1376	482	412	987	922	429
23	1327	463	346	960	914	416
24	1307	465	346	965	933	406
25	1419	415	342	1023	949	443
26	1404	401	331	980	918	423

0790 0791
* 472, 880

1335 *26

Dissolved Oxygen (mg/L) (40-100% saturation)

18	7.3	7.2	7.3	7.2	7.2	7.2
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.2	7.2	7.2	7.2	7.2
23	7.1	7.1	7.1	7.1	7.1	7.1
24	7.2	7.2	7.3	7.3	7.2	7.2
25	7.1	7.1	7.1	7.1	7.1	7.1
26	7.3	7.3	7.3	7.3	7.3	7.3

Dissolved Oxygen (mg/L) (40-100% saturation)

18	6.7	6.6	6.6	6.0	6.0	6.3
19	6.7	6.6	6.6	6.3	6.3	6.5
20	6.1	5.7	6.0	6.5	6.2	6.7
21	6.1	6.2	6.4	6.9	5.5	5.5
22	5.2	5.3	5.4	5.5	5.4	5.9
23	5.5	5.6	6.0	5.9	6.0	6.1
24	6.0	6.1	6.4	6.2	5.9	6.0
25	6.1	5.9	5.9	5.9	5.8	5.8
26	6.4	6.6	6.9	6.3	6.7	6.6

Temperature (°C)

18	24	25	24	25	25	25
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	25	25	25	25	25
23	24	26	26	26	26	26
24	25	25	24	24	25	25
25	26	26	26	26	26	26
26	24	24	24	24	24	24

Temperature (°C)

18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	25	25	25
25	25	25	25	24	24	25
26	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: OP

Date Reviewed: 2018/10/10/03

Method FMD 32 Day ELS Client TEC164 Sample 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

New Solutions						
Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
27	8.1	8.4	8.4	8.2	8.4	8.2
28	8.1	8.3	8.3	8.0	8.2	8.2
29	8.1	8.4	8.3	8.2	8.4	8.4
30	8.1	8.3	8.3	8.2	8.3	8.3
31	7.9	7.9	8.1	7.9	8.0	8.0
32						

Old Solutions						
Conc. (%)	1718-0789	1718-0790	1718-0791	1718-0792	1718-0793	1718-0794
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
27	7.9	8.0	8.2	8.0	8.1	8.2
28	8.0	8.1	8.2	8.0	8.1	8.1
29	8.0	8.2	8.3	8.1	8.1	8.2
30	8.0	8.1	8.2	8.0	8.1	8.1
31	7.6	7.9	7.9	7.7	7.8	7.9
32	7.8	7.9	7.9	8.0	7.9	7.9

Conductance (µS/cm)						
27	1454	424	333	1033	964	438
28	1456	461	326	1050	969	422
29	1276	356	313	955	989	418
30	1389	405	327	1010	1005	421
31	1251	390	331	971	973	403
32						

Conductance (µS/cm)						
27	1498	199	361	992	985	466
28	1559	519	285	1054	1017	504
29	1538	470	364	1032	1026	522
30	1521	509	367	1014	996	514
31	1262	385	354	1013	1013	434
32	1477	488	370	1029	1011	497

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	7.2	7.2	7.2	7.2	7.2	7.3
28	7.0	7.2	7.2	7.2	7.2	7.2
29	7.1	7.1	7.1	7.1	7.1	7.1
30	7.1	7.1	7.1	7.1	7.1	7.1
31	7.3	7.1	7.1	7.1	7.3	7.2
32						

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	6.1	6.1	6.3	6.0	6.0	6.3
28	6.2	6.1	6.2	5.7	5.9	6.1
29	5.9	6.0	6.3	6.1	6.0	6.0
30	5.9	6.0	6.0	6.1	6.0	5.9
31	5.9	6.1	6.2	5.9	5.9	6.1
32	5.8	5.8	5.7	5.7	5.7	5.8

Temperature (°C)						
27	25	25	25	25	25	24
28	25	25	25	25	25	25
29	26	26	26	26	26	26
30	26	26	26	26	26	26
31	24	26	26	26	24	25
32						

Temperature (°C)						
27	24	24	24	25	25	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	25	25	24	24	24	24
31	24	24	24	24	24	24
32	24	24	24	24	24	24

DO Levels (60-100% saturation) -
 4.4 to 7.3 mg/L at 24°C
 4.5 to 7.2 mg/L at 25°C
 4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/10/10/23

Method FMD 32 Day ELS Client TEC164 Sample: 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal
1718-0789 10 ug/L	A 1718 A	1	12	N	B	1	12	N	C	1	10	N	D	1	10	N
		2	11	N		2	11	N		2	10	N		2	10	N
		3	11	N		3	11	N		3	10	N		3	9	N
		4	10	N		4	10	N		4	10	N		4	9	N
		5	9	N		5	10	N		5	10	N		5	8	N
		6	10	N		6	10	N		6	10	N		6	10	N
		7	13	N		7	11	N		7	10	N		7	10	N
		8	11	N		8	11	N		8	10	N		8	10	N
		9	13	N		9	11	N		9	10	N		9	10	N
		10	10	N		10	10	N		10	10	N		10	10	N
		11	11	N		11	9	N		11	10	N		11	11	N
		12	9	N		12	10	N		12	10	N		12	11	N
		13	9	N		13	11	N		13	10	N		13	11	N
		14	12	N		14	11	N		14	9	N		14	11	N
		15	11	N		15	11	N		15	11	N		15	11	N
Comments																
1718-0790 10 ug/L	A	1	10	N	B	1	9	N	C	1	10	N	D	1	11	N
		2	10	N		2	10	N		2	10	N		2	9	N
		3	12	N		3	9	N		3	11	N		3	8	N
		4	10	N		4	10	N		4	10	N		4	9	N
		5	11	N		5	10	N		5	10	N		5	8	N
		6	10	N		6	10	N		6	10	N		6	10	N
		7	9	N		7	10	N		7	9	N		7	11	N
		8	11	N		8	11	N		8	10	N		8	7	N
		9	11	N		9	10	N		9	8	N		9	8	N
		10	11	AS		10	10	N		10	11	N		10	10	N
		11	10	N		11	11	N		11	11	N		11	9	N
		12	11	N		12	10	N		12	10	N		12	9	N
		13	11	N		13	10	N		13	10	N		13	10	N
		14	11	N		14	11	N		14	11	N		14	11	N
		15	11	N		15	11	N		15	11	N		15	11	N
Comments																

Reviewed By: JP Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample: 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

Test Termination

for normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=head, O=oral, E=eyes, G=gills, F=fins, S=spine**

Conc. 10 ug/L

Replicate #	A			B			C			D		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	
1	11	N	1	10	N	1	10	N	1	10	N	
2	11	↓	2	10	↓	2	10	↓	2	10	↓	
3	10	↓	3	9	↓	3	9	↓	3	10	↓	
4	9	↓	4	10	↓	4	9	↓	4	10	↓	
5	9	↓	5	10	↓	5	9	↓	5	10	↓	
6	9	↓	6	10	↓	6	9	↓	6	10	↓	
7	9	↓	7	10	↓	7	9	↓	7	10	↓	
8	10	↓	8	10	↓	8	9	↓	8	10	↓	
9	11	↓	9	9	↓	9	9	↓	9	10	↓	
10	10	↓	10	9	↓	10	10	↓	10	10	↓	
11	8	↓	11	9	↓	11	10	↓	11	10	↓	
12	10	↓	12	9	↓	12	9	↓	12	10	↓	
13	10	↓	13	9	↓	13	9	↓	13	10	↓	
14	11	↓	14	10	↓	14	10	↓	14	10	↓	
15	10	↓	15	10	↓	15	10	↓	15	10	↓	

Comments

Conc. 10 ug/L

Replicate #	A			B			C			D		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	
1	11	N	1	9	N	1	10	N	1	10	N	
2	11	↓	2	11	↓	2	10	↓	2	10	↓	
3	10	↓	3	10	↓	3	10	↓	3	10	↓	
4	10	↓	4	10	↓	4	10	↓	4	10	↓	
5	10	↓	5	10	↓	5	10	↓	5	10	↓	
6	10	↓	6	10	↓	6	10	↓	6	10	↓	
7	10	↓	7	10	↓	7	10	↓	7	10	↓	
8	10	↓	8	10	↓	8	10	↓	8	10	↓	
9	10	↓	9	10	↓	9	10	↓	9	10	↓	
10	10	↓	10	10	↓	10	10	↓	10	10	↓	
11	10	↓	11	10	↓	11	10	↓	11	10	↓	
12	10	↓	12	10	↓	12	10	↓	12	10	↓	
13	11	↓	13	10	↓	13	10	↓	13	10	↓	
14	11	↓	14	10	↓	14	10	↓	14	10	↓	
15	11	↓	15	10	↓	15	10	↓	15	10	↓	

Comments

Reviewed By: JP Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample: 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.		Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal		
1718-0793	10 ug/L	1	11	N	1	10	N	1	10	N	1	10	N
		2	11		2	9		2	9		2	9	
		3	9		3	11		3	11		3	11	
		4	12		4	10		4	10		4	13	
		5	10		5	9		5	9		5	10	
		6	9		6	9		6	10		6	10	
		7	11		7	9		7	9		7	9	
		8	10		8	12		8	11		8	10	
		9	10		9	10		9	9		9	9	
		10	11		10	10		10	9		10	10	
		11	9		11	10		11	10		11	10	
		12	10		12	10		12	11		12	9	
		13	9		13	9		13	11		13	11	
		14	11		14	10		14	11		14	11	
		15	11		15	10		15	11		15	11	
Comments													
1718-0794	10 ug/L	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal		
1			1			1	14	N	1	12	N		
2			2			2	13		2	11			
3			3			3	12		3	11			
4			4			4	11		4	11			
5			5			5	11		5	12			
6			6			6	12		6	10			
7			7			7	12		7	10			
8			8			8	-		8	10			
9			9			9	-		9	9			
10			10			10	-		10	10			
11			11			11	-		11	10			
12			12			12	-		12	9			
13			13			13	-		13	11			
14			14			14	-		14	10			
15			15			15	-		15	10			
Comments													

Reviewed By: JP Date Reviewed: 2018/04/03

Method FMD 32 Day ELS Client TEC164 Sample: 1718-0789 10 ug/L, 1718-0790 10 ug/L,
1718-0791 10 ug/L, 1718-0792 10 ug/L, 1718-0793 10 ug/L, 1718-0794 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=head, O=oral, E=eyes, G=gills, F=fins, S=spine**

Conc.

#REF1	Replicate #			Replicate #			Replicate #			Replicate #		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
	1			1			1			1		
	2			2			2			2		
	3			3			3			3		
	4			4			4			4		
	5			5			5			5		
	6			6			6			6		
	7			7			7			7		
	8			8			8			8		
	9			9			9			9		
	10			10			10			10		
	11			11			11			11		
	12			12			12			12		
	13			13			13			13		
	14			14			14			14		
	15			15			15			15		
Comments												

Reviewed By: JP Date Reviewed: 2018/01/03

Client TECUA 118-0789, 0790, 0791, Organism FM Batch 20180222FM Initial weights due: 2018/03/26
 Sample 0792, 0793, 0794, 1049/L

Item Weighed	Date	Initials	Balance*
dried pan	2018/03/16	SS	*1
dried pan + organisms	2018/03/29	AP	Mettler 1

* same balance must be used for initial and final weights
 * for FM/HA/CT, must use scale with 0.01 mg accuracy

Final weights due: 2018/03/31

Concentration

Replicate	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1003.11	1028.35	992.31	1011.62	1021.09	1043.68	1024.28	1048.68
b	1010.50	1038.89	1018.25	1041.13	1020.95	1041.81	1023.71	1047.09
c	1016.59	1036.38	1020.27	1043.32	1024.39	1044.12	1019.77	1042.19
d	1021.55	1048.03	1008.19	1029.17	1030.97	1050.83	*1030.40	1054.17
e								

Replicate	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a								
b								
c								
d								
e								

Balance Calibration Check:

first pan weighed:	Initial	Final
weight of first pan:	0789 D	793 A
first pan after all other pans weighed:	1024.55	1048.68

% difference <5%: Yes/ No

$$\% \text{ difference} = \frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$$

Reviewed By: SP Date Reviewed: 2018/04/03

Test Validity Met: Yes/ No/ NA

Results are Logical**: Yes/ No

** no negative numbers, consistent values across replicates

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Method FMD 32 Day ELS Client TEC164 Sample: CTL, CTL 10 ug/L, CTL 20 ug/L 1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)
Organism Information Source: Aquatic Batch: 20181021225M Egg Stage: 13 Somites Organisms Received in Good Condition: Yes or No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review	
					AM	PM		First	Second
2018/02/22	0	1500	LF/AP/CEP/EP/CB/ST	2	-	-	30 min	CB	LF
2018/02/23	1	1400	EP/ST/AP	2	-	-	30 min	EP	AP
2018/02/24	2	1330	EP/SS	2	-	-	60 min	SS	EP
2018/02/25	3	1345	LF/CB	2	-	-	120 min	CB	LF
2018/02/26	4	1210	LF/EP	2	-	-	60 min	ST	LF
2018/02/27	5	1410	CB/ST	2	-	-	60 min	SS	AP
2018/02/28	6	1130	AP	2	✓	✓	60 min	EP	CB
2018/03/01	7	1340	ST	2	✓	✓	45 min	EP	CB
2018/03/02	8	1210	AP	2	✓	✓	60 min	CB	CEP
2018/03/03	9	1300	SS/EP	2	✓	✓	60 min	SS	EP
2018/03/04	10	1330	CB/AP	2	✓	✓	60 min	CB	AP
2018/03/05	11	1400	EP/ML	2	✓	✓	45 min	CB	AP
2018/03/06	12	1315	ML/AP	2	✓	✓	60 min	ST	EP
2018/03/07	13	1200	CB/LE	2	✓	✓	90 min	AP	LF
2018/03/08	14	1340	ST/AP	2	✓	✓	CB 45 min	SS	CB
2018/03/09	15	1200	ML/LE	2	✓	✓	60 min	EP	SS
2018/03/10	16	1215	LF/ST	2	✓	✓	60 min	EP	AP
2018/03/11	17	1220	AP	2	✓	✓	90 min	SS	AP
2018/03/12	18	1200	AP	2	✓	✓	60 min	ML	EP
2018/03/13	19	1340	LF/ST	2	✓	✓	60 min	EP	AP
2018/03/14	20	1130	ST/ST	2	✓	✓	60 min	SS	AP
2018/03/15	21	1410	ST/SS	2	✓	✓	60 min	ML	LF
2018/03/16	22	1400	ML/LE	2	✓	✓	60 min	EP	LF
2018/03/17	23	1150	ST/SS	2	✓	✓	60 min	SS	-
2018/03/18	24	1300	LC/AP	2	✓	✓	60 min	LE	ML
2018/03/19	25	1130	EP	2	✓	✓	45 min	AP	-
2018/03/20	26	1165	ST/AP	2	✓	✓	45 min	CB	LF
2018/03/21	27	1115	AP/EP	2	✓	✓	90 min	CB	ST
2018/03/22	28	1355	EP/ML	2	✓	✓	60 min	CB	SS
2018/03/23	29	1300	CB/ML	2	✓	✓	90 min	EP	LF
2018/03/24	30	1400	LP	2	✓	✓	75 min	SS	ST
2018/03/25	31	1200	LC/AP	2	✓	✓	60 min	ML	AP
2018/03/26	32	1030	EP/AP	2	-	-	-	EP	ML

Reviewed By: JP Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)

1718-0792 20 ug/L (CM_MC2)

1718-0793 20 ug/L (GH_FR1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	CTL		CTL 10 ug/L		CTL 20 ug/L		1718-0789 20 ug/L		1718-0792 20 ug/L		1718-0793 20 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	15	0	15	0	15	0	15	0	15	0	15	0
b	15	0	14	1	15	0	15	0	15	0	15	0
c	15	0	14	1	14	1	14	0	15	0	15	0
d	15	0	15	0	15	0	15	0	15	0	15	0
e	29	0	30	0	30	0	30	0	30	0	30	0
f	30	0	30	0	30	0	30	1	30	0	30	0

Comments/Observations:

CTL rep e only 29 embryos loaded.

Number of Alive Embryos and Hatched Organisms

replicate	CTL			CTL 10 ug/L			CTL 20 ug/L			1718-0789 20 ug/L			1718-0792 20 ug/L			1718-0793 20 ug/L		
	Day 2			Day 2			Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	0	✓	15	0	✓	14	1	✓	15	0	✓	15	0	✓	15	0	✓
b	14	1	✓	13	1	✓	15	0	✓	15	0	✓	15	0	✓	15	0	✓
c	15	0	✓	12	2	✓	14	0	✓	14	0	✓	14	0	✓	15	0	✓
d	13	2	✓	14	1	✓	14	1	✓	14	1	✓	14	1	✓	15	0	✓
e	29	0		30	0		30	0		30	0		30	0		30	0	
f	30	0		30	0		30	0		30	0		29	0		30	0	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	8	0	7	0
b	14	0	1	0
c	14	0	1	0
d	13	0	2	0

CTL 10 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	4	0	11	0
b	14	1	0	0
c	14	0	1	0
d	11	0	4	0

CTL 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	4	0	11	0
b	14	0	1	0
c	14	0	1	0
d	10	0	5	0

1718-0789 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	4	0	10	0
b	4	0	10	1
c	9	1	5	0
d	8	0	7	0

1718-0792 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	3	0	12	0
b	13	0	2	0
c	10	0	5	0
d	11	0	4	0

1718-0793 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	2	12	0
b	3	0	12	0
c	4	2	9	0
d	13	0	2	0



CTL
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	3	0	12	0
b	6	0	9	0
c	5	0	10	0
d	6	0	9	0

CTL 10 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	3	0	11	0
c	4	0	11	0
d	4	0	11	0

CTL 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	0
b	0	0	15	0
c	0	0	15	0
d	1	0	14	0

1718-0789 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	1	14	0
b	0	0	14	0
c	2	1	14	0
d	1	0	13	0

1718-0792 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	14	0
b	2	0	13	0
c	0	1	14	0
d	0	0	15	0

1718-0793 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	13	0
b	0	0	15	0
c	0	0	13	0
d	2	0	13	0

Comments/Observations

Reviewed By: JTP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)

1718-0792 20 ug/L (CM_MC2)

1718-0793 20 ug/L (GH_FR1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	14	1
18	0	14	0

1718-0789 20 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	13	4
0	0	14	0
18	0	13	0
0	0	15	0

CTL 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15(2)	0
0	0	13	1
0	0	15	0
0	0	15	0

1718-0792 20 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	10*	0
0	0	15	0

CTL 20 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15(1)	0
0	0	15	0
18	0	14	0

1718-0793 20 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	13	0
0	0	15	0
0	0	13	0
0	0	15	0



CTL 20 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	15	0
0	0	14	0

1718-0793 20 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	13(1)	0
0	0	15	0
0	0	13	0
0	0	15	0

CTL

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	14	0
0	0	14	0

1718-0789 20 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	13	0
0	0	13	0
0	0	15	0

CTL 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	14
0	0	13(1)	0
0	0	12	0
0	0	15	0

1718-0792 20 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	10*	0
0	0	15	0

Comments/Observations
* 1718-0792 20 ug/L rep C, 4 fish lost during transfer on day 5, replicate not replenished on day 5 - JP

Reviewed By: JP

Date Reviewed: 2018/01/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	15	14	15	13(2)
b	15	13(0)	14	13	15	15
c	14	15	15	12(2)	10	13(1)
d	14	15	15	15(1)	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	15	13(1)	15	13
b	15	13	14	13	15	15
c	14	15	15	12(2)	10	13
d	14	15	15	13(1)	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	15	14	15	13
b	15	13	14	13	15	15
c	14	15	15	10(1)	10	13(1)
d	14	15	15(1)	15(1)	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	15	14	15	13
b	15	13	14	13	15	15
c	14	15	15	10	10	13
d	14	15	15	15(1)	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 11	CTL 10 ug/L Day 11	CTL 20 ug/L Day 11	1718-0789 20 ug/L Day 11	1718-0792 20 ug/L Day 11	1718-0793 20 ug/L Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(2)	14	15(1)	14	15	13(2)
b	15	13	14	13	15	15
c	14	15	15	10	10	13(1)
d	14	15	15(1)	13, 14	15	15

Comments/Observations:

	CTL Day 12	CTL 10 ug/L Day 12	CTL 20 ug/L Day 12	1718-0789 20 ug/L Day 12	1718-0792 20 ug/L Day 12	1718-0793 20 ug/L Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(2)	14	15(1)	14	15	13(2)
b	15	13(1)	14	13	15	15
c	14	15	15	10(1)	10	13(1)
d	14	15	15(1)	14	15	15

Comments/Observations:

	CTL Day 13	CTL 10 ug/L Day 13	CTL 20 ug/L Day 13	1718-0789 20 ug/L Day 13	1718-0792 20 ug/L Day 13	1718-0793 20 ug/L Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	15	14	15	13
b	15	13	14	13	15	15
c	14	15	15	10(1)	10	13
d	14	15	15	14	15	15

Comments/Observations:

	CTL Day 14	CTL 10 ug/L Day 14	CTL 20 ug/L Day 14	1718-0789 20 ug/L Day 14	1718-0792 20 ug/L Day 14	1718-0793 20 ug/L Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14, 15	14	15(1)	14	15	12
b	15	13(1)	14	13, 12	15	15
c	14	15	15	10(2)	10	13(1)
d	14(1)	15	15(1)	14(1)	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 15	CTL 10 ug/L Day 15	CTL 20 ug/L Day 15	1718-0789 20 ug/L Day 15	1718-0792 20 ug/L Day 15	1718-0793 20 ug/L Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(11)	14	14(11)	14	15	12
b	15	13(11)	14	13(10) 14	15	15
c	14	15	15	10	10	13(11)
d	14	15	14	14	15	15

Comments/Observations:

	CTL Day 16	CTL 10 ug/L Day 16	CTL 20 ug/L Day 16	1718-0789 20 ug/L Day 16	1718-0792 20 ug/L Day 16	1718-0793 20 ug/L Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	15	14	15	12
b	15	13(11)	14	13	15	15
c	14	15	15	10	10	13(11)
d	14	15	14	13	15	15

Comments/Observations:

	CTL Day 17	CTL 10 ug/L Day 17	CTL 20 ug/L Day 17	1718-0789 20 ug/L Day 17	1718-0792 20 ug/L Day 17	1718-0793 20 ug/L Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(11)	14	15	14	15	12
b	15	13(11)	14	13	15	15
c	14	15	15	10	10	13
d	14	15	14	12	15	15

Comments/Observations:

	CTL Day 18	CTL 10 ug/L Day 18	CTL 20 ug/L Day 18	1718-0789 20 ug/L Day 18	1718-0792 20 ug/L Day 18	1718-0793 20 ug/L Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	14	15	12
b	15	13	14	13	15	15(11)
c	14	15	14	10	10	13
d	14	15	14	12	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164 Sample: CTL, CTL 10 ug/L, CTL 20 ug/L
 1718-0789 20 ug/L (FR_CP1)
 1718-0792 20 ug/L (CM_MC2)
 1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 19	CTL 10 ug/L Day 19	CTL 20 ug/L Day 19	1718-0789 20 ug/L Day 19	1718-0792 20 ug/L Day 19	1718-0793 20 ug/L Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	14	14	15	12
b	15	13	14	13	15	15(1)
c	14	15	14	10(1)	10	13(1)
d	14	15	14	12	15	15

Comments/Observations:

	CTL Day 20	CTL 10 ug/L Day 20	CTL 20 ug/L Day 20	1718-0789 20 ug/L Day 20	1718-0792 20 ug/L Day 20	1718-0793 20 ug/L Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	14	14	15	12
b	15	13(1)	14	13	15	15(1)
c	14	15	14	10(1)	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

	CTL Day 21	CTL 10 ug/L Day 21	CTL 20 ug/L Day 21	1718-0789 20 ug/L Day 21	1718-0792 20 ug/L Day 21	1718-0793 20 ug/L Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	14	14	15	12(1)
b	15	13(1)	14	13	15	16(1)
c	14	15	14	10(1)	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

	CTL Day 22	CTL 10 ug/L Day 22	CTL 20 ug/L Day 22	1718-0789 20 ug/L Day 22	1718-0792 20 ug/L Day 22	1718-0793 20 ug/L Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	14	14	15	12
b	15	13(1)	14	13	15	15(1)
c	14	15	14	10	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

Reviewed By: SP Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	14	15	12(1)
b	16(1)	13(1)	14	13	15	15
c	14	15	14	9	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	14	15	12(1)
b	15(1)	13(1)	14	13	15	15
c	14	15	14	9	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	14	14	14	15	12(1)
b	15	13(1)	14	13	15	15
c	14	15	14	9(1)	10	13(2)
d	14	15	14	12	15	15

Comments/Observations:

replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
	Alive hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	12
b	15	13(1)	14	13	15	14 14
c	14	15	14	8	10	11
d	14	15	14	12	15	15

Comments/Observations:

Reviewed By: CTP Reviewed: 2018/04/102

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

Day 27 ST
written on
day 28 for
CTL UNT/
CTL 20ug

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
replicate	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	12
b	15	13(1)	14	13	15	14
c	14	15	14	8	10	11
d	14	15	14	12	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
replicate	Day 28	Day 28	Day 28	Day 28	Day 28	Day 28
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	13
b	15	13(1)	14	13	15	14
c	14	15	14	8	10	11(0)
d	14	15	14	12	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
replicate	Day 29	Day 29	Day 29	Day 29	Day 29	Day 29
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	12
b	15	13(1)	14	13	15	14
c	14	15	14	8	10	11
d	14	15	14	12	15	15

Comments/Observations:

	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
replicate	Day 30	Day 30	Day 30	Day 30	Day 30	Day 30
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	12
b	15	13(1)	14	13	15	14
c	14	15	14	8	10	10
d	14	15	14	12	15	15

Comments/Observations:

Reviewed By: JP Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L (FR_CP1)
1718-0792 20 ug/L (CM_MC2)
1718-0793 20 ug/L (GH_FR1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 31	CTL 10 ug/L Day 31	CTL 20 ug/L Day 31	1718-0789 20 ug/L Day 31	1718-0792 20 ug/L Day 31	1718-0793 20 ug/L Day 31
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	14	14	15	12
b	15	13(1)	14	13	15	14
c	14	15	14	8	10	10
d	14	15	14	12	15	15

Comments/Observations:

	CTL Day 32	CTL 10 ug/L Day 32	CTL 20 ug/L Day 32	1718-0789 20 ug/L Day 32	1718-0792 20 ug/L Day 32	1718-0793 20 ug/L Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13/14	14	14	14	15	12
b	14/15	13(1)	14	13	15	14
c	14	15	14	8	10	10
d	14	15	14	12	15	15

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/04/12

Method FMD 32 Day ELS

Client TEC164

Sample CTL CTL 10 ug/L CTL 20 ug/L

1718-0789 20 ug/L, 1718-0792 20 ug/L, 1718-0793 20 ug/L

New Solutions

Conc. (%)	CTL	CTL	CTL	1718-0789	1718-0792	1718-0793
Day	10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L

pH (units)						
0	8.3	8.2	8.4	8.2	8.1	8.2
1	8.2	8.3	8.2	8.2	8.2	8.4
2	8.2	8.3	8.2	8.2	8.3	8.4
3	8.2	8.2	8.2	8.2	7.9	8.3
4	8.3	8.3	8.3	8.2	8.1	8.4
5	8.0	7.9	8.0	7.9	8.0	8.0
6	8.0	8.1	8.1	8.1	8.1	8.2
7	8.0	8.2	8.2	8.1	8.1	8.0
8	8.1	8.2	8.2	8.1	8.2	8.2

Conductance (µS/cm)						
0	366	440	484	1647	1041	917
1	382	508	522	1654	1036	1045
2	352	483	518	1573	1052	906
3	361	468	486	1541	990	831
4	366	475	499	1608	1032	895
5	443	434	472	1674	997	882
6	439	463	471	1588	976	881
7	407	448	445	1500	1079	902
8	519	477	456	1521	1099	929

Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.0	7.8	7.0	7.0	7.1	7.4
4	7.1	7.1	7.1	7.1	7.2	7.2
5	7.1	7.0	7.0	7.0	6.8	6.7
6	7.3	7.3	7.3	7.3	7.3	7.3
7	7.1	7.0	7.0	7.0	6.9	7.0
8	7.2	7.2	7.2	7.0	7.0	7.1

Temperature (°C)						
0	24.0	24.0	24.0	24.0	24.0	24.0
1	24.0	24.0	24.0	24.0	24.0	24.0
2	24.0	25.0	24.0	25.0	25.0	24.0
3	24.5	24.5	25.0	24.0	24.0	24.0
4	25	25	25	25	25	25
5	24	24	24	26	26	26
6	24.0	24	24	24	24	24
7	26	26	26	26	26	26
8	24	25	25	26	26	26

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions

CTL	CTL	CTL	1718-0789	1718-0792	1718-0793
10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L

pH (units)						
0						
1	8.2	8.3	8.4	8.1	8.1	8.2
2	7.9	8.1	8.1	7.8	7.9	8.0
3	8.1	8.2	8.2	8.0	8.0	8.1
4	8.1	8.2	8.2	8.0	8.1	8.0
5	7.6	7.9	7.9	7.7	7.8	7.8
6	8.1	8.1	8.1	7.8	7.9	7.9
7	7.9	7.9	7.9	7.9	7.9	8.0
8	7.8	7.9	8.0	7.9	7.9	8.0

Conductance (µS/cm)						
0						
1	379	537	641	647	1034	909
2	376	523	530	1521	1009	896
3	368	500	524	1606	931	914
4	500	485	518	1545	1028	866
5	466	485	487	1496	1046	897
6	435	464	484	1543	989	859
7	446	470	488	1570	1031	890
8	425	483	484	1465	1061	902

Dissolved Oxygen (mg/L) (40-100% saturation)						
0						
1	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.1	7.1	7.2	7.2	7.1
4	7.2	7.1	7.2	7.0	7.0	7.3
5	6.7	6.9	6.9	6.6	6.6	6.6
6	6.9	6.9	6.8	6.8	6.8	6.8
7	6.3	6.3	6.2	6.2	6.2	6.0
8	6.4	6.4	6.2	6.2	6.5	6.7

Temperature (°C)						
0						
1	24.0	24.0	24.0	24.0	24.0	24.0
2	24.0	24.0	24.0	24.0	24.0	24.0
3	24.0	24.0	24.0	24.0	24.0	24.0
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24.0	24.0	24.0	24.0	24.0	24
7	24	24	24	24	24	24
8	24	24	25	24	24	24

Reviewed by: JP

Date reviewed: 2018/04/02

Method FMD 32 Day ELS

Client TEC164

Sample CTL CTL 10 ug/L, CTL 20 ug/L

1718-0789 20 ug/L, 1718-0792 20 ug/L, 1718-0793 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL	CTL	1718-0789	1718-0792	1718-0793
Day	10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L

pH (units)						
9	8.3	8.1	8.1	7.9	8.1	8.1
10	8.4	8.4	8.3	8.0	8.0	8.2
11	8.1	8.1	8.1	7.9	7.9	8.0
12	8.1	7.9	8.0	8.1	8.1	8.2
13	8.0	8.0	8.0	8.1	8.1	8.2
14	8.0	8.2	8.2	8.1	8.1	8.2
15	8.0	8.1	8.1	8.1	8.0	8.2
16	8.2	8.2	8.2	8.2	8.1	8.3
17	8.2	8.2	8.2	8.2	7.8	8.0

Conductance (µS/cm)						
9	462	446	438	1557	1101	927
10	462	447	438	1470	1069	921
11	447	438	428	1500	1076	930
12	470	448	438	1425	1026	920
13	456	448	446	1514	1073	924
14	483	443	512	1441	1050	927
15	461	463	466	1426	1045	937
16	425	432	434	1407	1021	930
17	477	434	425	1478	1044	932

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	7.2	7.2	7.2	7.2	7.1	7.3
10	7.2	7.2	7.2	7.2	7.2	7.3
11	7.2	7.2	7.3	7.1	7.1	7.1
12	7.3	7.2	7.3	7.2	7.2	7.2
13	7.3	7.3	7.3	7.1	7.1	7.1
14	7.3	7.2	7.3	7.2	7.2	7.1
15	7.1	7.1	7.1	7.0	7.1	7.1
16	7.1	7.1	7.2	7.0	7.1	7.1
17	7.3	7.3	7.3	7.3	7.2	7.2

Temperature (°C)						
9	25	25	25	25	25	24
10	25	25	25	25	25	24
11	25	25	24	26	26	26
12	24	25	24	25	25	25
13	24	24	24	26	26	26
14	24	26	24	25	25	26
15	26	26	26	26	26	26
16	26	26	25	26	26	26
17	24	24	24	24	25	25

Old Solutions						
CTL	CTL	CTL	1718-0789	1718-0792	1718-0793	
10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	

pH (units)						
9	7.9	7.9	7.9	7.8	7.9	7.9
10	7.9	7.9	7.9	7.9	7.9	7.9
11	7.9	7.8	7.8	7.8	7.8	7.8
12	8.0	8.0	7.8	7.8	7.9	8.0
13	7.7	7.7	7.7	7.8	7.9	7.9
14	8.0	7.7	7.7	7.9	8.0	8.0
15	7.7	7.7	7.8	7.8	7.8	7.9
16	7.9	8.0	7.9	7.9	8.0	8.0
17	7.9	7.9	7.8	7.8	7.9	8.0

Conductance (µS/cm)						
9	534	489	470	1489	1119	915
10	530	429	469	1501	1092	898
11	490	462	465	1486	1079	895
12	468	460	460	1512	1074	940
13	524	474	462	1500	1069	944
14	465	469	457	1449	1083	952
15	496	477	477	1433	1066	955
16	472	488	463	1338	1021	918
17	427	460	461	1368	1039	896

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	6.6	6.5	6.4	6.4	6.2	6.3
10	6.9	7.0	7.0	6.9	7.1	7.1
11	6.0	5.9	6.1	6.0	6.1	6.3
12	6.9	6.9	6.7	6.6	6.7	6.5
13	6.1	6.1	6.1	6.2	6.4	6.2
14	6.4	6.3	6.2	6.1	6.5	6.2
15	5.4	5.0	5.1	6.0	5.5	5.9
16	5.9	5.7	6.0	6.1	6.3	6.9
17	6.0	6.0	6.0	6.0	6.0	6.0

Temperature (°C)						
9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	25	25	24	24
15	25	25	26	24	25	25
16	24	24	24	24	24	24
17	25	25	25	25	25	25

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed by: JP

Date reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample CTL CTL 10 ug/L CTL 20 ug/L
1718-0789 20 ug/L, 1718-0792 20 ug/L, 1718-0793 20 ug/L

Conc. (%) Day	New Solutions					
	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	pH (units)					
18	8.1	8.2	8.2	8.3	8.3	8.4
19	8.2	8.2	8.2	8.0	8.2	8.2
20	8.1	8.2	8.1	8.1	8.0	8.2
21	8.3	8.3	8.2	8.2	8.2	8.4
22	8.3	8.3	8.3	8.2	8.2	8.3
23	8.1	8.2	8.2	8.1	8.1	8.2
24	8.2	8.3	8.3	8.2	8.2	8.2
25	8.2	8.4	8.1	7.9	8.1	8.3
26	8.3	8.3	8.3	8.1	8.2	8.3

Conc. (%) Day	Old Solutions					
	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789 20 ug/L	1718-0792 20 ug/L	1718-0793 20 ug/L
	pH (units)					
18	7.4	7.7	7.8	7.8	8.1	8.1
19	8.0	8.0	7.9	8.2	8.0	8.1
20	7.9	7.9	7.8	8.0	8.0	8.0
21	7.8	7.6	7.2	8.0	8.0	8.1
22	8.0	8.0	8.0	8.0	8.1	8.2
23	8.0	8.0	8.0	7.8	7.9	8.1
24	7.5	7.8	7.9	7.9	7.9	8.1
25	8.2	8.1	8.2	8.1	8.0	8.3
26	8.0	7.9	7.9	7.9	8.0	8.0

Conc. (%) Day	Conductance (µS/cm)					
	18	469	450	467	439	477
19	465	409	406	430	440	431
20	477	297	296	435	404	474
21	478	461	406	432	408	418
22	439	431	467	406	411	410
23	403	416	430	439	409	417
24	443	404	398	421	431	420
25	439	428	425	410	421	433
26	400	394	376	431	406	471

Conc. (%) Day	Conductance (µS/cm)					
	18	489	452	451	434	435
19	465	443	443	432	430	433
20	299	409	404	420	415	430
21	438	413	412	427	471	455
22	439	462	418	436	404	424
23	432	449	461	366	426	406
24	451	441	449	383	434	452
25	474	457	455	398	411	417
26	487	429	422	435	473	494

Conc. (%) Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
	18	7.3	7.2	7.2	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.2	7.2	7.2	7.2	7.2	7.2
23	7.2	7.2	7.2	7.1	7.1	7.1
24	7.3	7.2	7.3	7.1	7.2	7.2
25	7.0	5.8	5.8	5.5	5.4	5.3
26	7.3	7.3	7.3	7.3	7.3	7.3

Conc. (%) Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
	18	6.9	6.9	6.5	6.4	6.5
19	6.0	6.1	6.0	6.1	6.3	6.5
20	6.7	6.4	5.5	6.7	6.0	6.3
21	5.3	5.5	5.5	5.6	5.1	6.0
22	5.4	5.4	5.4	5.4	5.6	5.6
23	5.7	5.5	5.4	5.7	5.5	5.6
24	6.4	6.2	6.0	6.3	6.3	5.9
25	6.0	5.8	5.8	5.5	5.4	5.3
26	6.4	6.0	5.8	5.7	5.9	5.7

Conc. (%) Day	Temperature (°C)					
	18	24	25	25	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	28	25	28	25	25	25
23	25	24	25	26	26	26
24	24	25	24	25	25	24
25	24.5	24	24	25	26	26
26	24	24	24	24	24	24

Conc. (%) Day	Temperature (°C)					
	18	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	25	25	25	25	25	25
23	24	24	24	24	24	24
24	24	24	24	25	25	25
25	24	24	24	24.5	25	25
26	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP
LTLW1 LTL10 LTL20 0189 0792 0793
• 7.0 7.1 7.1 7.1 7.1 7.1

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample CTL CTL 10 ug/L CTL 20 ug/L
1718-0789 20 ug/L, 1718-0792 20 ug/L, 1718-0793 20 ug/L

New Solutions

Conc. (%)	CTL	CTL	CTL	1718-0789	1718-0792	1718-0793
Day	10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L
	pH (units)					
27	7.9	8.3	8.2	8.1	8.2	8.3
28	7.8	8.2	8.1	8.2	8.1	8.2
29	8.3	8.3	8.3	8.2	8.2	8.4
30	8.3	8.3	8.2	8.2	8.2	8.3
31	7.9	7.8	8.0	7.9	7.6	8.0
32						

DAY
31: CTL, CTL(10)
* 7.6, 7.9

Old Solutions

CTL	CTL	CTL	1718-0789	1718-0792	1718-0793
10 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L	20 ug/L
pH (units)					
27	7.9	7.9	7.9	8.0	8.0
28	8.0	7.9	7.9	7.9	8.2
29	7.9	7.9	7.7	7.9	8.2
30	7.9	7.9	7.8	7.9	8.2
31	7.9	7.5	7.4	7.6	7.9
32	8.0	7.9	7.6	7.8	7.9

Conductance (µS/cm)

27	484	399	423	1186	1164	967
28	508	404	432	1440	1173	967
29	417	407	405	1227	1034	1001
30	408	420	416	1308	1112	1008
31	523	448	413	1240	1022	994
32						

JAN
31: CTL CTL(10)
473 493

Conductance (µS/cm)

27	451	443	423	1391	1219	912
28	474	479	453	1482	1210	1024
29	484	441	448	1428	1187	993
30	491	456	463	1318	1211	1004
31	523	429	469	1276	1016	976
32	575	477	460	1398	1205	1000

Dissolved Oxygen (mg/L) (40-100% saturation)

27	7.2	7.2	7.2	7.2	7.2	7.2
28	7.0	7.3	7.3	7.2	7.2	7.2
29	7.2	7.3	7.4	6.7	7.0	7.0
30	7.1	7.1	7.1	7.1	7.1	7.1
31	7.3	7.3	7.3	7.1	7.1	7.2
32						

DAY 31:
CTL CTL(10)
7.3 7.3

Dissolved Oxygen (mg/L) (40-100% saturation)

27	6.1	6.0	6.0	6.0	6.0	6.0
28	5.8	5.9	5.8	5.8	5.3	5.3
29	4.8	4.8	4.9	5.1	5.2	5.3
30	5.6	5.6	5.4	5.6	5.7	5.7
31	6.8	5.3	5.2	5.3	5.7	5.6
32	6.5	5.7	5.8	5.7	5.7	5.7

Temperature (°C)

27	25	25	25	25	25	25
28	25	24	24	25	25	25
29	24	24	24	25	26	26
30	26	26	26	26	26	26
31	24	24	24	26	26	25
32						

CTL CTL(10)
24 24

Temperature (°C)

27	24	24	24	24	24	24
28	24	25	25	25	25	25
29	25	25	25	25	25	25
30	25	25	25	25	25	25
31	24	24	24	25	25	24
32	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: OP

Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 10 ug/L CTL 20 ug/L 1718-0789 20 ug/L
1718-0792 20 ug/L
1718-0793 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
CTL

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	8	N	1	11	N	1	8	N	1	10	N
2	11		2	11		2	11		2	10	
3	12		3	12		3	10		3	10	
4	11		4	10		4	11		4	10	
5	11		5	12		5	11		5	10	
6	11		6	11		6	11		6	12	
7	9		7	12		7	11		7	11	
8	10		8	10		8	12		8	10	
9	10		9	10		9	11		9	10	
10	9		10	10		10	10		10	11	
11	11		11	11		11	10		11	10	
12	10		12	12		12	11		12	10	
13	10		13	10		13	11		13	10	
14	12	N	14	11		14	11		14	10	
15	-	-	15	10		15	-	-	15	-	-

Comments

Conc.
CTL
10 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	7	N	1	7	ACS	1	13	N	1	12	N
2	7		2	12	N	2	10		2	10	
3	11		3	6		3	10		3	10	
4	10		4	12		4	11		4	11	
5	10		5	11		5	8		5	10	
6	12		6	10		6	9		6	10	
7	11		7	10		7	10		7	11	
8	11		8	11		8	11		8	11	
9	10		9	10		9	11		9	12	
10	10		10	9		10	12		10	13	
11	11		11	10		11	11		11	12	
12	9		12	11		12	10		12	11	
13	11		13	11		13	9		13	11	
14	11		14	-	-	14	10		14	11	
15	-	-	15	-	-	15	11		15	11	

Comments

Reviewed By: JP Date Reviewed: 2016/12/2

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
20 ug/L	1	10	N	1	10	N	1	10	N	1	9	N
	2	11		2	10		2	10		2	10	
	3	10		3	10		3	10		3	10	
	4	10		4	11		4	11		4	11	
	5	10		5	10		5	10		5	9	
	6	10		6	11		6	11		6	11	
	7	10		7	11		7	10		7	10	
	8	11		8	11		8	11		8	11	
	9	10		9	10		9	11		9	10	
	10	10		10	11		10	10		10	10	
	11	11		11	11		11	9		11	10	
	12	11		12	11		12	10		12	10	
	13	11		13	10		13	10		13	10	
	14	10		14	10		14	11		14	10	
	15	-		15	-		15	-		15	-	

Comments

Conc. CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1718-0789 20 ug/L	1	8	N	1	10	N	1	8	N	1	10	N
	2	10		2	10		2	11		2	11	
	3	11		3	10		3	11		3	10	
	4	10		4	10		4	12		4	10	
	5	10		5	10		5	11		5	11	
	6	10		6	10		6	11		6	11	
	7	10		7	10		7	11		7	11	
	8	9		8	11		8	11		8	10	
	9	10		9	10		9	-		9	11	
	10	9		10	10		10	-		10	11	
	11	10		11	11		11	-		11	11	
	12	10		12	10		12	-		12	11	
	13	10		13	-		13	-		13	-	
	14	10		14	-		14	-		14	-	
	15	-		15	-		15	-		15	-	

Comments
*we^{op} length not completed for rep D, fish 12

Reviewed By: JP Date Reviewed: 2008/04/02

Method FMD 32 Day ELS Client TEC164 Sample: CTL CTL 10 ug/L, CTL 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal			
1718-0792 20 ug/L	A	1	11	N	B	1	9	N	C	1	13	N	D	1	8	N			
		2	10			2	13			2	10			2	9		2	9	
		3	8			3	10			3	10			3	10		3	10	
		4	8			4	10			4	11			4	9		4	9	
		5	10			5	11			5	10			5	12		5	12	
		6	8			6	10			6	10			6	10		6	10	
		7	10			7	9			7	12			7	10		7	10	
		8	10			8	10			8	11			8	10		8	10	
		9	9			9	10			9	9			9	12		9	12	
		10	9			10	10			10	10			10	11		10	11	
		11	10			11	10			11	-			11	10		11	10	
		12	10			12	9			12	-			12	11		12	11	
		13	9			13	9			13	-			13	10		13	10	
		14	9			14	10			14	-			14	10		14	10	
		15	10			15	9			15	-			15	11		15	11	
Comments																			
1718-0793 20 ug/L	A	1	11	N	B	1	12	N	C	1	12	N	D	1	7	N			
		2	10			2	11			2	12			2	8		2	8	
		3	12			3	10			3	12			3	11		3	11	
		4	7			4	11			4	11			4	11		4	11	
		5	11			5	11			5	11			5	8		5	8	
		6	10			6	12			6	9			6	9		6	9	
		7	10			7	11			7	10			7	10		7	10	
		8	10			8	10			8	10			8	10		8	10	
		9	10			9	10			9	11			9	10		9	10	
		10	10			10	10			10	10			10	10		10	10	
		11	10			11	10			11	-			11	12		11	12	
		12	10			12	10			12	-			12	10		12	10	
		13	10			13	10			13	-			13	10		13	10	
		14	10			14	10			14	-			14	10		14	10	
		15	10			15	10			15	-			15	11		15	11	
Comments																			

Reviewed By: JP Date Reviewed: 2018/04/02

Method FMD 32 Day ELS Client TEC164 Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. #REP	Replicate #			Replicate #			Replicate #			Replicate #		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
	1			1			1			1		
	2			2			2			2		
	3			3			3			3		
	4			4			4			4		
	5			5			5			5		
	6			6			6			6		
	7			7			7			7		
	8			8			8			8		
	9			9			9			9		
	10			10			10			10		
	11			11			11			11		
	12			12			12			12		
	13			13			13			13		
	14			14			14			14		
	15			15			15			15		
Comments												

DP

Reviewed By: _____ Date Reviewed: _____

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client TEC164 Sample CTL, CTL 10 ug/L, CTL 20 ug/L
 Date of change 2018/03/20 Day of change 6
 1718-0789 20 ug/L
 1718-0792 20 ug/L
 1718-0793 20 ug/L

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789	1718-0792	1718-0793	-
A	1ml						
B	1						
C	1						
D	1						

Date of change 2018/03/08 Day of change 14

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789	1718-0792	1718-0793	-
A	1.5						
B	1.5						
C	1.5						
D	1.5						

Date of change _____ Day of change _____

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789	1718-0792	1718-0793	-
A							
B							
C							
D							

Date of change _____ Day of change _____

Volume (mL) of Artemia Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL	CTL 10 ug/L	CTL 20 ug/L	1718-0789	1718-0792	1718-0793	-
A							
B							
C							
D							

*Feeding volume is maintained following a feeding change until a new feeding regime is recorded

Reviewed By: _____ Date Reviewed: _____

Organism Weights Bench Sheet

TEC164
 Client ~~SUN104~~ U# 1718-0789, 0792, 0793 20ug/L
 Sample CTL, CTL 10ug/L, CTL 20ug/L Organism FM Batch 20180222FM

Initial weights due: 2018/03/26

Final weights due: 2018/03/31

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2018/03/16	SS	1
Final Weight (mg):	dried pan + organisms	2018/03/31	ST	1

* same balance must be used for initial and final weights
 * for FM/HA/CT, must use scale with 0.01 mg accuracy

Concentration

Replicate	CTL		CTL 10ug/L		CTL 20ug/L		1718-0789 20ug/L		1718-0792 20ug/L		1718-0793 20ug/L	
	Initial	Final	Initial	Final	Initial _{SS}	Final	Initial	Final	Initial	Final	Initial	Final
a	1002.35	1022.44	1027.13	1026.78	1021.84	1041.32	1013.99	1034.01	1008.49	1025.64	1016.05	1033.43
b	1020.38	1043.16	1028.21	1052.44	1026.69	1046.30	1019.04	1041.09	995.30	1018.36	1016.42	1037.89
c	1023.88	1047.77	1025.04	1051.35	1017.70	1039.59	1013.23	1035.95	1001.25	1025.27	1018.33	1039.17
d	1021.58	1053.08	1021.82	1048.70	1002.9	1024.01	1017.98	1041.68	1000.07	1023.68	1020.57	1045.28
e												

Concentration

Replicate	Initial		Final		Initial		Final		Initial		Final		Initial		Final	
a																
b																
c																
d																
e																

Balance Calibration Check:

	Initial	Final
first pan weighed:	CTC D	CTA
weight of first pan:	1021.59	1022.44
first pan after all other pans weighed:	1021.63	1022.46

Test Validity Met: Yes/No/NA

Results are Logical**: Yes/No

** no negative numbers, consistent values across replicates

% difference <5%: Yes/No Yes/No

$$\% \text{ difference} = \frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$$

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Reviewed By: STP Date Reviewed: 2018/04/02

CETIS Summary Report

Report Date: 24 Jul-18 09:48 (p 1 of 3)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h		
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

NOTES:

- reference locations are FR_UFR1, GH_ER2 and GH_FR1
- all sites and samples were spiked with 10µg/L Cu.
- samples FR_FRCP1, CM_MC2, GH_FR1 were spiked with 20µg/L Cu as well.
- statistics using control that was spiked w/ 10µg/L Cu

CETIS Summary Report

Report Date: 24 Jul-18 09:44 (p 1 of 2)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
FR_UFR1	4	0.85	0.7165	0.9835	0.7333	0.9333	0.04194	0.08389	9.87%	0.0%
GH_ER2	2	0.7333	0	1	0.4667	1	0.2667	0.3771	51.43%	13.73%
CM_MC1	4	0.95	0.897	1	0.9333	1	0.01667	0.03333	3.51%	-11.76%
FR_FRCP1	4	0.8476	0.6473	1	0.6667	0.9333	0.06293	0.1259	14.85%	0.28%
GH_FR1	4	0.8667	0.673	1	0.7333	1	0.06086	0.1217	14.04%	-1.96%
CM_MC2	4	0.9167	0.8151	1	0.8667	1	0.03191	0.06383	6.96%	-7.84%
FR_FRCP1 20µg	4	0.7833	0.5043	1	0.5333	0.9333	0.08767	0.1753	22.38%	7.84%
CM_MC2 20µg	4	0.9167	0.6515	1	0.6667	1	0.08333	0.1667	18.18%	-7.84%
GH_FR1 20µg	4	0.85	0.6148	1	0.6667	1	0.07391	0.1478	17.39%	0.0%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.7333	0.9333	0.8667	0.8667
GH_ER2	0.4667	1		
CM_MC1	1	0.9333	0.9333	0.9333
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
GH_FR1	0.9333	1	0.7333	0.8
CM_MC2	0.8667	0.8667	1	0.9333
FR_FRCP1 20µg	0.9333	0.8667	0.5333	0.8
CM_MC2 20µg	1	1	0.6667	1
GH_FR1 20µg	0.8	0.9333	0.6667	1

CETIS Summary Report

Report Date: 24 Jul-18 09:44 (p 2 of 2)
Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	11/15	14/15	13/15	13/15
GH_ER2	7/15	15/15		
CM_MC1	15/15	14/15	14/15	14/15
FR_FRCP1	14/15	12/14	14/15	10/15
GH_FR1	14/15	15/15	11/15	12/15
CM_MC2	13/15	13/15	15/15	14/15
FR_FRCP1 20µg	14/15	13/15	8/15	12/15
CM_MC2 20µg	15/15	15/15	10/15	15/15
GH_FR1 20µg	12/15	14/15	10/15	15/15

CETIS Summary Report

Report Date: 24 Jul-18 09:59 (p 1 of 2)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h		
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	1.538	1.297	1.779	1.339	1.699	0.07574	0.1515	9.85%	0.0%
Cu Ctrl 10µg/L	4	1.618	1.27	1.966	1.31	1.792	0.1094	0.2188	13.53%	-5.21%
Cu Ctrl 20µg/L	4	1.38	1.239	1.521	1.3	1.459	0.0443	0.0886	6.42%	10.23%
FR_UFR1	4	1.577	1.326	1.829	1.399	1.781	0.079	0.158	10.02%	-2.57%
GH_ER2	2	1.392	0.1676	2.616	1.295	1.488	0.09633	0.1362	9.79%	9.5%
CM_MC1	4	1.392	1.262	1.521	1.324	1.506	0.04062	0.08124	5.84%	9.51%
FR_FRCP1	4	1.542	1.293	1.79	1.319	1.683	0.0781	0.1562	10.13%	-0.26%
GH_FR1	4	1.566	1.478	1.654	1.495	1.627	0.02765	0.05529	3.53%	-1.85%
CM_MC2	4	1.589	1.53	1.649	1.54	1.63	0.01876	0.03752	2.36%	-3.36%
FR_FRCP1 20µg	4	1.477	1.308	1.645	1.335	1.587	0.05304	0.1061	7.18%	3.98%
CM_MC2 20µg	4	1.668	1.105	2.231	1.378	2.184	0.177	0.354	21.22%	-8.49%
GH_FR1 20µg	4	1.407	1.088	1.725	1.159	1.647	0.1001	0.2003	14.24%	8.52%

CETIS Summary Report

Report Date: 24 Jul-18 09:59 (p 2 of 2)
Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1.339	1.519	1.593	1.699
Cu Ctrl 10µg/L	1.31	1.615	1.754	1.792
Cu Ctrl 20µg/L	1.3	1.307	1.459	1.455
FR_UFR1	1.781	1.592	1.537	1.399
GH_ER2	1.295	1.488		
CM_MC1	1.506	1.391	1.345	1.324
FR_FRCP1	1.683	1.599	1.319	1.565
GH_FR1	1.627	1.559	1.495	1.585
CM_MC2	1.63	1.601	1.587	1.54
FR_FRCP1 20µg	1.335	1.47	1.515	1.587
CM_MC2 20µg	1.378	1.537	2.184	1.574
GH_FR1 20µg	1.159	1.431	1.389	1.647

CETIS Summary Report

Report Date: 24 Jul-18 09:37 (p 1 of 1)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
FR_UFR1	4	1.577	1.326	1.829	1.399	1.781	0.079	0.158	10.02%	0.0%
GH_ER2	2	1.392	0.1676	2.616	1.295	1.488	0.09633	0.1362	9.79%	11.76%
CM_MC1	4	1.392	1.262	1.521	1.324	1.506	0.04062	0.08124	5.84%	11.77%
FR_FRCP1	4	1.542	1.293	1.79	1.319	1.683	0.0781	0.1562	10.13%	2.25%
GH_FR1	4	1.566	1.478	1.654	1.495	1.627	0.02765	0.05529	3.53%	0.7%
CM_MC2	4	1.589	1.53	1.649	1.54	1.63	0.01876	0.03752	2.36%	-0.77%
FR_FRCP1 20µg	4	1.477	1.308	1.645	1.335	1.587	0.05304	0.1061	7.18%	6.38%
CM_MC2 20µg	4	1.668	1.105	2.231	1.378	2.184	0.177	0.354	21.22%	-5.78%
GH_FR1 20µg	4	1.407	1.088	1.725	1.159	1.647	0.1001	0.2003	14.24%	10.81%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1.781	1.592	1.537	1.399
GH_ER2	1.295	1.488		
CM_MC1	1.506	1.391	1.345	1.324
FR_FRCP1	1.683	1.599	1.319	1.565
GH_FR1	1.627	1.559	1.495	1.585
CM_MC2	1.63	1.601	1.587	1.54
FR_FRCP1 20µg	1.335	1.47	1.515	1.587
CM_MC2 20µg	1.378	1.537	2.184	1.574
GH_FR1 20µg	1.159	1.431	1.389	1.647

CETIS Summary Report

Report Date: 24 Jul-18 09:50 (p 1 of 2)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h		
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	10.49	9.976	10.99	10.14	10.8	0.1599	0.3198	3.05%	0.0%
Cu Ctrl 10µg/L	4	10.42	9.542	11.29	10	11.2	0.275	0.5501	5.28%	0.64%
Cu Ctrl 20µg/L	4	10.48	9.986	10.98	10.07	10.79	0.1561	0.3121	2.98%	0.02%
FR_UFR1	4	9.95	8.964	10.94	9.15	10.45	0.3099	0.6199	6.23%	5.1%
GH_ER2	2	11.31	-1.142	23.76	10.33	12.29	0.98	1.386	12.25%	-7.87%
CM_MC1	4	9.215	8.044	10.39	8.21	9.87	0.368	0.736	7.99%	12.11%
FR_FRCP1	4	10.41	9.416	11.4	9.57	10.93	0.3115	0.623	5.99%	0.74%
GH_FR1	4	10.06	9.865	10.25	9.93	10.21	0.06047	0.1209	1.2%	4.08%
CM_MC2	4	9.838	9.326	10.35	9.54	10.21	0.1607	0.3215	3.27%	6.18%
FR_FRCP1 20µg	4	10.48	9.457	11.5	9.79	11.25	0.3215	0.643	6.14%	0.05%
CM_MC2 20µg	4	10.07	9.348	10.78	9.53	10.6	0.2253	0.4505	4.48%	4.01%
GH_FR1 20µg	4	10.42	9.843	11	10	10.8	0.1821	0.3643	3.5%	0.6%

CETIS Summary Report

Report Date: 24 Jul-18 09:50 (p 2 of 2)
Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	10.29	10.8	10.71	10.14
Cu Ctrl 10µg/L	10.07	10	10.4	11.2
Cu Ctrl 20µg/L	10.43	10.79	10.64	10.07
FR_UFR1	10.45	10.43	9.77	9.15
GH_ER2			12.29	10.33
CM_MC1	9.87	9.64	9.14	8.21
FR_FRCP1	10.93	10.83	9.57	10.3
GH_FR1	10.21	9.93	10.09	10
CM_MC2	10	9.54	9.6	10.21
FR_FRCP1 20µg	9.79	10.15	11.25	10.73
CM_MC2 20µg	9.53	9.93	10.6	10.2
GH_FR1 20µg	10.25	10.64	10.8	10

CETIS Summary Report

Report Date: 04 Jun-18 16:11 (p 1 of 2)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 17-8919-3195 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h		
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Hatched Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
Cu Ctrl 10µg/L	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
Cu Ctrl 20µg/L	4	1	1	1	1	1	0	0	0.0%	-1.7%
FR_UFR1	4	1	1	1	1	1	0	0	0.0%	-1.7%
GH_ER2	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
CM_MC1	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
FR_FRCP1	4	1	1	1	1	1	0	0	0.0%	-1.7%
GH_FR1	4	1	1	1	1	1	0	0	0.0%	-1.7%
CM_MC2	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
FR_FRCP1 20µg	4	0.9333	0.8467	1	0.8667	1	0.02722	0.05443	5.83%	5.09%
CM_MC2 20µg	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
GH_FR1 20µg	4	0.9333	0.8108	1	0.8667	1	0.03849	0.07698	8.25%	5.09%

CETIS Summary Report

Report Date: 04 Jun-18 16:11 (p 2 of 2)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	0.9333
Cu Ctrl 10µg/L	1	0.9333	1	1
Cu Ctrl 20µg/L	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	1	0.9333	1	1
CM_MC1	1	0.9333	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	0.9333
FR_FRCP1 20µg	0.9333	0.9333	0.8667	1
CM_MC2 20µg	1	1	0.9333	1
GH_FR1 20µg	0.8667	1	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	15/15	15/15	14/15
Cu Ctrl 10µg/L	15/15	14/15	15/15	15/15
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15
FR_UFR1	15/15	15/15	15/15	15/15
GH_ER2	15/15	14/15	15/15	15/15
CM_MC1	15/15	14/15	15/15	15/15
FR_FRCP1	15/15	14/14	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	15/15	14/15
FR_FRCP1 20µg	14/15	14/15	13/15	15/15
CM_MC2 20µg	15/15	15/15	14/15	15/15
GH_FR1 20µg	13/15	15/15	13/15	15/15

CETIS Analytical Report

Report Date: 28 May-18 10:10 (p 3 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-8268-0465	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 28 May-18 10:09	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	03-3506-6061	22 Feb-18	22 Feb-18	15h	Teck Coal	Teck Coal Q1
Cu Ctrl 10µg/L	08-7607-2413	21 Feb-18	21 Feb-18	39h		Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	21 Feb-18	21 Feb-18	39h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	0.6603	1.0000	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20µg/L	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	57	3	60	0.95	0.05	0.0%
Cu Ctrl 10µg/L Negative Contr	57	3	60	0.95	0.05	0.0%
Cu Ctrl 20µg/L Dilution Water	56	4	60	0.9333	0.06667	1.75%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.9333	1	0.9333	0.9333
Cu Ctrl 10µg/L	0.9333	0.8667	1	1
Cu Ctrl 20µg/L	0.9333	0.9333	0.9333	0.9333

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	14/15	15/15	14/15	14/15
Cu Ctrl 10µg/L	14/15	13/15	15/15	15/15
Cu Ctrl 20µg/L	14/15	14/15	14/15	14/15

Fathead Minnow 32-d Survival and Growth Test

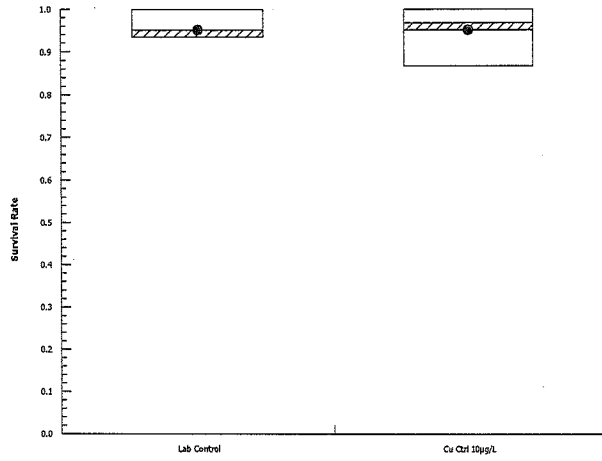
Nautilus Environmental

Analysis ID: 07-8268-0465
Analyzed: 28 May-18 10:09

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 28 May-18 10:10 (p 3 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-7028-6575	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 28 May-18 10:09	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	03-3506-6061	22 Feb-18	22 Feb-18	15h	Teck Coal	Teck Coal Q1
Cu Ctrl 10µg/L	08-7607-2413	21 Feb-18	21 Feb-18	39h		Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	21 Feb-18	21 Feb-18	39h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.2%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	-0.7001	2.18	0.25	6	0.8774	CDF	Non-Significant Effect
		Cu Ctrl 20µg/L	1.374	2.18	0.25	6	0.1669	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1167797	0.05838986	2	2.227	0.1638	Non-Significant Effect
Error	0.2360194	0.02622438	9			
Total	0.3527992		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.928	9.21	0.3813	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9312	0.8025	0.3935	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	1.538	1.297	1.779	1.556	1.339	1.699	0.07574	9.85%	0.0%
Cu Ctrl 10µg/L	4	1.618	1.27	1.966	1.685	1.31	1.792	0.1094	13.53%	-5.21%
Cu Ctrl 20µg/L	4	1.38	1.239	1.521	1.381	1.3	1.459	0.0443	6.42%	10.23%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1.339	1.519	1.593	1.699
Cu Ctrl 10µg/L	1.31	1.615	1.754	1.792
Cu Ctrl 20µg/L	1.3	1.307	1.459	1.455

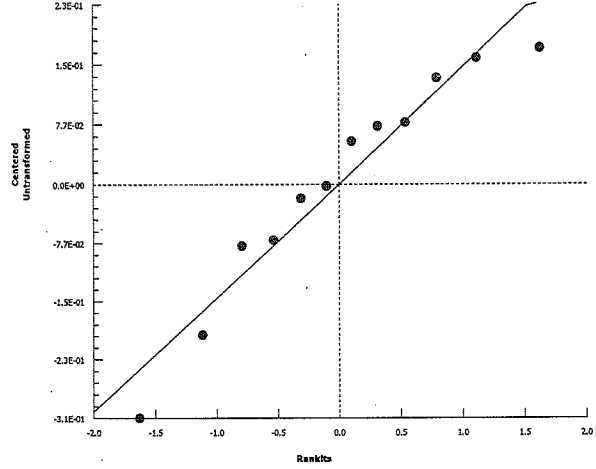
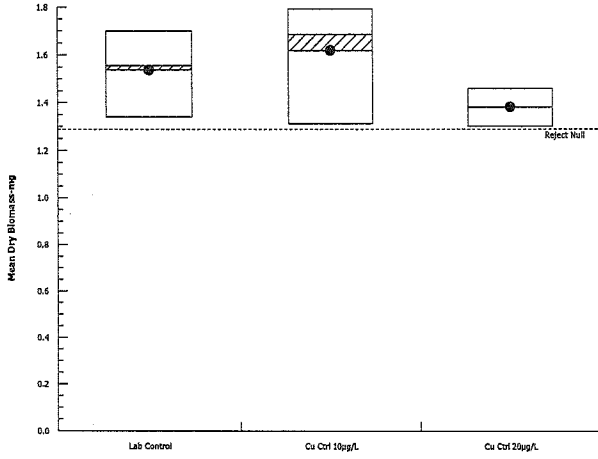
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-7028-6575 Endpoint: Mean Dry Biomass-mg
Analyzed: 28 May-18 10:09 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 28 May-18 10:10 (p 1 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-7627-1265	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 28 May-18 10:09	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	03-3506-6061	22 Feb-18	22 Feb-18	15h	Teck Coal	Teck Coal Q1
Cu Ctrl 10µg/L	08-7607-2413	21 Feb-18	21 Feb-18	39h		Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	21 Feb-18	21 Feb-18	39h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.02%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	0.2333	2.18	0.631	6	0.5721	CDF	Non-Significant Effect
		Cu Ctrl 20µg/L	0.008641	2.18	0.631	6	0.6633	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01171678	0.005858391	2	0.03499	0.9657	Non-Significant Effect
Error	1.50685	0.1674278	9			
Total	1.518567		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.156	9.21	0.5610	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9189	0.8025	0.2766	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	10.49	9.976	10.99	10.5	10.14	10.8	0.1599	3.05%	0.0%
Cu Ctrl 10µg/L	4	10.42	9.542	11.29	10.23	10	11.2	0.275	5.28%	0.64%
Cu Ctrl 20µg/L	4	10.48	9.986	10.98	10.53	10.07	10.79	0.1561	2.98%	0.02%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	10.29	10.8	10.71	10.14
Cu Ctrl 10µg/L	10.07	10	10.4	11.2
Cu Ctrl 20µg/L	10.43	10.79	10.64	10.07

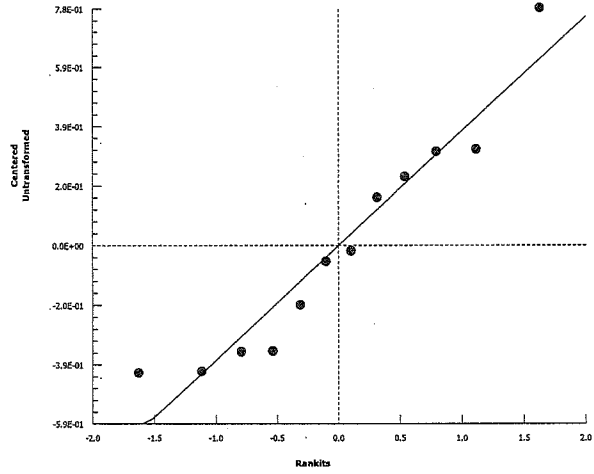
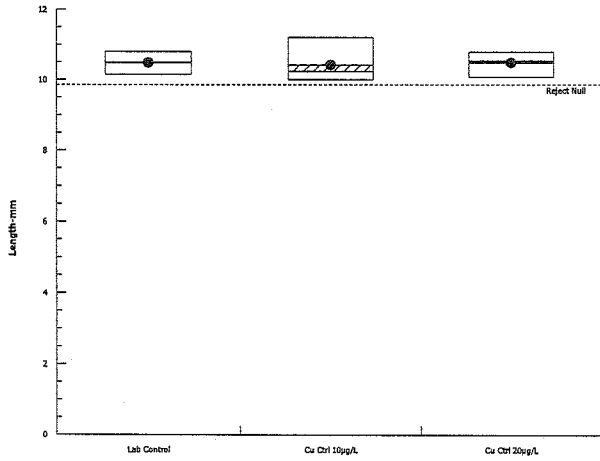
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-7627-1265 Endpoint: Length-mm
Analyzed: 28 May-18 10:09 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 28 May-18 10:10 (p 1 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-0649-2001	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 28 May-18 10:09	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	03-3506-6061	22 Feb-18	22 Feb-18	15h	Teck Coal	Teck Coal Q1
Cu Ctrl 10µg/L	08-7607-2413	21 Feb-18	21 Feb-18	39h		Teck Coal Q1 2018
Cu Ctrl 20µg/L	08-1415-0389	21 Feb-18	21 Feb-18	39h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	0.7521	1.0000	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20µg/L	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	59	1	60	0.9833	0.01667	0.0%
Cu Ctrl 10µg/L Negative Contr	59	1	60	0.9833	0.01667	0.0%
Cu Ctrl 20µg/L Dilution Water	60	0	60	1	0	-1.7%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	0.9333
Cu Ctrl 10µg/L	1	0.9333	1	1
Cu Ctrl 20µg/L	1	1	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	15/15	15/15	14/15
Cu Ctrl 10µg/L	15/15	14/15	15/15	15/15
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 28 May-18 10:10 (p 2 of 4)
Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

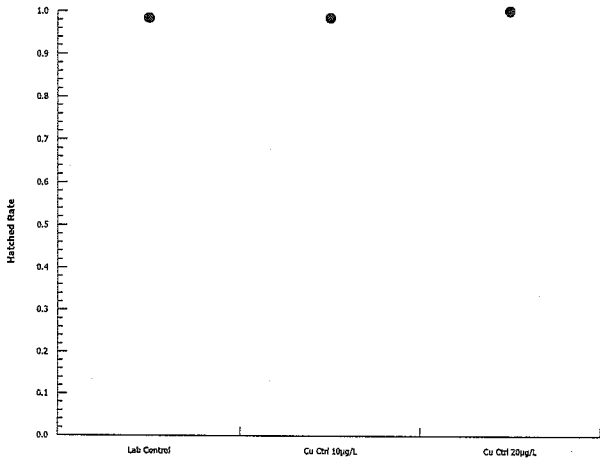
Nautilus Environmental

Analysis ID: 16-0649-2001
Analyzed: 28 May-18 10:09

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 1 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-2663-7289	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jun-18 10:09	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	0.06272	0.2509	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_ER2	0.005467	0.0328	Exact	Significant Effect
Cu Ctrl 10µg/L		CM_MC1	0.6603	0.6603	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		FR_FRCP1	0.05893	0.2946	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_FR1	0.1022	0.3065	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC2	0.3585	0.7170	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L Lab Water	57	3	60	0.95	0.05	0.0%
FR_UFR1	51	9	60	0.85	0.15	10.53%
GH_ER2	22	8	30	0.7333	0.2667	22.81%
CM_MC1	57	3	60	0.95	0.05	0.0%
FR_FRCP1	50	9	59	0.8475	0.1525	10.79%
GH_FR1	52	8	60	0.8667	0.1333	8.77%
CM_MC2	55	5	60	0.9167	0.08333	3.51%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	0.9333	0.8667	1	1
FR_UFR1	0.7333	0.9333	0.8667	0.8667
GH_ER2	0.4667	1		
CM_MC1	1	0.9333	0.9333	0.9333
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
GH_FR1	0.9333	1	0.7333	0.8
CM_MC2	0.8667	0.8667	1	0.9333

CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 2 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

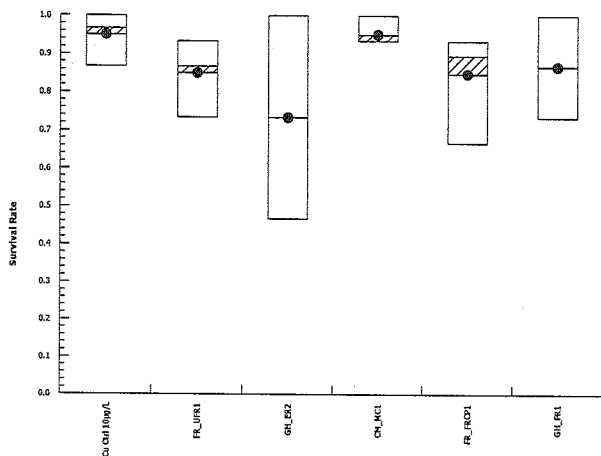
Analysis ID: 00-2663-7289 Endpoint: Survival Rate
 Analyzed: 08 Jun-18 10:09 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
 Official Results: Yes

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	11/15	14/15	13/15	13/15
GH_ER2	7/15	15/15		
CM_MC1	15/15	14/15	14/15	14/15
FR_FRCP1	14/15	12/14	14/15	10/15
GH_FR1	14/15	15/15	11/15	12/15
CM_MC2	13/15	13/15	15/15	14/15

Graphics



CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 1 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2713-2525	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Jun-18 10:09	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	14.6%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	0.4277	2.478	0.236	6	0.7246	CDF	Non-Significant Effect
		GH_ER2	1.942	2.478	0.289	4	0.1313	CDF	Non-Significant Effect
		CM_MC1	2.381	2.478	0.236	6	0.0602	CDF	Non-Significant Effect
		FR_FRCP1	0.8012	2.478	0.236	6	0.5590	CDF	Non-Significant Effect
		GH_FR1	0.5434	2.478	0.236	6	0.6761	CDF	Non-Significant Effect
		CM_MC2	0.2997	2.478	0.236	6	0.7739	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1738818	0.02898029	6	1.603	0.2007	Non-Significant Effect
Error	0.3434853	0.01807817	19			
Total	0.517367		25			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.621	16.81	0.1415	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9567	0.8912	0.3306	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	4	1.618	1.27	1.966	1.685	1.31	1.792	0.1094	13.53%	0.0%
FR_UFR1	4	1.577	1.326	1.829	1.564	1.399	1.781	0.079	10.02%	2.51%
GH_ER2	2	1.392	0.1676	2.616	1.392	1.295	1.488	0.09633	9.79%	13.98%
CM_MC1	4	1.392	1.262	1.521	1.368	1.324	1.506	0.04062	5.84%	13.99%
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	4.71%
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	3.19%
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	1.76%

CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 2 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

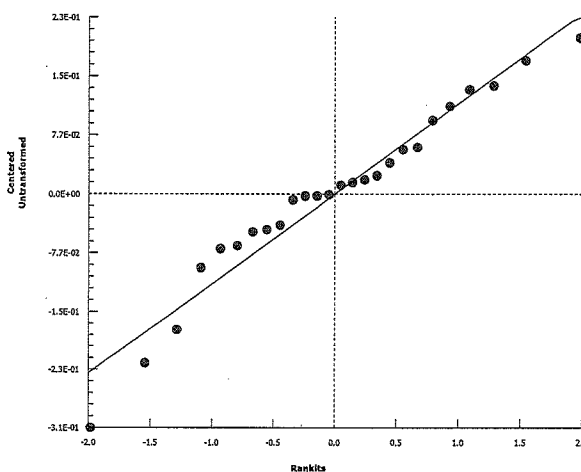
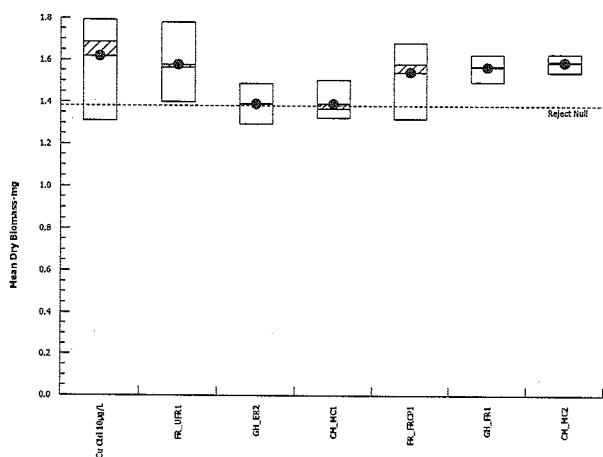
Analysis ID: 11-2713-2525 Endpoint: Mean Dry Biomass-mg
 Analyzed: 08 Jun-18 10:09 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	1.31	1.615	1.754	1.792
FR_UFR1	1.781	1.592	1.537	1.399
GH_ER2	1.295	1.488		
CM_MC1	1.506	1.391	1.345	1.324
FR_FRCP1	1.683	1.599	1.319	1.565
GH_FR1	1.627	1.559	1.495	1.585
CM_MC2	1.63	1.601	1.587	1.54

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:12 (p 1 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-8365-9489	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:12	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.3%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	1.08	2.478	1.073	6	0.4296	CDF	Non-Significant Effect
		GH_ER2	-1.683	2.478	1.314	4	0.9988	CDF	Non-Significant Effect
		CM_MC1	2.777	2.478	1.073	6	0.0277	CDF	Significant Effect
		FR_FRCP1	0.02309	2.478	1.073	6	0.8618	CDF	Non-Significant Effect
		GH_FR1	0.8314	2.478	1.073	6	0.5449	CDF	Non-Significant Effect
		CM_MC2	1.339	2.478	1.073	6	0.3181	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	7.207952	1.201325	6	3.204	0.0240	Significant Effect
Error	7.125001	0.3750001	19			
Total	14.33295		25			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.735	16.81	0.1363	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9668	0.8912	0.5426	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	4	10.42	9.542	11.29	10.23	10	11.2	0.275	5.28%	0.0%
FR_UFR1	4	9.95	8.964	10.94	10.1	9.15	10.45	0.3099	6.23%	4.49%
GH_ER2	2	11.31	-1.142	23.76	11.31	10.33	12.29	0.98	12.25%	-8.57%
CM_MC1	4	9.215	8.044	10.39	9.39	8.21	9.87	0.368	7.99%	11.54%
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	0.1%
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	3.46%
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	5.57%

CETIS Analytical Report

Report Date: 01 Jun-18 15:12 (p 2 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

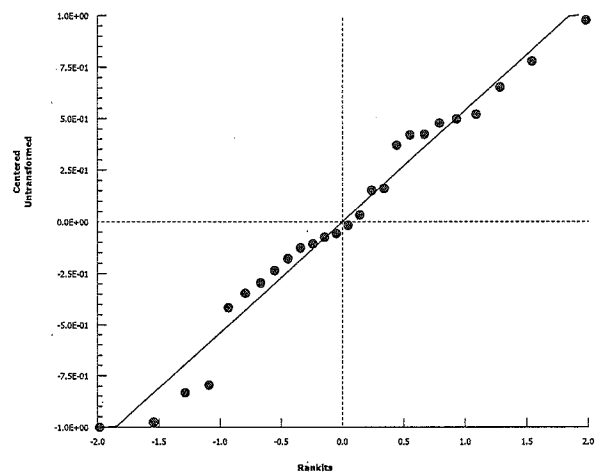
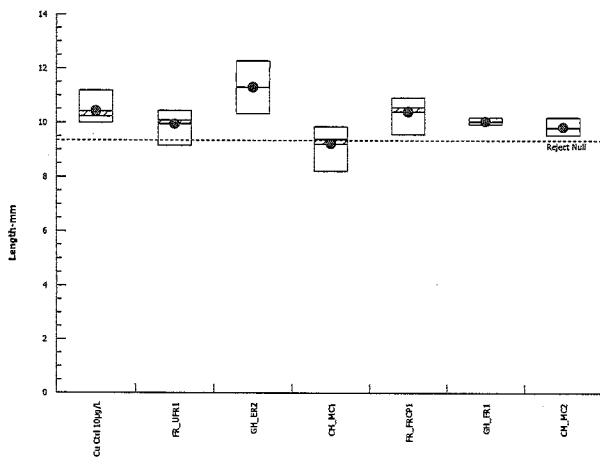
Analysis ID: 00-8365-9489 Endpoint: Length-mm
 Analyzed: 01 Jun-18 15:12 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	10.07	10	10.4	11.2
FR_UFR1	10.45	10.43	9.77	9.15
GH_ER2	12.29	10.33		
CM_MC1	9.87	9.64	9.14	8.21
FR_FRCP1	10.93	10.83	9.57	10.3
GH_FR1	10.21	9.93	10.09	10
CM_MC2	10	9.54	9.6	10.21

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:12 (p 1 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-9070-2666	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:12	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	08-7607-2413	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h		
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h		
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h		
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Control 10 µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_ER2	0.7521	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC1	0.7521	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC2	0.7521	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L Negative Contr	59	1	60	0.9833	0.01667	0.0%
FR_UFR1	60	0	60	1	0	-1.7%
GH_ER2	59	1	60	0.9833	0.01667	0.0%
CM_MC1	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1	59	0	59	1	0	-1.7%
GH_FR1	60	0	60	1	0	-1.7%
CM_MC2	59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	1	0.9333	1	1
FR_UFR1	1	1	1	1
GH_ER2	1	0.9333	1	1
CM_MC1	1	0.9333	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	0.9333

Fathead Minnow 32-d Survival and Growth Test

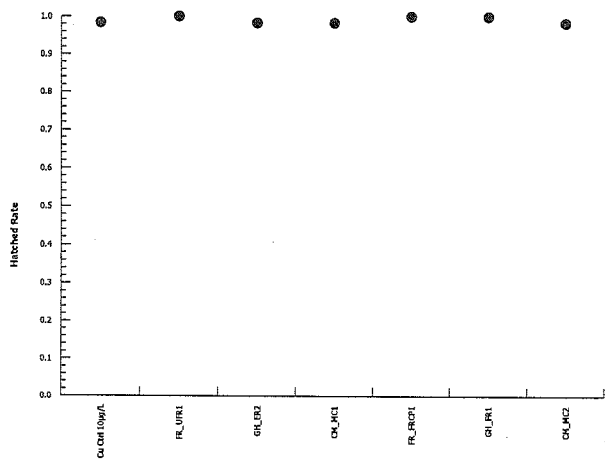
Nautilus Environmental

Analysis ID: 19-9070-2666 Endpoint: Hatched Rate CETIS Version: CETISv1.8.7
 Analyzed: 01 Jun-18 15:12 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	15/15	14/15	15/15	15/15
FR_UFR1	15/15	15/15	15/15	15/15
GH_ER2	15/15	14/15	15/15	15/15
CM_MC1	15/15	14/15	15/15	15/15
FR_FRCP1	15/15	14/14	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	15/15	14/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 11 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-8899-6328	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	0.5855	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	51	9	60	0.85	0.15	0.0%
FR_FRCP1	50	9	59	0.8475	0.1525	0.3%
CM_MC2	55	5	60	0.9167	0.08333	-7.84%
GH_FR1	52	8	60	0.8667	0.1333	-1.96%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.7333	0.9333	0.8667	0.8667
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
CM_MC2	0.8667	0.8667	1	0.9333
GH_FR1	0.9333	1	0.7333	0.8

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	11/15	14/15	13/15	13/15
FR_FRCP1	14/15	12/14	14/15	10/15
CM_MC2	13/15	13/15	15/15	14/15
GH_FR1	14/15	15/15	11/15	12/15

Fathead Minnow 32-d Survival and Growth Test

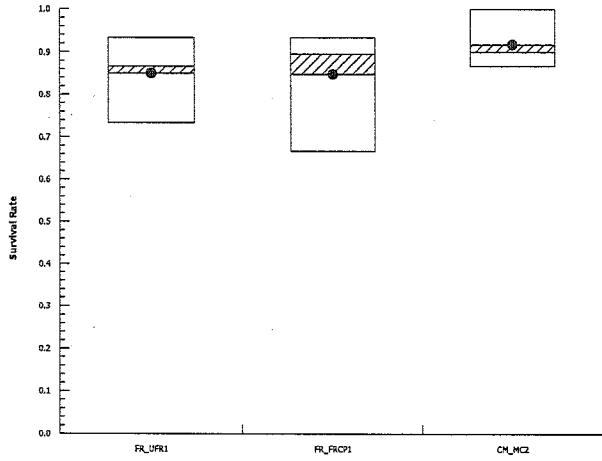
Nautilus Environmental

Analysis ID: 05-8899-6328
Analyzed: 01 Jun-18 16:31

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 11 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-5800-9236	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.9%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	0.4329	2.287	0.188	6	0.5752	CDF	Non-Significant Effect
		CM_MC2	-0.1483	2.287	0.188	6	0.7997	CDF	Non-Significant Effect
		GH_FR1	0.1341	2.287	0.188	6	0.6998	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.004941185	0.001647062	3	0.1224	0.9451	Non-Significant Effect
Error	0.1614861	0.01345718	12			
Total	0.1664273		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.655	11.34	0.0837	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9442	0.8408	0.4041	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	1.577	1.326	1.829	1.564	1.399	1.781	0.079	10.02%	0.0%
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	2.25%
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	-0.77%
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	0.7%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1.781	1.592	1.537	1.399
FR_FRCP1	1.683	1.599	1.319	1.565
CM_MC2	1.63	1.601	1.587	1.54
GH_FR1	1.627	1.559	1.495	1.585

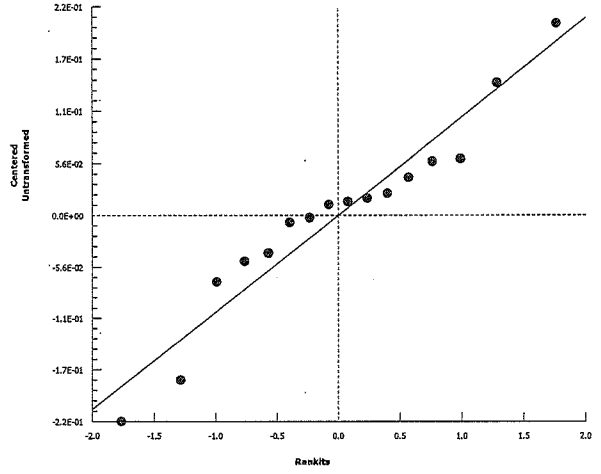
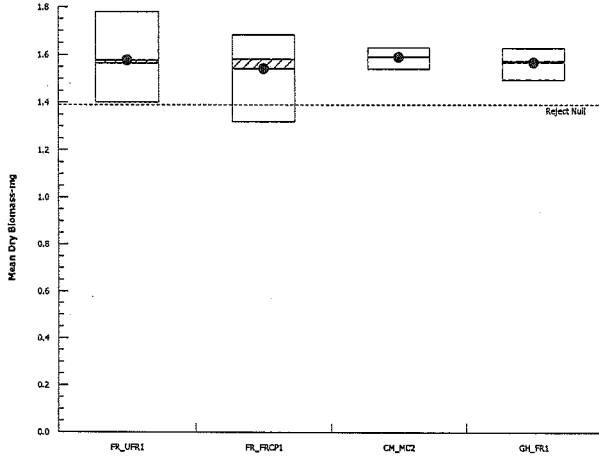
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-5800-9236 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 5 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-9395-8109	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.67%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	-1.371	2.287	0.763	6	0.9831	CDF	Non-Significant Effect
		CM_MC2	0.3372	2.287	0.763	6	0.6165	CDF	Non-Significant Effect
		GH_FR1	-0.3222	2.287	0.763	6	0.8494	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.7293186	0.2431062	3	1.092	0.3899	Non-Significant Effect
Error	2.671226	0.2226022	12			
Total	3.400545		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.29	11.34	0.0983	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9178	0.8408	0.1555	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	9.95	8.964	10.94	10.1	9.15	10.45	0.3099	6.23%	0.0%
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	-4.6%
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	1.13%
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	-1.08%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	10.45	10.43	9.77	9.15
FR_FRCP1	10.93	10.83	9.57	10.3
CM_MC2	10	9.54	9.6	10.21
GH_FR1	10.21	9.93	10.09	10

Analyst: *EMM* QA: *JOU June 4/18*

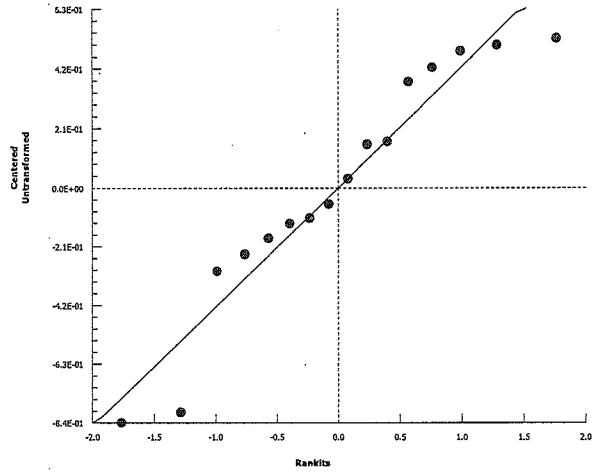
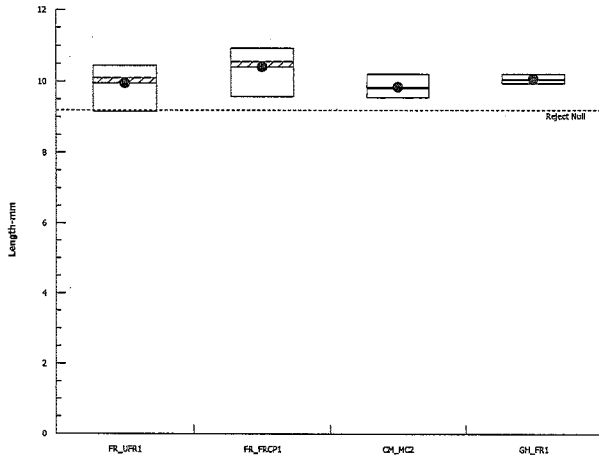
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-9395-8109 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 5 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 20-2987-4860	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4357-0013	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	60	0	60	1	0	0.0%
FR_FRCP1	59	0	59	1	0	0.0%
CM_MC2	59	1	60	0.9833	0.01667	1.67%
GH_FR1	60	0	60	1	0	0.0%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1	1	1	1
FR_FRCP1	1	1	1	1
CM_MC2	1	1	1	0.9333
GH_FR1	1	1	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	15/15	15/15	15/15	15/15
FR_FRCP1	15/15	14/14	15/15	15/15
CM_MC2	15/15	15/15	15/15	14/15
GH_FR1	15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 6 of 12)
Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

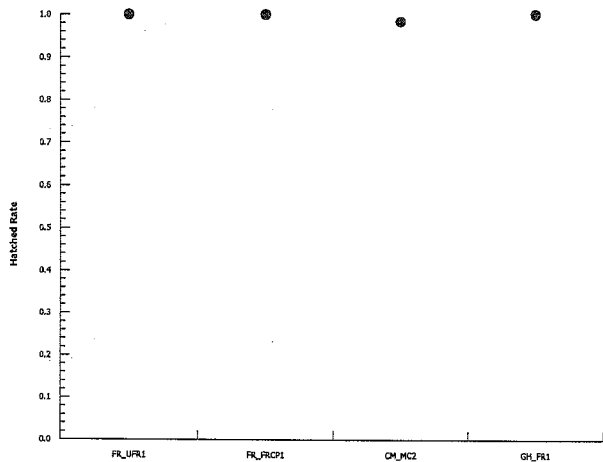
Nautilus Environmental

Analysis ID: 20-2987-4860
Analyzed: 01 Jun-18 16:31

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 3 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-6487-0494	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jun-18 10:13	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Negative Contr	22	8	30	0.7333	0.2667	0.0%
FR_FRCP1	50	9	59	0.8475	0.1525	-15.56%
GH_FR1	52	8	60	0.8667	0.1333	-18.18%
CM_MC2	55	5	60	0.9167	0.08333	-25.0%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.4667	1		
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
GH_FR1	0.9333	1	0.7333	0.8
CM_MC2	0.8667	0.8667	1	0.9333

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	7/15	15/15		
FR_FRCP1	14/15	12/14	14/15	10/15
GH_FR1	14/15	15/15	11/15	12/15
CM_MC2	13/15	13/15	15/15	14/15

Fathead Minnow 32-d Survival and Growth Test

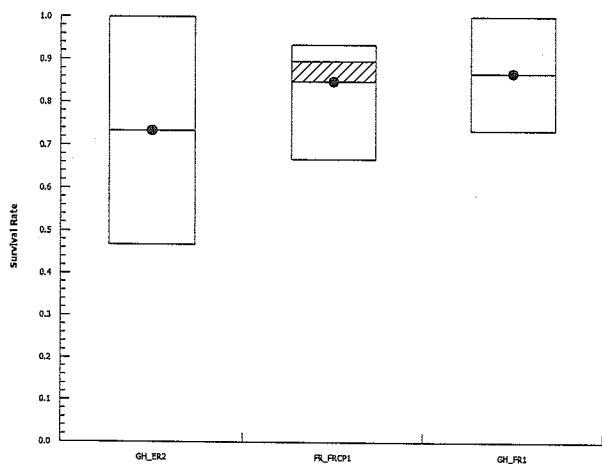
Nautilus Environmental

Analysis ID: 11-6487-0494
Analyzed: 08 Jun-18 10:13

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 3 of 4)
 Test Code: 180296-297(2rep | 19-7957-7956)

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-5943-5207	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Jun-18 10:14	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	14.5%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	-1.689	2.269	0.202	4	0.9847	CDF	Non-Significant Effect
		GH_FR1	-1.965	2.269	0.202	4	0.9914	CDF	Non-Significant Effect
		CM_MC2	-2.226	2.269	0.202	4	0.9950	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0564802	0.01882673	3	1.79	0.2125	Non-Significant Effect
Error	0.1051495	0.01051495	10			
Total	0.1616297		13			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	5.487	11.34	0.1394	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9407	0.8239	0.4271	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	2	1.392	0.1676	2.616	1.392	1.295	1.488	0.09633	9.79%	0.0%
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	-10.78%
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	-12.54%
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	-14.2%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1.295	1.488		
FR_FRCP1	1.683	1.599	1.319	1.565
GH_FR1	1.627	1.559	1.495	1.585
CM_MC2	1.63	1.601	1.587	1.54

CETIS Analytical Report

Report Date: 08 Jun-18 10:15 (p 4 of 4)
Test Code: 180296-297(2rep | 19-7957-7956)

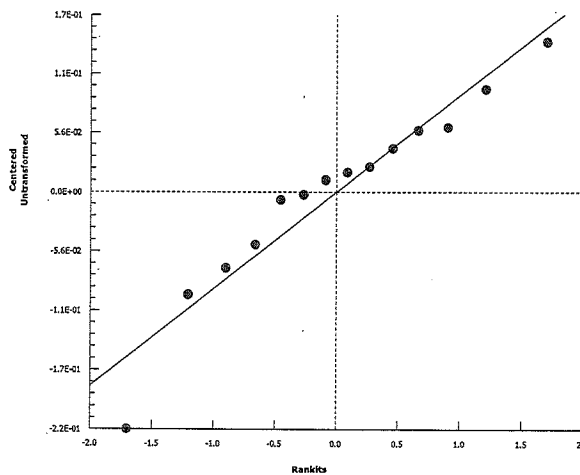
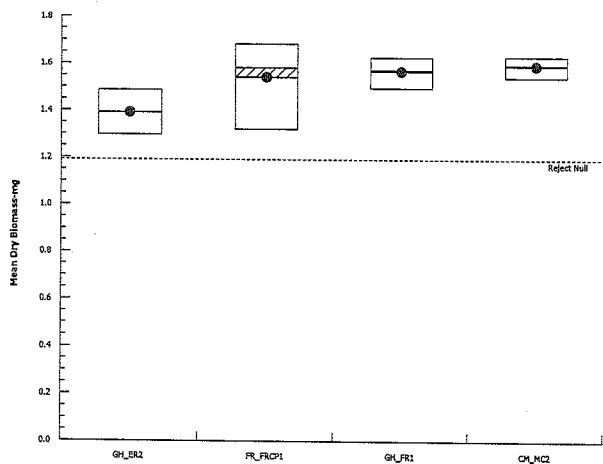
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-5943-5207 Endpoint: Mean Dry Biomass-mg
Analyzed: 08 Jun-18 10:14 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 1 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-4321-8345	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.2%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	1.777	2.269	1.153	4	0.1074	CDF	Non-Significant Effect
		CM_MC2	2.899	2.269	1.153	4	0.0179	CDF	Significant Effect
		GH_FR1	2.466	2.269	1.153	4	0.0364	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3.167496	1.055832	3	3.07	0.0777	Non-Significant Effect
Error	3.439226	0.3439226	10			
Total	6.606721		13			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.08	11.34	0.0282	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9679	0.8239	0.8473	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	2	11.31	-1.142	23.76	11.31	10.33	12.29	0.98	12.25%	0.0%
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	7.98%
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	13.02%
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	11.07%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	12.29	10.33		
FR_FRCP1	10.93	10.83	9.57	10.3
CM_MC2	10	9.54	9.6	10.21
GH_FR1	10.21	9.93	10.09	10

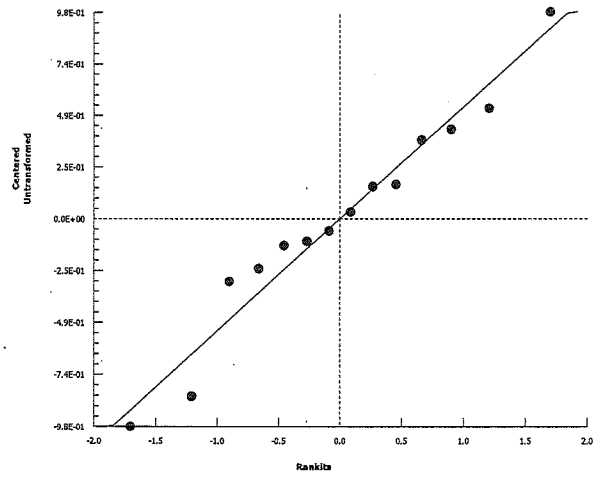
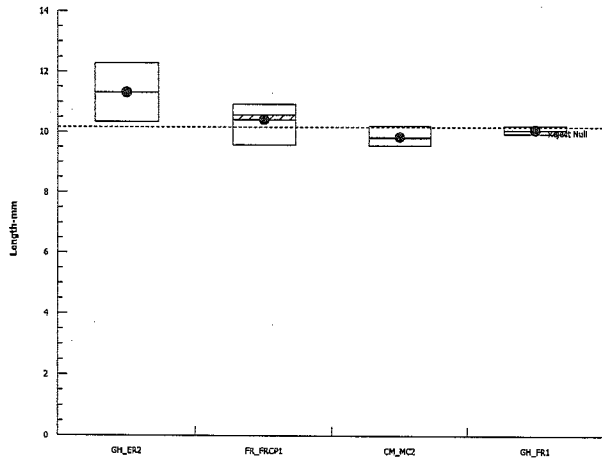
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-4321-8345 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 1 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-5392-2545	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	09-3923-5904	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.7521	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Negative Contr	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1	59	0	59	1	0	-1.7%
CM_MC2	59	1	60	0.9833	0.01667	0.0%
GH_FR1	60	0	60	1	0	-1.7%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1	0.9333	1	1
FR_FRCP1	1	1	1	1
CM_MC2	1	1	1	0.9333
GH_FR1	1	1	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	15/15	14/15	15/15	15/15
FR_FRCP1	15/15	14/14	15/15	15/15
CM_MC2	15/15	15/15	15/15	14/15
GH_FR1	15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 2 of 12)
Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

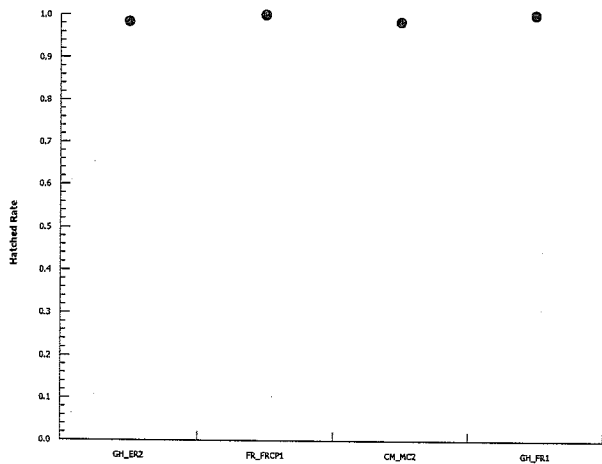
Nautilus Environmental

Analysis ID: 18-5392-2545
Analyzed: 01 Jun-18 16:31

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 9 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-3714-6128	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	0.05893	0.1768	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.3585	0.3585	Exact	Non-Significant Effect
CM_MC1		GH_FR1	0.1022	0.2043	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1 Unamended Sa	57	3	60	0.95	0.05	0.0%
FR_FRCP1	50	9	59	0.8475	0.1525	10.79%
CM_MC2	55	5	60	0.9167	0.08333	3.51%
GH_FR1	52	8	60	0.8667	0.1333	8.77%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	1	0.9333	0.9333	0.9333
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
CM_MC2	0.8667	0.8667	1	0.9333
GH_FR1	0.9333	1	0.7333	0.8

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	15/15	14/15	14/15	14/15
FR_FRCP1	14/15	12/14	14/15	10/15
CM_MC2	13/15	13/15	15/15	14/15
GH_FR1	14/15	15/15	11/15	12/15

Fathead Minnow 32-d Survival and Growth Test

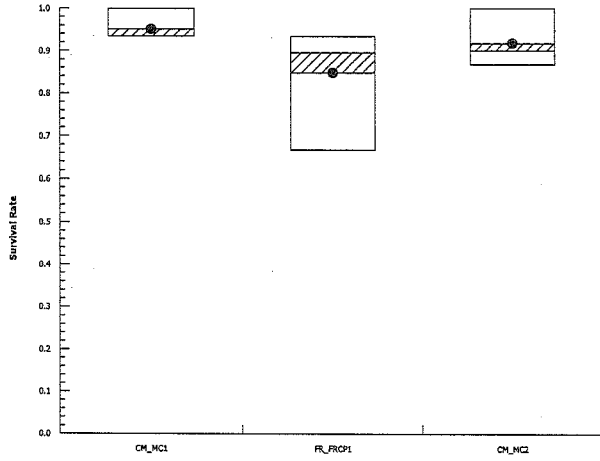
Nautilus Environmental

Analysis ID: 13-3714-6128
Analyzed: 01 Jun-18 16:31

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 9 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 13-3893-0107	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.9%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	-2.255	2.287	0.152	6	0.9980	CDF	Non-Significant Effect
		CM_MC2	-2.971	2.287	0.152	6	0.9997	CDF	Non-Significant Effect
		GH_FR1	-2.623	2.287	0.152	6	0.9992	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.09560261	0.03186753	3	3.594	0.0463	Significant Effect
Error	0.1063882	0.008865687	12			
Total	0.2019908		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	5.763	11.34	0.1237	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9333	0.8408	0.2752	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	4	1.392	1.262	1.521	1.368	1.324	1.506	0.04062	5.84%	0.0%
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	-10.79%
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	-14.22%
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	-12.55%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	1.506	1.391	1.345	1.324
FR_FRCP1	1.683	1.599	1.319	1.565
CM_MC2	1.63	1.601	1.587	1.54
GH_FR1	1.627	1.559	1.495	1.585

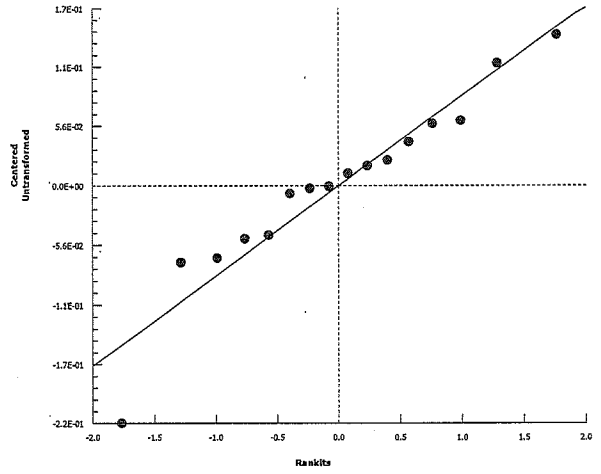
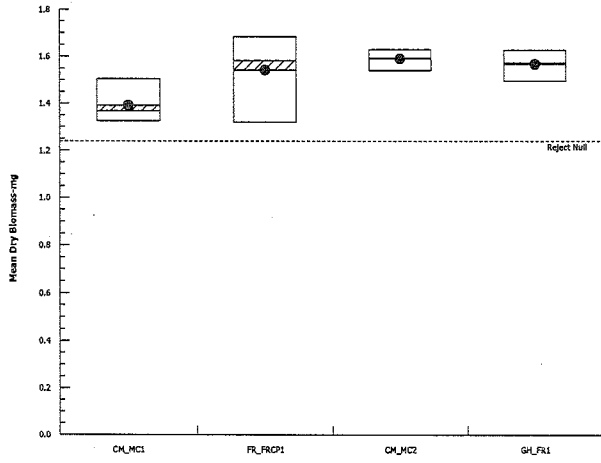
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-3893-0107 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 3 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 11-4182-3060	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.98%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	-3.295	2.287	0.828	6	0.9998	CDF	Non-Significant Effect
		CM_MC2	-1.72	2.287	0.828	6	0.9927	CDF	Non-Significant Effect
		GH_FR1	-2.328	2.287	0.828	6	0.9984	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3.015168	1.005056	3	3.836	0.0388	Significant Effect
Error	3.143726	0.2619771	12			
Total	6.158894		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.101	11.34	0.0687	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9321	0.8408	0.2636	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	4	9.215	8.044	10.39	9.39	8.21	9.87	0.368	7.99%	0.0%
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	-12.94%
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	-6.76%
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	-9.14%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	9.87	9.64	9.14	8.21
FR_FRCP1	10.93	10.83	9.57	10.3
CM_MC2	10	9.54	9.6	10.21
GH_FR1	10.21	9.93	10.09	10

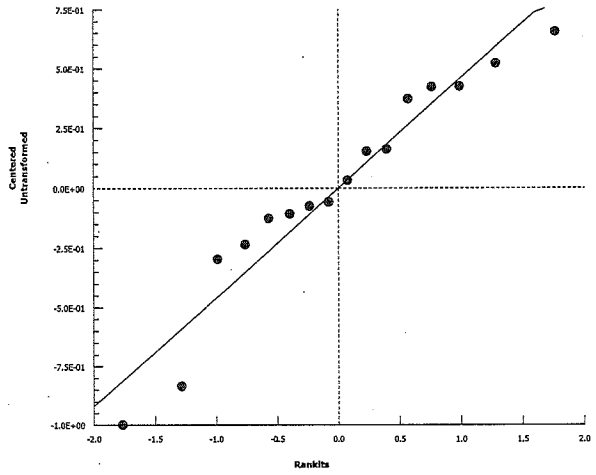
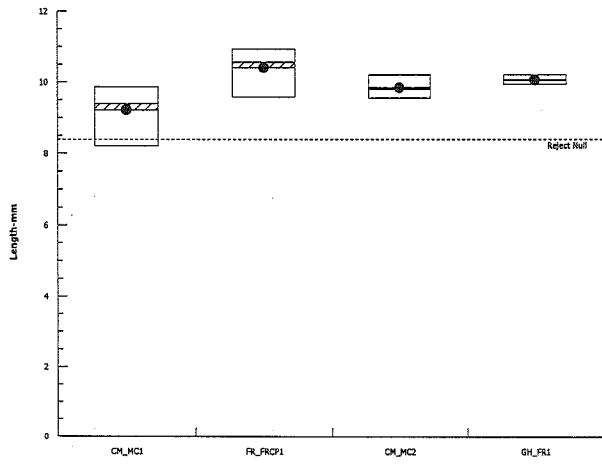
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-4182-3060 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 3 of 12)
 Test Code: 180296-297b | 06-9306-9393

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-0980-4052	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:31	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-7759-5425	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7858-2744	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h		
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h		
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
GH_FR1	Water Sample	Teck Coal	GH_FR1		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.7521	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1 Unamended Sa	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1	59	0	59	1	0	-1.7%
CM_MC2	59	1	60	0.9833	0.01667	0.0%
GH_FR1	60	0	60	1	0	-1.7%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	1	0.9333	1	1
FR_FRCP1	1	1	1	1
CM_MC2	1	1	1	0.9333
GH_FR1	1	1	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	15/15	14/15	15/15	15/15
FR_FRCP1	15/15	14/14	15/15	15/15
CM_MC2	15/15	15/15	15/15	14/15
GH_FR1	15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 01 Jun-18 16:32 (p 4 of 12)
Test Code: 180296-297b | 06-9306-9393

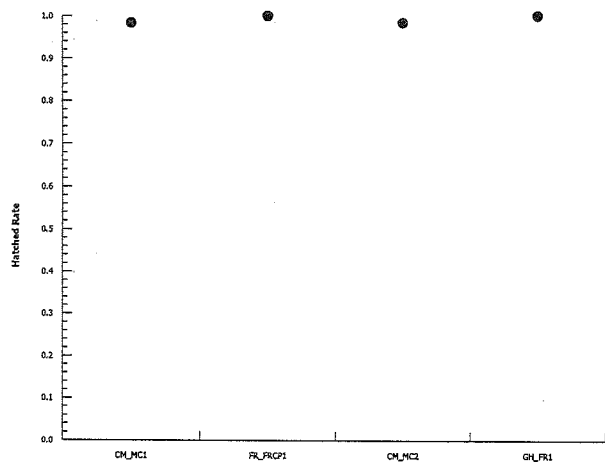
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-0980-4052 Endpoint: Hatched Rate
Analyzed: 01 Jun-18 16:31 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:27 (p 3 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-7904-2254	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:24	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	0.01694	0.0508	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	0.1197	0.2394	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	56	4	60	0.9333	0.06667	0.0%
FR_FRCP1 20µg	47	13	60	0.7833	0.2167	16.07%
CM_MC2 20µg	55	1	56	0.9821	0.01786	-5.23%
GH_FR1 20µg	51	9	60	0.85	0.15	8.93%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	0.9333	0.9333	0.9333	0.9333
FR_FRCP1 20µg	0.9333	0.8667	0.5333	0.8
CM_MC2 20µg	1	1	0.9091	1
GH_FR1 20µg	0.8	0.9333	0.6667	1

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	14/15	14/15	14/15	14/15
FR_FRCP1 20µg	14/15	13/15	8/15	12/15
CM_MC2 20µg	15/15	15/15	10/11	15/15
GH_FR1 20µg	12/15	14/15	10/15	15/15

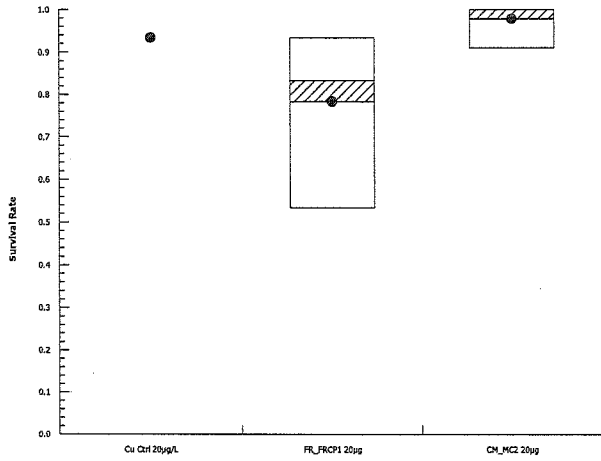
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-7904-2254 Endpoint: Survival Rate
Analyzed: 01 Jun-18 15:24 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:27 (p 3 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-1597-8376	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:24	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	25.2%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	-0.6332	2.287	0.347	6	0.9152	CDF	Non-Significant Effect
		CM_MC2 20µg	-1.896	2.287	0.347	6	0.9953	CDF	Non-Significant Effect
		GH_FR1 20µg	-0.1734	2.287	0.347	6	0.8075	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2028957	0.06763189	3	1.466	0.2731	Non-Significant Effect
Error	0.5535226	0.04612689	12			
Total	0.7564183		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.118	11.34	0.1060	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9229	0.8408	0.1878	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	4	1.38	1.239	1.521	1.381	1.3	1.459	0.0443	6.42%	0.0%
FR_FRCP1 20µg	4	1.477	1.308	1.645	1.492	1.335	1.587	0.05304	7.18%	-6.97%
CM_MC2 20µg	4	1.668	1.105	2.231	1.556	1.378	2.184	0.177	21.22%	-20.86%
GH_FR1 20µg	4	1.407	1.088	1.725	1.41	1.159	1.647	0.1001	14.24%	-1.91%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	1.3	1.307	1.459	1.455
FR_FRCP1 20µg	1.335	1.47	1.515	1.587
CM_MC2 20µg	1.378	1.537	2.184	1.574
GH_FR1 20µg	1.159	1.431	1.389	1.647

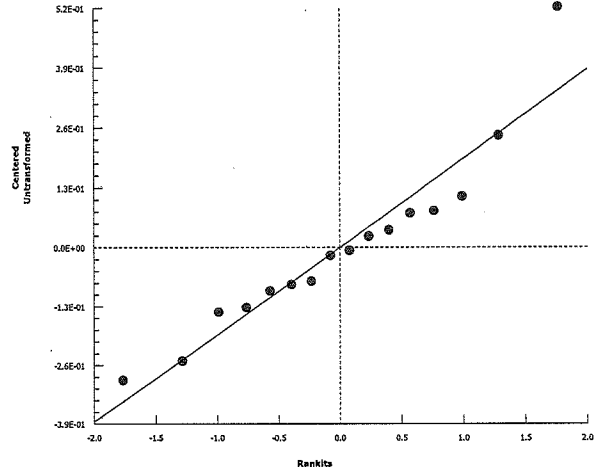
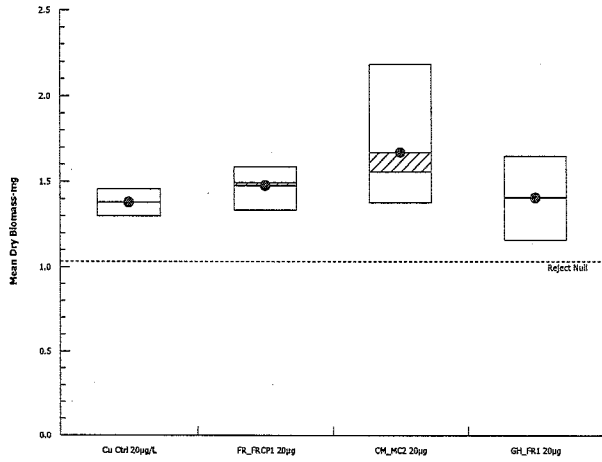
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-1597-8376 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 15:24 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:27 (p 1 of 4)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4660-7886	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:25	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.1%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	0.007686	2.287	0.744	6	0.7473	CDF	Non-Significant Effect
		CM_MC2 20µg	1.283	2.287	0.744	6	0.2359	CDF	Non-Significant Effect
		GH_FR1 20µg	0.1844	2.287	0.744	6	0.6799	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.4812498	0.1604166	3	0.758	0.5389	Non-Significant Effect
Error	2.539651	0.2116376	12			
Total	3.020901		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.619	11.34	0.6550	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9777	0.8408	0.9426	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	4	10.48	9.986	10.98	10.53	10.07	10.79	0.1561	2.98%	0.0%
FR_FRCP1 20µg	4	10.48	9.457	11.5	10.44	9.79	11.25	0.3215	6.14%	0.02%
CM_MC2 20µg	4	10.07	9.348	10.78	10.07	9.53	10.6	0.2253	4.48%	3.98%
GH_FR1 20µg	4	10.42	9.843	11	10.44	10	10.8	0.1821	3.5%	0.57%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	10.43	10.79	10.64	10.07
FR_FRCP1 20µg	9.79	10.15	11.25	10.73
CM_MC2 20µg	9.53	9.93	10.6	10.2
GH_FR1 20µg	10.25	10.64	10.8	10

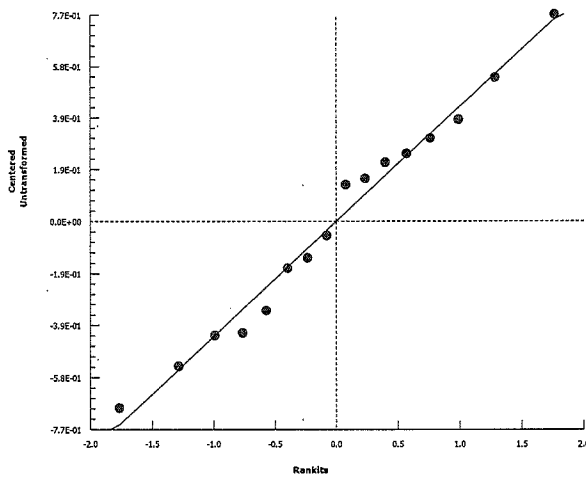
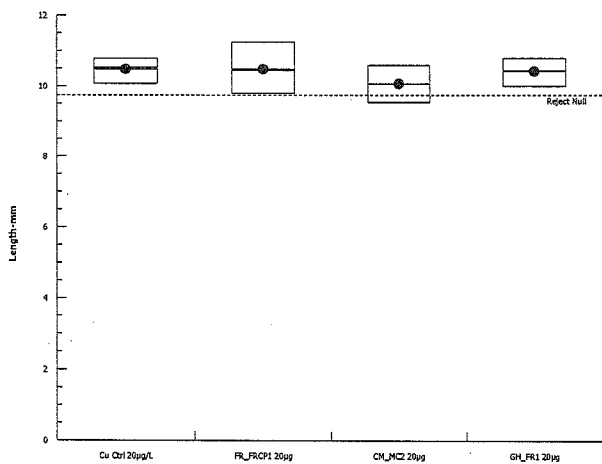
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4660-7886 Endpoint: Length-mm
Analyzed: 01 Jun-18 15:25 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 04 Jun-18 16:16 (p 1 of 2)
 Test Code: 180296-297 | 14-3412-1712

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-4683-5610	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 04 Jun-18 16:04	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 17-8919-3195	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	08-1415-0389	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Control 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	0.05936	0.1781	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	0.5	0.5000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	0.05936	0.1781	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	60	0	60	1	0	0.0%
FR_FRCP1 20µg	56	4	60	0.9333	0.06667	6.67%
CM_MC2 20µg	59	1	60	0.9833	0.01667	1.67%
GH_FR1 20µg	56	4	60	0.9333	0.06667	6.67%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	1	1	1	1
FR_FRCP1 20µg	0.9333	0.9333	0.8667	1
CM_MC2 20µg	1	1	0.9333	1
GH_FR1 20µg	0.8667	1	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15
FR_FRCP1 20µg	14/15	14/15	13/15	15/15
CM_MC2 20µg	15/15	15/15	14/15	15/15
GH_FR1 20µg	13/15	15/15	13/15	15/15

CETIS Analytical Report

Report Date: 04 Jun-18 16:16 (p 2 of 2)
Test Code: 180296-297 | 14-3412-1712

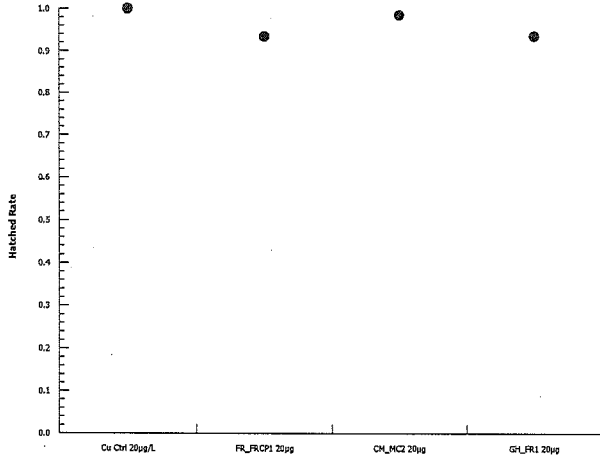
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-4683-5610 Endpoint: Hatched Rate
Analyzed: 04 Jun-18 16:04 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 4 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-3832-0576	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:04	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	50	9	59	0.8475	0.1525	0.0%
FR_FRCP1 20µg	47	13	60	0.7833	0.2167	7.57%

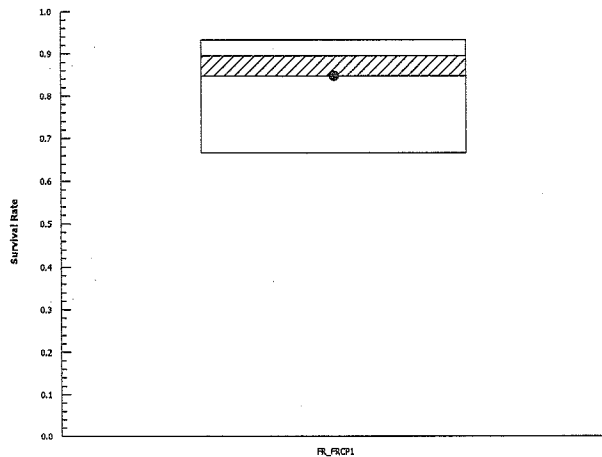
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
FR_FRCP1 20µg	0.9333	0.8667	0.5333	0.8

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	14/15	12/14	14/15	10/15
FR_FRCP1 20µg	14/15	13/15	8/15	12/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 7 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-5991-5831	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:05	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	11.9%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	-0.6902	1.943	0.183	6	0.7421	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.008490021	0.008490021	1	0.4763	0.5159	Non-Significant Effect
Error	0.1069463	0.01782438	6			
Total	0.1154363		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.169	47.47	0.5413	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9079	0.6451	0.3393	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	0.0%
FR_FRCP1 20µg	4	1.477	1.308	1.645	1.492	1.335	1.587	0.05304	7.18%	4.23%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1.683	1.599	1.319	1.565
FR_FRCP1 20µg	1.335	1.47	1.515	1.587

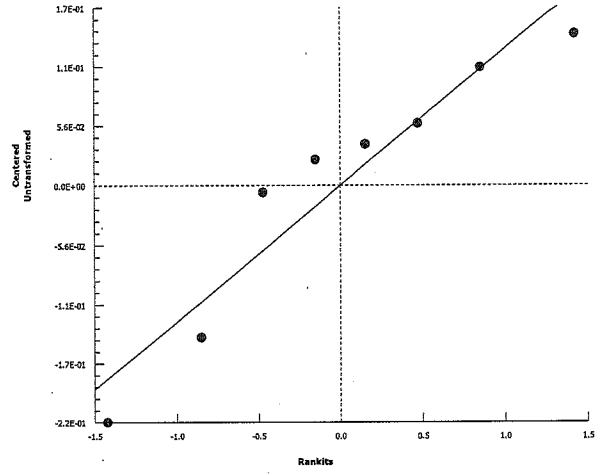
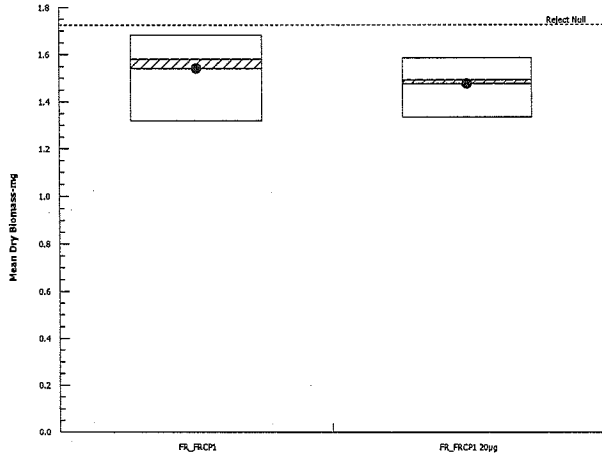
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-5991-5831 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:05 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 3 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-7619-6542	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:05	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	8.36%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	0.1619	1.943	0.87	6	0.4383	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01051243	0.01051243	1	0.02623	0.8767	Non-Significant Effect
Error	2.404876	0.4008126	6			
Total	2.415388		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.065	47.47	0.9598	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9458	0.6451	0.6684	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	0.0%
FR_FRCP1 20µg	4	10.48	9.457	11.5	10.44	9.79	11.25	0.3215	6.14%	-0.7%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	10.93	10.83	9.57	10.3
FR_FRCP1 20µg	9.79	10.15	11.25	10.73

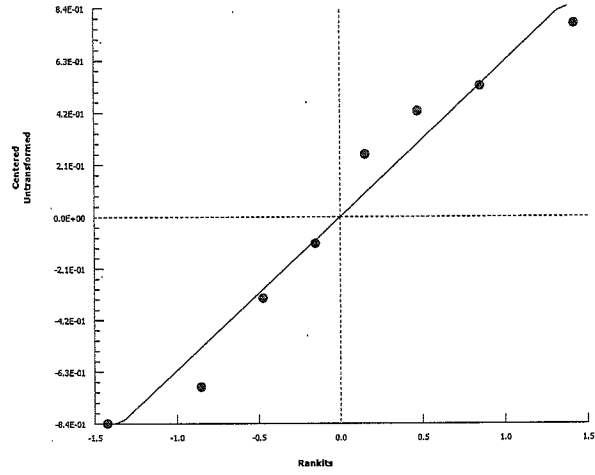
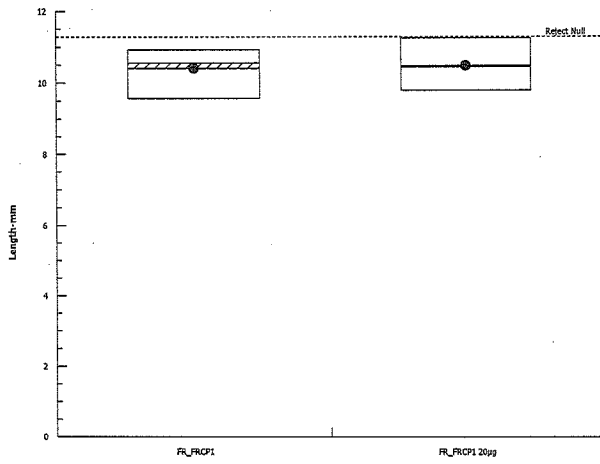
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-7619-6542 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:05 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 2 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-1484-1388	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:05	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	59	0	59	1	0	0.0%
FR_FRCP1 20µg	56	4	60	0.9333	0.06667	6.67%

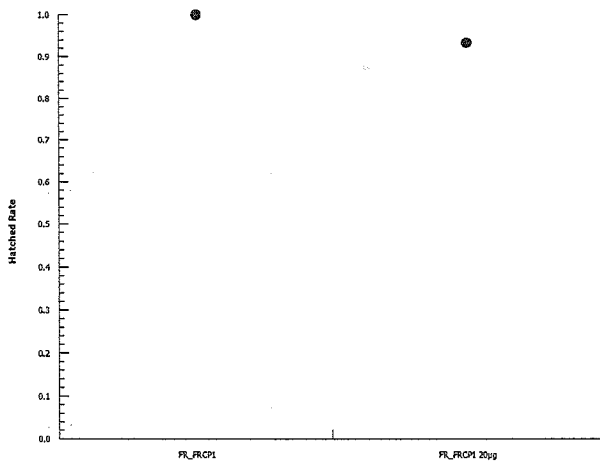
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1	1	1	1
FR_FRCP1 20µg	0.9333	0.9333	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	15/15	14/14	15/15	15/15
FR_FRCP1 20µg	14/15	14/15	13/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 3 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-7294-5736	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:04	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	0.2535	0.2535	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	50	9	59	0.8475	0.1525	0.0%
FR_FRCP1 20µg	47	13	60	0.7833	0.2167	7.57%

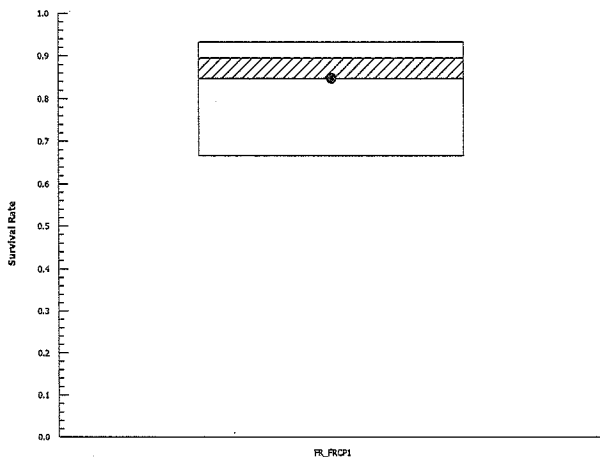
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.9333	0.8571	0.9333	0.6667
FR_FRCP1 20µg	0.9333	0.8667	0.5333	0.8

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	14/15	12/14	14/15	10/15
FR_FRCP1 20µg	14/15	13/15	8/15	12/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 5 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-8262-1046	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:04	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.9%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	0.6902	1.943	0.183	6	0.2579	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.008490021	0.008490021	1	0.4763	0.5159	Non-Significant Effect
Error	0.1069463	0.01782438	6			
Total	0.1154363		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.169	47.47	0.5413	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9079	0.6451	0.3393	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	1.542	1.293	1.79	1.582	1.319	1.683	0.0781	10.13%	0.0%
FR_FRCP1 20µg	4	1.477	1.308	1.645	1.492	1.335	1.587	0.05304	7.18%	4.23%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1.683	1.599	1.319	1.565
FR_FRCP1 20µg	1.335	1.47	1.515	1.587

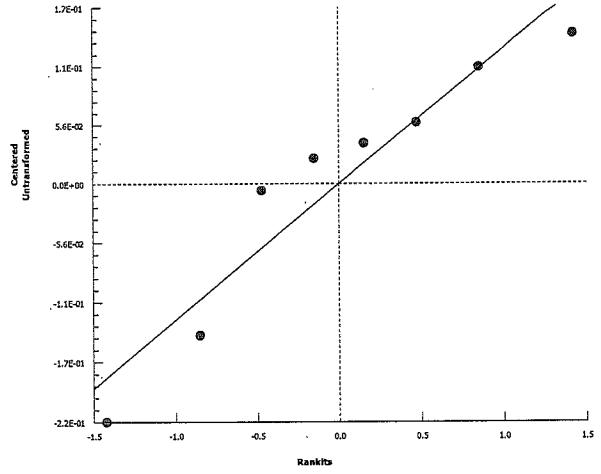
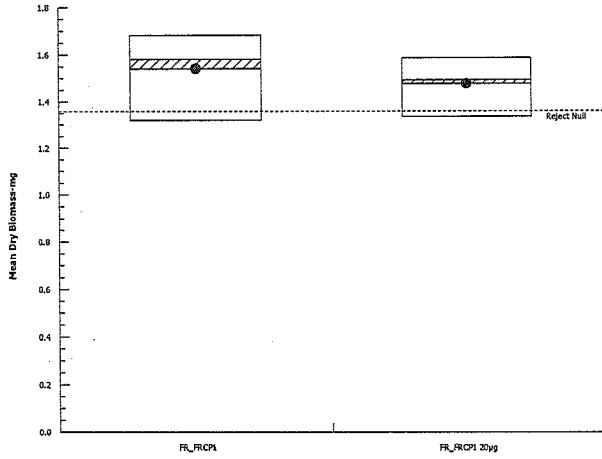
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-8262-1046 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:04 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 1 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-2436-9317	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:04	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.36%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	-0.1619	1.943	0.87	6	0.5617	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01051243	0.01051243	1	0.02623	0.8767	Non-Significant Effect
Error	2.404876	0.4008126	6			
Total	2.415388		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.065	47.47	0.9598	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9458	0.6451	0.6684	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	10.41	9.416	11.4	10.57	9.57	10.93	0.3115	5.99%	0.0%
FR_FRCP1 20µg	4	10.48	9.457	11.5	10.44	9.79	11.25	0.3215	6.14%	-0.7%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	10.93	10.83	9.57	10.3
FR_FRCP1 20µg	9.79	10.15	11.25	10.73

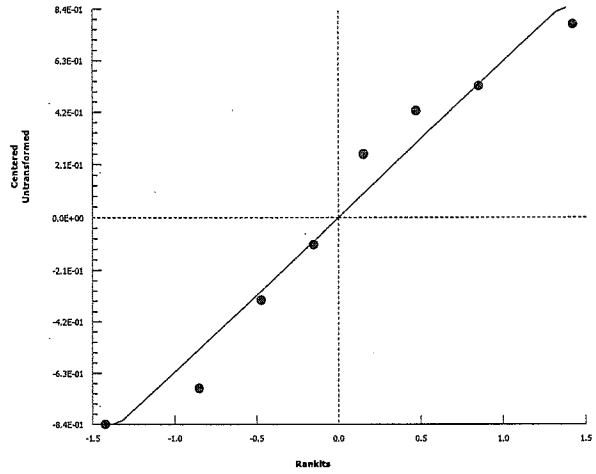
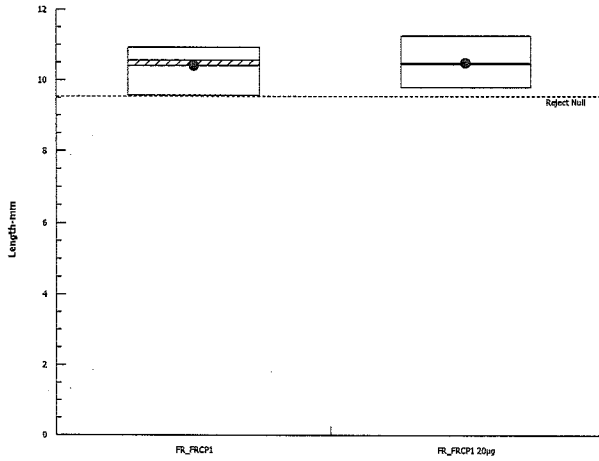
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-2436-9317 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:04 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:05 (p 1 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-9567-2656	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:04	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	01-2151-0223	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
FR_FRCP1 20µg	00-9616-7269	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_FRCP1		FR_FRCP1 20µg	0.06141	0.0614	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	59	0	59	1	0	0.0%
FR_FRCP1 20µg	56	4	60	0.9333	0.06667	6.67%

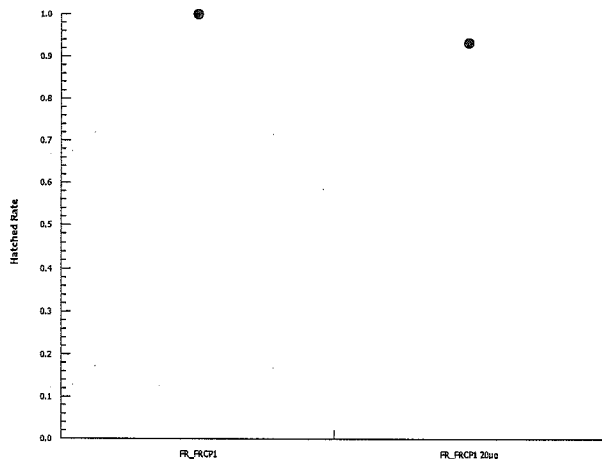
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1	1	1	1
FR_FRCP1 20µg	0.9333	0.9333	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	15/15	14/14	15/15	15/15
FR_FRCP1 20µg	14/15	14/15	13/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 3 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-1849-7525	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1 Upstream Contr	52	8	60	0.8667	0.1333	0.0%
GH_FR1 20µg	51	9	60	0.85	0.15	1.92%

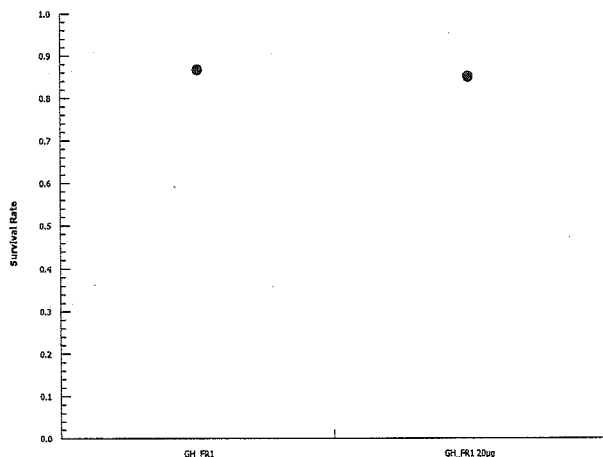
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.9333	1	0.7333	0.8
GH_FR1 20µg	0.8	0.9333	0.6667	1

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	14/15	15/15	11/15	12/15
GH_FR1 20µg	12/15	14/15	10/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 5 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-8503-5146	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.9%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	1.535	1.943	0.202	6	0.0878	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05087797	0.05087797	1	2.357	0.1756	Non-Significant Effect
Error	0.129504	0.021584	6			
Total	0.180382		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	13.12	47.47	0.0626	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9258	0.6451	0.4782	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	0.0%
GH_FR1 20µg	4	1.407	1.088	1.725	1.41	1.159	1.647	0.1001	14.24%	10.18%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1.627	1.559	1.495	1.585
GH_FR1 20µg	1.159	1.431	1.389	1.647

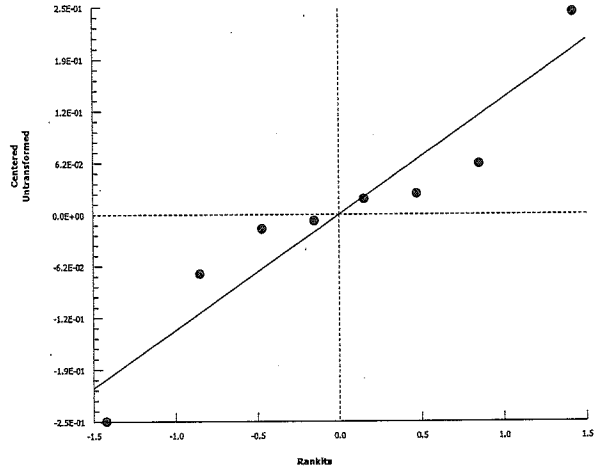
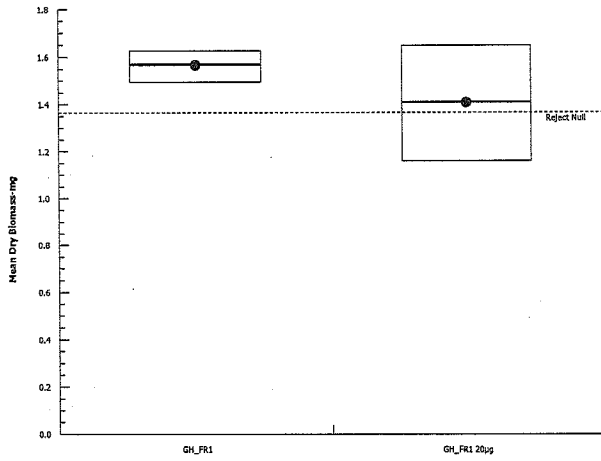
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-8503-5146 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:11 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 1 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-0475-4509	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	3.71%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	-1.902	1.943	0.373	6	0.9471	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.26645	0.26645	1	3.617	0.1059	Non-Significant Effect
Error	0.4419502	0.07365837	6			
Total	0.7084002		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	9.073	47.47	0.1030	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9902	0.6451	0.9953	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	0.0%
GH_FR1 20µg	4	10.42	9.843	11	10.44	10	10.8	0.1821	3.5%	-3.63%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10.21	9.93	10.09	10
GH_FR1 20µg	10.25	10.64	10.8	10

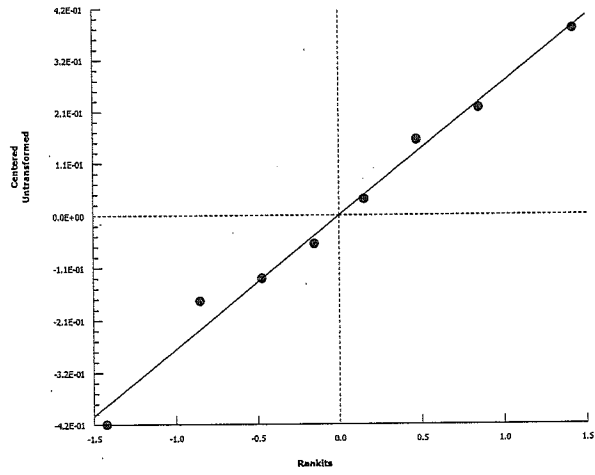
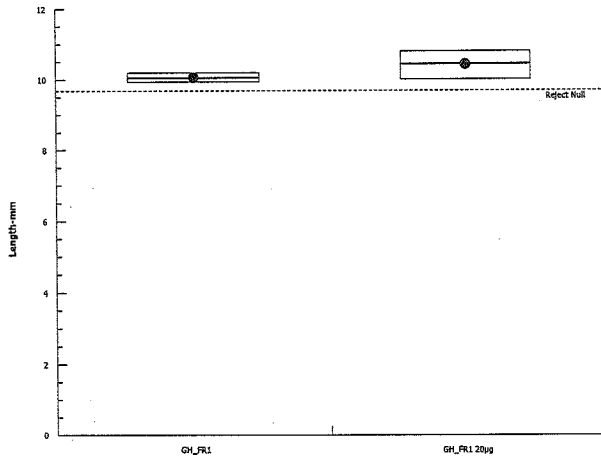
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-0475-4509 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:11 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 1 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 21-3318-2267	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	0.05936	0.0594	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1 Upstream Contr	60	0	60	1	0	0.0%
GH_FR1 20µg	56	4	60	0.9333	0.06667	6.67%

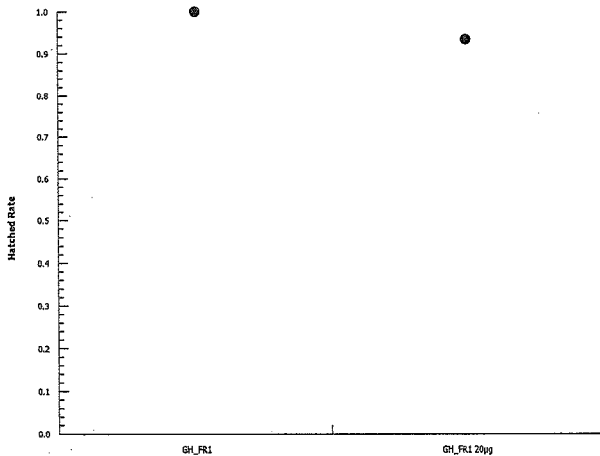
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1	1	1	1
GH_FR1 20µg	0.8667	1	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	15/15	15/15	15/15	15/15
GH_FR1 20µg	13/15	15/15	13/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 4 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-8671-0334	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1 Upstream Contr	52	8	60	0.8667	0.1333	0.0%
GH_FR1 20µg	51	9	60	0.85	0.15	1.92%

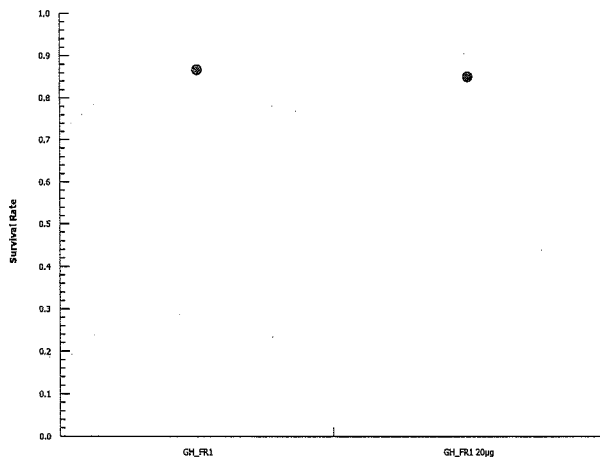
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.9333	1	0.7333	0.8
GH_FR1 20µg	0.8	0.9333	0.6667	1

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	14/15	15/15	11/15	12/15
GH_FR1 20µg	12/15	14/15	10/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 7 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-9008-1849 Endpoint: Mean Dry Biomass-mg CETIS Version: CETISv1.8.7
 Analyzed: 01 Jun-18 16:11 Analysis: Parametric-Two Sample Official Results: Yes

Batch ID: 05-1226-2709 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 22 Feb-18 15:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 26 Mar-18 10:30 Species: Pimephales promelas Brine:
 Duration: 31d 20h Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	12.9%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	-1.535	1.943	0.202	6	0.9122	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05087797	0.05087797	1	2.357	0.1756	Non-Significant Effect
Error	0.129504	0.021584	6			
Total	0.180382		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	13.12	47.47	0.0626	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9258	0.6451	0.4782	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	1.566	1.478	1.654	1.572	1.495	1.627	0.02765	3.53%	0.0%
GH_FR1 20µg	4	1.407	1.088	1.725	1.41	1.159	1.647	0.1001	14.24%	10.18%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1.627	1.559	1.495	1.585
GH_FR1 20µg	1.159	1.431	1.389	1.647

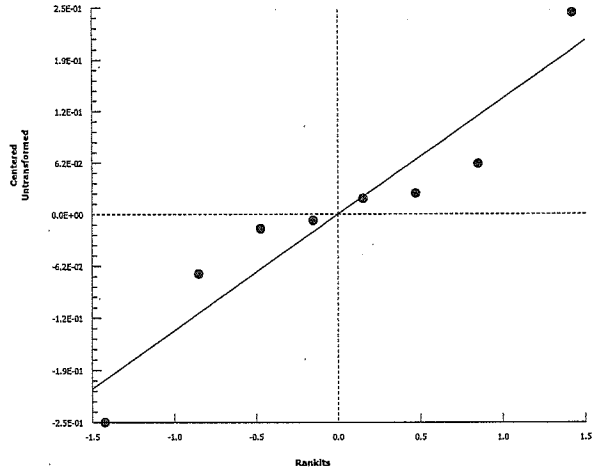
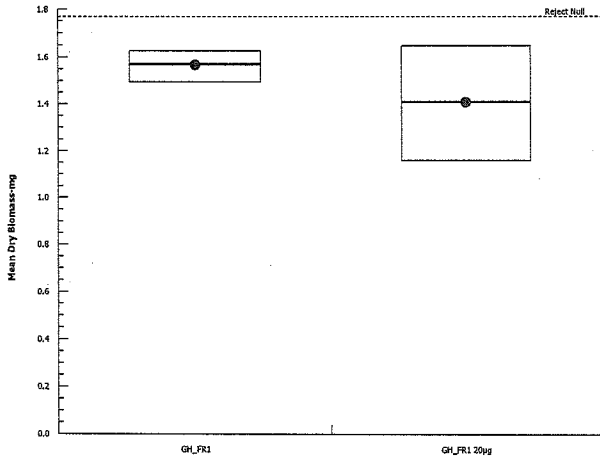
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-9008-1849 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 16:11 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 3 of 8)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4088-7746	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	3.71%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	1.902	1.943	0.373	6	0.0529	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.26645	0.26645	1	3.617	0.1059	Non-Significant Effect
Error	0.4419502	0.07365837	6			
Total	0.7084002		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	9.073	47.47	0.1030	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9902	0.6451	0.9953	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	10.06	9.865	10.25	10.05	9.93	10.21	0.06047	1.2%	0.0%
GH_FR1 20µg	4	10.42	9.843	11	10.44	10	10.8	0.1821	3.5%	-3.63%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10.21	9.93	10.09	10
GH_FR1 20µg	10.25	10.64	10.8	10

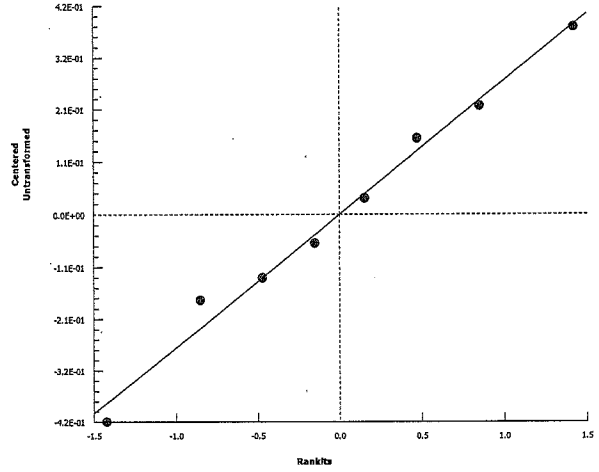
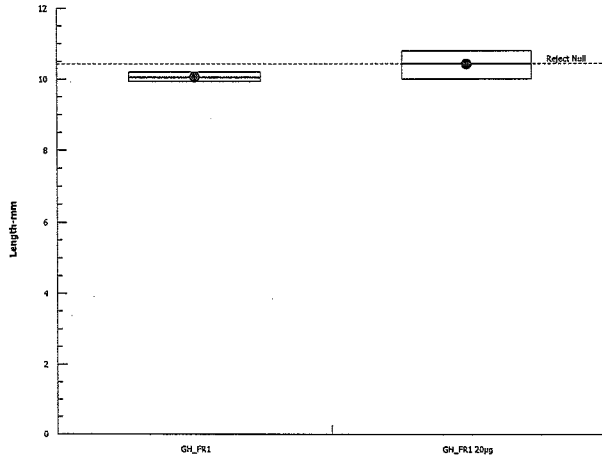
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4088-7746 Endpoint: Length-mm
Analyzed: 01 Jun-18 16:11 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:12 (p 2 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-6969-5977	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:11	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	12-8967-7706	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
GH_FR1 20µg	03-4386-0366	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1 Upstream Contr	60	0	60	1	0	0.0%
GH_FR1 20µg	56	4	60	0.9333	0.06667	6.67%

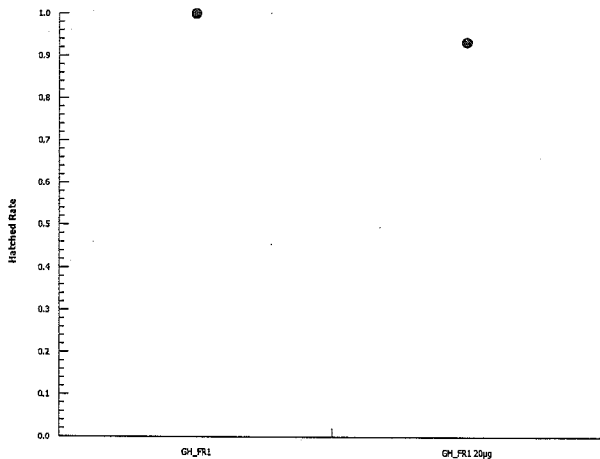
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1	1	1	1
GH_FR1 20µg	0.8667	1	0.8667	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	15/15	15/15	15/15	15/15
GH_FR1 20µg	13/15	15/15	13/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:54 (p 2 of 2)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-5165-7049	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:52	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code		NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	Negative Contr	55	5	60	0.9167	0.08333	0.0%
CM_MC2 20µg		55	1	56	0.9821	0.01786	-7.14%

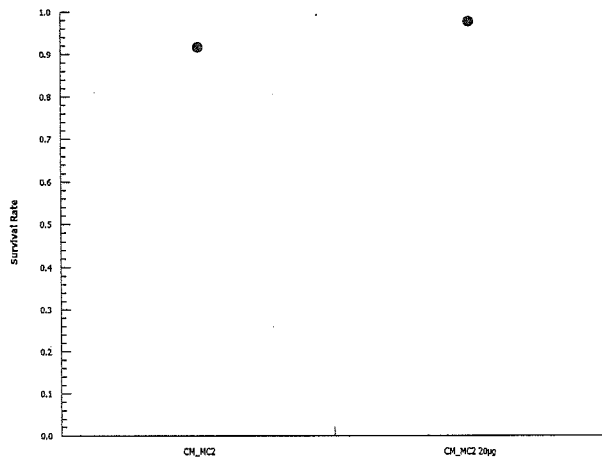
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.8667	0.8667	1	0.9333
CM_MC2 20µg	1	1	0.9091	1

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	13/15	13/15	15/15	14/15
CM_MC2 20µg	15/15	15/15	10/11	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:54 (p 3 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-9192-1316	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:52	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	26.4%	

Unequal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	-0.4434	2.353	0.419	3	0.6562	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01245331	0.01245331	1	0.1966	0.6730	Non-Significant Effect
Error	0.3801141	0.06335235	6			
Total	0.3925674		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	89	47.47	0.0040	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8334	0.6451	0.0645	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	0.0%
CM_MC2 20µg	4	1.668	1.105	2.231	1.556	1.378	2.184	0.177	21.22%	-4.97%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1.63	1.601	1.587	1.54
CM_MC2 20µg	1.378	1.537	2.184	1.574

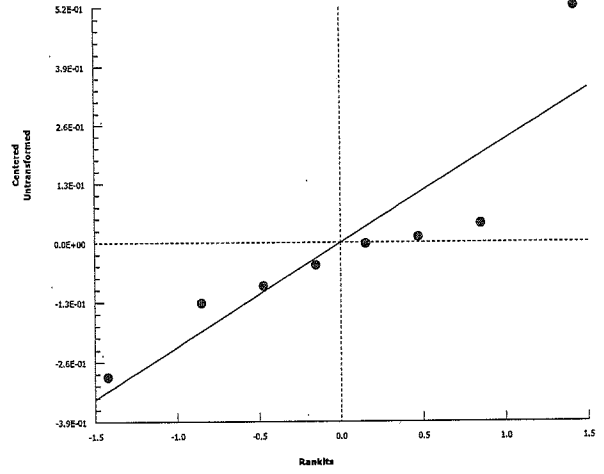
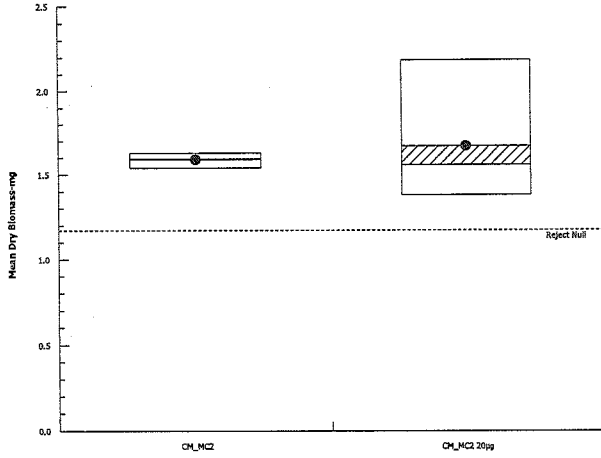
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-9192-1316 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 15:52 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:54 (p 1 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-4136-4731	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:52	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.47%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	-0.8221	1.943	0.538	6	0.7788	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1035125	0.1035125	1	0.6758	0.4425	Non-Significant Effect
Error	0.9189754	0.1531626	6			
Total	1.022488		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.964	47.47	0.5934	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.971	0.6451	0.9058	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	0.0%
CM_MC2 20µg	4	10.07	9.348	10.78	10.07	9.53	10.6	0.2253	4.48%	-2.31%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	10	9.54	9.6	10.21
CM_MC2 20µg	9.53	9.93	10.6	10.2

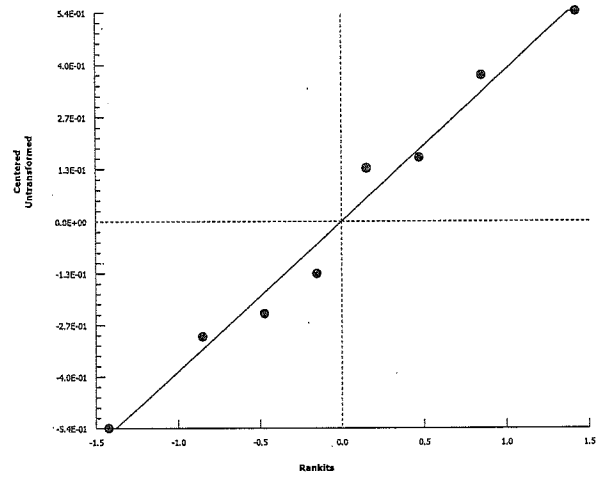
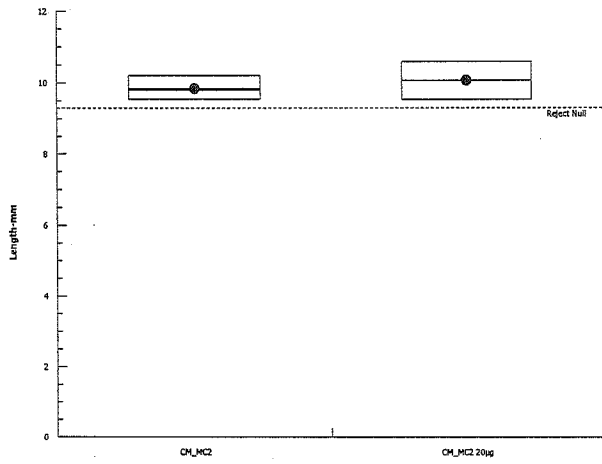
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-4136-4731 Endpoint: Length-mm
Analyzed: 01 Jun-18 15:52 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:56 (p 1 of 1)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-3977-0152	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:56	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	0.7521	0.7521	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Negative Contr	59	1	60	0.9833	0.01667	0.0%
CM_MC2 20µg	59	1	60	0.9833	0.01667	0.0%

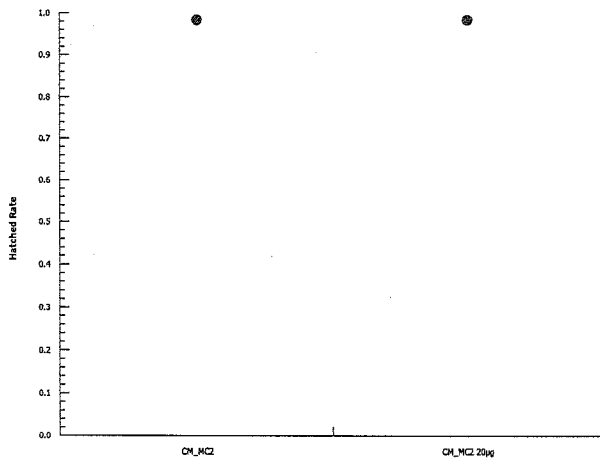
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	1	0.9333
CM_MC2 20µg	1	1	0.9333 ✓	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	15/15	14/15
CM_MC2 20µg	15/15	15/15	14/15	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:00 (p 1 of 1)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-0048-9646	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:59	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	0.1199	0.1199	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Negative Contr	55	5	60	0.9167	0.08333	0.0%
CM_MC2 20µg	55	1	56	0.9821	0.01786	-7.14%

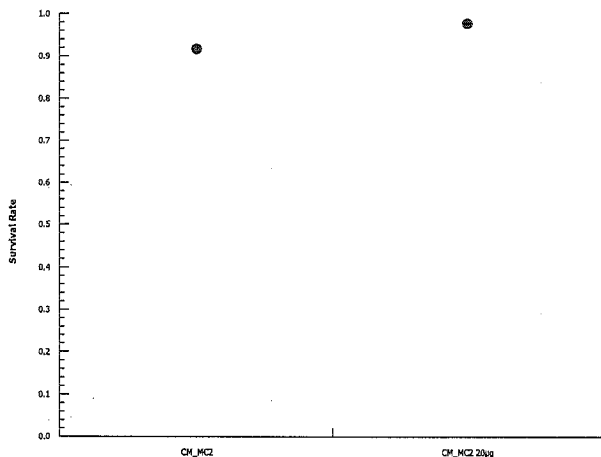
Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.8667	0.8667	1	0.9333
CM_MC2 20µg	1	1	0.9091	1

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	13/15	13/15	15/15	14/15
CM_MC2 20µg	15/15	15/15	10/11	15/15

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:59 (p 3 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0719-9748	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:59	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	26.4%	

Unequal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	0.4434	2.353	0.419	3	0.3438	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01245331	0.01245331	1	0.1966	0.6730	Non-Significant Effect
Error	0.3801141	0.06335235	6			
Total	0.3925674		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	89	47.47	0.0040	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8334	0.6451	0.0645	Normal Distribution

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	1.589	1.53	1.649	1.594	1.54	1.63	0.01876	2.36%	0.0%
CM_MC2 20µg	4	1.668	1.105	2.231	1.556	1.378	2.184	0.177	21.22%	-4.97%

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1.63	1.601	1.587	1.54
CM_MC2 20µg	1.378	1.537	2.184	1.574

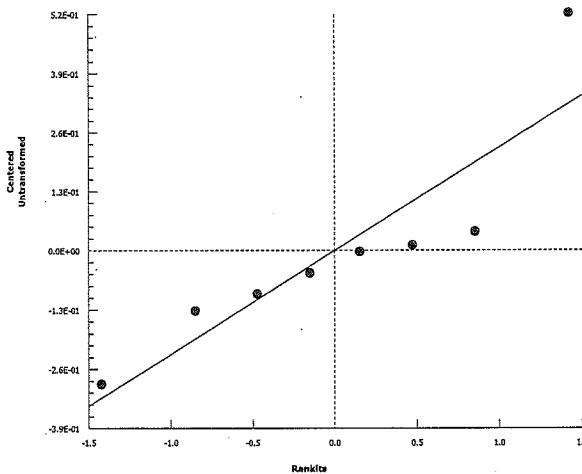
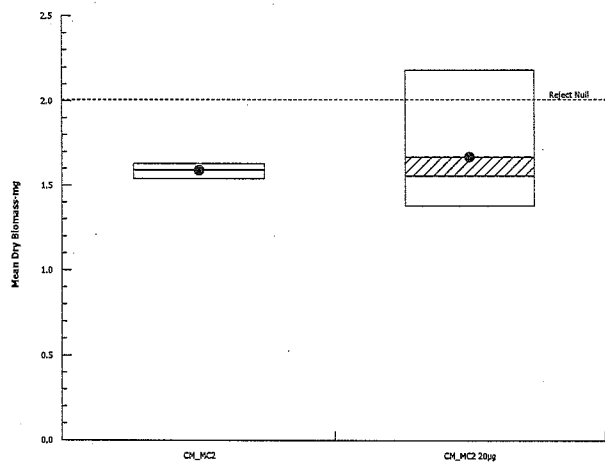
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0719-9748 Endpoint: Mean Dry Biomass-mg
Analyzed: 01 Jun-18 15:59 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 15:59 (p 1 of 4)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-1797-2211	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 15:59	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	5.47%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	0.8221	1.943	0.538	6	0.2212	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1035125	0.1035125	1	0.6758	0.4425	Non-Significant Effect
Error	0.9189754	0.1531626	6			
Total	1.022488		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.964	47.47	0.5934	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.971	0.6451	0.9058	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	9.838	9.326	10.35	9.8	9.54	10.21	0.1607	3.27%	0.0%
CM_MC2 20µg	4	10.07	9.348	10.78	10.07	9.53	10.6	0.2253	4.48%	-2.31%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	10	9.54	9.6	10.21
CM_MC2 20µg	9.53	9.93	10.6	10.2

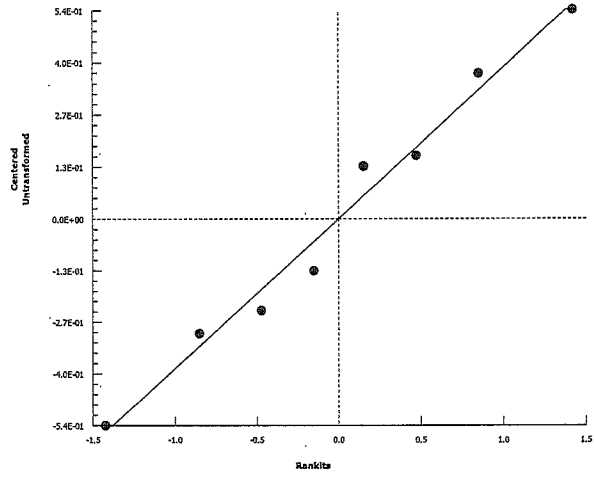
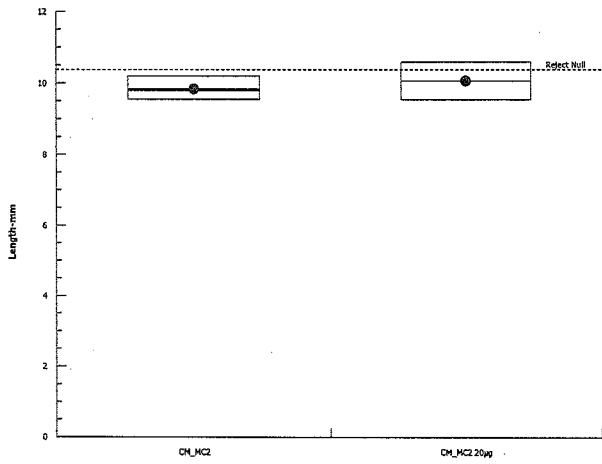
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-1797-2211 Endpoint: Length-mm
Analyzed: 01 Jun-18 15:59 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 01 Jun-18 16:00 (p 1 of 1)
 Test Code: 180296-180297 | 02-6254-6866

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-0642-5278	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 01 Jun-18 16:00	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 05-1226-2709	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 22 Feb-18 15:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 26 Mar-18 10:30	Species: Pimephales promelas	Brine:
Duration: 31d 20h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	05-9726-3701	19 Feb-18	20 Feb-18	87h	Teck Coal	Teck Coal Q1 2018
CM_MC2 20µg	02-6823-8730	19 Feb-18	20 Feb-18	87h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC2		CM_MC2 20µg	0.7521	0.7521	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Negative Contr	59	1	60	0.9833	0.01667	0.0%
CM_MC2 20µg	59	1	60	0.9833	0.01667	0.0%

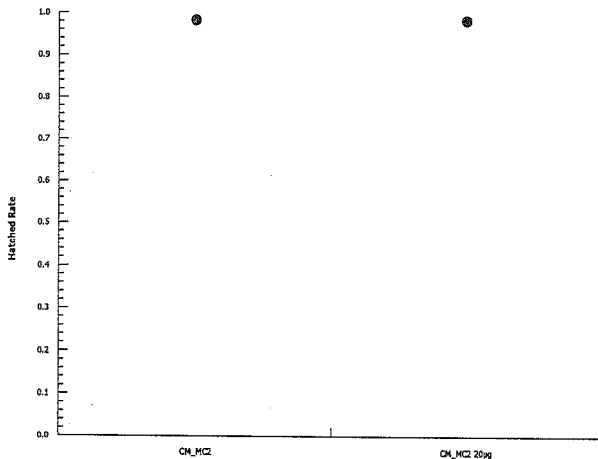
Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	1	0.9333
CM_MC2 20µg	1	1	0.9333	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	15/15	14/15
CM_MC2 20µg	15/15	15/15	14/15	15/15

Graphics



APPENDIX E – Chain-of-Custody Forms

COC ID: WEEKLY_CHRONIC_Q1_20180227_1 TURNAROUND TIME: Regular RUSH: No

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental			Report Format / Distribution				
Project Manager	Jay Jones			Lab Contact	Emma Marus			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
								Email 3:	Karen.Hannan@teck.com	X	X	X
Address	PO Box 3000			Address	8664 commerce Court			Email 4:	Don.Sacino@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 5:	Jay.jones@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	550369			
Phone Number	1-250-425-7321			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field; L: Lab; FL: Field & Lab; N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h P. subcapitata P/F	7d C.dubia P/F	28 d Hyalella P/F	32d FHM P/F (10 µg/L Cu treated) Conducted in Calgary	32d FHM P/F (20 µg/L Cu treated) Conducted in Calgary					
CM_MC1_Q1_WS_20180227_N	CM_MC1	WS	n	2/27/2018	11:05	G	1x20L	X	X	X	X	X					5.4
CM_MC2_Q1_WS_20180227_N CM-MC2 (EDTA)	CM_MC2	WS	n	2/27/2018	11:03	G	1x20L	X	X	X	X	X					5.4
CM_MC3_Q1_WS_20180227_N	CM_MC3	WS	n	2/27/2018	11:49	G	1x20L	X	X	X	X	X					5.4

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
sample description: all samples clear, colourless, odourless, no particulates			Nautilus - Burnaby	Feb 28/18 @ 09:00
			NY - Nari Yamamoto	Q1 - week 1

NB OF BOTTLES RETURNED/DESCRIPTION		SAMPLER INFORMATION	
Regular (default)	X	Sampler's Name	Scott Holmgren/Don Sacino
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge		Mobile #	250 425 7518
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	02/27/2018 14:00:00

Teck

COC ID: 20180227Naut		TURNAROUND TIME:				RUSH:					
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job# Elkview Operations		Lab Name Nautilus Environmental		Report Format / Distribution				Excel	PDF	EDD	
Job Description Chronic Toxicity Sampling		Lab Contact Emma Marus		Email 1: Cameron.Griffin@teck.com		X		X	X		
Project Manager Cameron Griffin		Email Emma@nautilusenvironmental.ca		Email 2: teckcoal@equisonline.com		X		X	X		
Email Cameron.Griffin@teck.com		Address 8664 Commerce Court		Email 3: James.Boldt@teck.com		X		X	X		
Address RR#1 HWY#3		Imperial Square, Lake City		Email 4: Bryan.Ogden@Teck.com		X		X	X		
City Sparwood		Province BC		Email 6: Teck.Lab.Results@sharepoint.teck.com		X		X	X		
Postal Code V0B 2G1		Country Canada		City Burnaby		Province BC		PO number			
Phone Number 1-250-425-8137		Country Canada		Postal Code V5A 4N7		Country Canada		Phone Number 604-420-8773			

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dubia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail						
EV_HC1_WS_2018-02-27_N	EV_HC1	WS	N	2/27/2018	10:00	G	1 x 20L			1	1						5.4		
EV_MC2_WS_2018-02-27_N	EV_MC2	WS	N	2/27/2018	11:15	G	1 x 20L			1	1						7.6		
Total							2												
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS								RELINQUISHED BY/AFFILIATION				DATE/TIME		ACCEPTED BY/AFFILIATION					
early life stage P/F 30d rainbow trout								Bryan Ogden				February 27, 2018		Nautilus - Burnaby		Feb 28/18 @ 09:00			
														NY - Mari Yamamoto		Q1 - week 1			
Regular (default) X								Sampler's Name				Bryan Ogden		Mobile #		250 425 3629			
Priority (2-3 business days) - 50% surcharge								Sampler's Signature						Date/Time		February 27, 2018			
Emergency (1 Business Day) - 100% surcharge																			
For Emergency <1 Day, ASAP or Weekend - Contact ALS																			

sample description: all samples clear, colourless, odourless, no particulates

COC ID: WEEKLY_CHRONIC_Q1_20180306_1		TURNAROUND TIME: Regular		RUSH: No					
PROJECT/CLIENT INFO			LABORATORY		OTHER INFO				
Facility Name / Job#: Coal Mountain Operations			Lab Name: Nautilus Environmental		Report Format / Distribution				
Project Manager: Jay Jones			Lab Contact: Emma Marus		Email 1:	Scott.Holmgren@teck.com	Excel X	PDF X	EDD X
Email: Jay.Jones@teck.com			Email: emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
Address: PO Box 3000			Address: 8664 commerce Court		Email 3:	Karen.Hannan@teck.com	X	X	X
City: Sparwood			City: Burnaby		Email 4:	Dori.Sacino@teck.com	X	X	X
Province: BC			Province: BC		Email 5:	Jay.jones@teck.com	X	X	X
Postal Code: V0B 2G0			Postal Code: V5A 4N7		PO number:		550369		
Country: Canada			Country: Canada						
Phone Number: 1-250-425-7321			Phone Number: 604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED																
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	180295	180296	180297	180298	180299	180300	180301	180302	180303	180304	180305	180306	180307	180308	180309	180310	
CM_MC1_Q1_WS_20180306_N	CM_MC1	WS	n	3/6/2018		G	1	20	x	x	x													
CM_MC2_Q1_WS_20180306_N	CM_MC2	WS	n	3/6/2018		G	1	20	x	x	x													
CM_MC3_Q1_WS_20180306_N	CM_MC3	WS	n	3/6/2018		G	1	20	x	x	x													

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION			DATE/TIME	
								Nautilus - Burnaby			Mar 07/18 @ 9:05	
								CM - Christine Martinez			Q1 - week 2 refresh sample	
NB OF BOTTLES RETURNED/DESCRIPTION			Sampler's Name			Mobile #		Sampler's Signature			Date/Time	
Regular (default) X			Scott Holmgren/Don Sacino			250 425 7518					03/06/2018 14:00:00	
Priority (2-3 business days) - 50% surcharge												
Emergency (1 Business Day) - 100% surcharge												
For Emergency <1 Day, ASAP or Weekend - Contact ALS												

28 d Hyalite P/F
 32d FHM P/F (0.1g/L cu treated) conducted in Calgary
 32d FHM P/F (0.1g/L cu treated) conducted in Calgary

Temp °C
 4.3
 3.2
 3.3

COC ID: WEEKLY_CHRONIC_Q1_20180320_1		TURNAROUND TIME: Regular		RUSH: No				
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO		
Facility Name / Job#: Coal Mountain Operations		Lab Name: Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD
Project Manager: Jay Jones		Lab Contact: Emma Marus		Email 1:	Scott.Holmgren@teck.com	X	X	X
Email: Jay.Jones@teck.com		Email: emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
Address: PO Box 3000		Address: 8664 commerce Court		Email 3:	Karen.Hannan@teck.com	X	X	X
City: Sparwood	Province: BC	City: Burnaby	Province: BC	Email 4:	Don.Sacino@teck.com	X	X	X
Postal Code: V0B 2G0	Country: Canada	Postal Code: V5A 4N7	Country: Canada	Email 5:	Jay.jones@teck.com	X	X	X
Phone Number: 1-250-425-7321		Phone Number: 604-420-8773		PO number:	550369			


SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, NI: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PRESERV.	REL.						
CM_MC1_Q1_WS_20180320_N	CM_MC1	WS	n	3/20/2018		G	1 X 20L	28 d Hyalella P/F 32d FHM P/F (10µg/L Cu treated) Conducted in Calgary								
CM_MC2_Q1_WS_20180320_N	CM_MC2	WS	n	3/20/2018		G	1 X 20L	32d FHM P/F (20µg/L Cu treated) Conducted in Calgary								
CM_MC3_Q1_WS_20180320_N	CM_MC3	WS	n	3/20/2018		G	1 X 20L									
CM-MC2-EDTA																

Temp °C
4.0
6.0
5.7

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
					Nautilus - Burnaby	Mar 20/18 @ 09:07
					NY - Nan Yamamoto	refresh sample Q1 - week 4
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Mobile #	250 425 7518	
Regular (default) X		Scott Holmgren/Don Sacino				
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	03/20/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge						
For Emergency <1 Day, ASAP or Weekend - Contact ALS						

COC ID: 20180313-1450		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.bagin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field, L: Lab, FL: Field & Lab, N: None					
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 Day H. azteca P/F	WO# 180295 refresh samples.	320 FHM P/F (10 µg/L Cu Trinded) Conducted in Calgary	320 FHM P/F (20 µg/L Cu Trinded) Conducted in Calgary							
FR_FRCPI_WS_201803130952_N_23	FR_FRCPI	WS		2018/03/13	09:52	G	1X20L	X										6.0°C
FR_UFR1_WS_201803131214_N_22	FR_UFR1	WS		2018/03/13	12:14	G	1X20L	X										6.5°C

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS All metals samples must be shipped to ALS Burnaby for analysis	RELINQUISHED BY/AFFILIATION Chelsea Jensen/Jason Gravelle	DATE/TIME NAUTILUS - Burnaby	ACCEPTED BY/AFFILIATION Kamia Lyne, etc, etc	DATE/TIME Mar 14/18 @ 10:30
	SERVICE REQUEST (rush - subject to availability)			
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name Chelsea Jensen/Jason Gravelle	Mobile # 250 425 4729		
Priority (2-3 business days) - 50% surcharge	Sampler's Signature 	Date/Time		
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP, or Weekend - Contact ALS				

COC ID: WEEKLY_CHRONIC_Q1_20180313_1 TURNAROUND TIME: Regular RUSH: No

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental			Report Format / Distribution				
Project Manager	Jay Jones			Lab Contact	Emma Marus			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
								Email 3:	Karen.Hannan@teck.com	X	X	X
								Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	8664 commerce Court			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	550369			
Postal Code	VOB 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	25 d Hyalella P/F	NO# 180295 re fresh sample	320 FHM P/F (10 mg/L Cu + trace lead) Conducted in Calgary	320 FHM P/F (10 mg/L Cu + trace lead) Conducted in Calgary						
CM_MC1_Q1_WS_20180313_N	CM_MC1	WS	n	3/13/2018	11:00	G	1x20L	X		X	X						7.5°C
CM_MC2_Q1_WS_20180313_N	CM_MC2	WS	n	3/13/2018	10:16	G	1x20L	X		X	X						6 th 6.7°C
CM_MC3_Q1_WS_20180313_N	CM_MC3	WS	n	3/13/2018	11:00	G	1x20L	X		X	X						5.5°C
CM-MC2-EDTA								X									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Nautilus - Burnaby Karin Jone, K, J	Mar 14/18 @ 10:30

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default)	X	Scott Holmgren/Don Sacino		250 425 7518	03/13/2018 14:00:00
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

COC ID: 20180227-1401

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilis Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PH.	PREP.	FL.	NAME
FR_FRCP1_WS_201802271326_N_29	1718-0789 FR_FRCP1	WS		2018/02/27	13:26	G	2	30 D early lifestage Fathead Minnow P/F (10 ug/L CU Treated)				
FR_UFRI_WS_201802271040_N_28	1718-0790 FR_UFRI	WS		2018/02/27	10:40	G	1	30 D early lifestage Fathead Minnow P/F (20 ug/L CU Treated)				

2018/02/28
11:00
DU
6x 20L car boxes
Drop off
2c
NO S/I
good

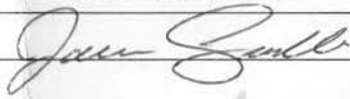
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	02/27		

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Chelsea Jensen/Jason Gravelle	<i>Jason Gravelle</i>	250 425 4729	02/27/18

COC ID: 20180306-1338		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	NAUT_30d_FHM_P/F (10 ug/l CU Treated)	NAUT_30d_FHM_P/F (20 ug/l CU Treated)							
FR_FRCPI_MON_2018-03-05_N	1718-0789 FR_FRCPI	WS		2018/03/06	12:49	G	4	X	X							
FR_UFRI_MON_2018-03-05_N	1718-0790 FR_UFRI	WS		2018/03/06	11:15	G	2	X								
<p>2018/03/07 11:15 DU X 20L manitowlin 60 NOST good</p>																

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	06-Mar-18		

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	March 6, 2018
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

COC ID: 20180313-1455 TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESERV.	ANALYSIS										
FR_FRCP1_WS_201803130952_N_23	FR_FRCP1	WS		2018/03/13	09:52	G				30 Day early life stage Fathead PF Minnow (10ug/l CU treated)	X	X								
FR_UFRI_WS_201803131214_N_22	FR_UFRI	WS		2018/03/13	12:14	G				30 Day early life stage Fathead Minnow PF (20ug/l CU treated)	X									
<p>2018/03/14 13:30 DU 6x20L DROP OFF 6C NO S/I good</p>																				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle			
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: 20180320-1329		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	NAUT_30d_FHM_P/F (10 ug/l CU Treated)	NAUT_30d_FHM_P/F (20 ug/l CU Treated)	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None		
FR_UFR1_WS_201803200957_N_46	1718-0789 FR_UFR1	WS		2018/03/20	09:57	G	2	2				
FR_FRCPI_WEK_2018-03-19_N	1718-0790 FR_FRCPI	WS		2018/03/20	11:22	G	4	2	2			
<p>208/103121 15:20 DU 6x20L Drop off 100 NBS/I good</p>												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	20-Mar-18		
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	March 20, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: WEEKLY_CHRONIC_02192018_2		TURNAROUND TIME: Regular		RUSH:																
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO														
Facility Name / Job# Coal Mountain Operations		Lab Name Hydroqual Laboratories		Report Format / Distribution		Excel	PDF	EDD												
Project Manager Jay Jones		Lab Contact Claudio Quinteros		Email 1: Scott.Holmgren@teck.com		X	X	X												
Email Jay.Jones@teck.com		Jessica Wang		Email 2: teckcoal@equisonline.com				X												
		Email claudio@nautilusenvironmental.ca		Email 3: Karen.Hannan@teck.com		X	X	X												
		Email jessica@nautilusenvironmental.ca		Email 4: Don.Sacino@teck.com		X	X	X												
Address PO Box 3000		Address #4, 6125-12th Street S.E.		Email 5: Jay.jones@teck.com		X	X	X												
City Sparwood		Province BC	City Calgary	Province AB	PO number	478075														
Postal Code V0B 2G0		Country Canada	Postal Code T2H 2K1	Country Canada																
Phone Number 1-250-425-7321		Phone Number 403-253-7121																		
SAMPLE DETAILS				ANALYSIS REQUESTED				<small>Filtered - F: Field, L: Lab, FI: Field & Lab, N: None</small>												
<i>1718-0791</i>	Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	RESERVED	PHI									
CM_MC1_Q1_WS_20180219_N	CM_MC1	WS	n	2/19/2018	9:40	G	3		30 d early life stage fathead minnow P/F (10 ug/l CU Treated)										-1°C	
CM_MC2_Q1_WS_20180219_N	CM_MC2	WS	n	2/19/2018	10:30	G	6												-1°C	
<i>1718-0792</i>																				ca/DU 9x 20L carboys 208/02/20 -1°C 1330 Manitoulin/drop off No S/I partially frozen
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME										
NB OF BOTTLES RETURNED/DESCRIPTION																				
Regular (default) X				Sampler's Name		Scott Holmgren/Don Sacino		Mobile #		250 425 7518										
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time		02/19/2018 14:00:00										
Emergency (1 Business Day) - 100% surcharge																				
For Emergency <1 Day, ASAP or Weekend - Contact ALS																				

COC ID: WEEKLY_CHRONIC_20180227_2 TURNAROUND TIME: Regular RUSH: No

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories				Report Format / Distribution				
Project Manager Jay Jones				Lab Contact Claudio Quinteros				Email 1:	Scott.Holmgren@teck.com	X	X	X
Email Jay.Jones@teck.com				Jessica Wang				Email 2:	teckcoal@equisonline.com			X
				Email claudio@nautilusenvironmental.ca				Email 3:	Karen.Hannan@teck.com	X	X	X
				Address #4, 6125-12th Street S.E.				Email 4:	Don.Sacino@teck.com	X	X	X
Address PO Box 3000				City Calgary				Email 5:	Jay.jones@teck.com	X	X	X
City Sparwood				Province BC	City Calgary				Province AB	PO number 550369		
Postal Code V0B 2G0				Country Canada	Postal Code T2H 2K1				Country Canada			
Phone Number 1-250-425-7321				Phone Number 403-253-7121								

SAMPLE DETAILS								ANALYSIS REQUESTED							
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS
CM_MC1_Q1_WS_20180227_N 1718-0791	CM_MC1	WS	n	2/27/2018	11:05	G	2	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)							
CM_MC2_Q1_WS_20180227_N 1718-0792	CM_MC2	WS	n	2/27/2018	11:03	G	4	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)	X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION	Regular (default)	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
	X			

Sampler's Name	Mobile #
Scott Holmgren/Don Sacino	250 425 7518

Sampler's Signature	Date/Time
	02/27/2018 14:00:00

2018/02/28 2°C
 11:00 Drop OFF NOS/I
 DU good
 6x20L carboys

COC ID: WEEKLY_CHRONIC_20180313_2		TURNAROUND TIME: Regular		RUSH: No							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job# Coal Mountain Operations		Lab Name Hydroqual Laboratories		Report Format / Distribution		Excel	PDF	EDD			
Project Manager Jay Jones		Lab Contact Claudio Quinteros		Email 1:	Scott.Holmgren@teck.com	X	X	X			
Email Jay.Jones@teck.com		Jacklyn Poole		Email 2:	teckcoal@equisonline.com			X			
		Email claudio@nautilusenvironmental.ca		Email 3:	Karen.Hannan@teck.com	X	X	X			
		Email jacklyn@nautilusenvironmental.ca		Email 4:	Don.Sacino@teck.com	X	X	X			
Address PO Box 3000		Address #4, 6125-12th Street S.E.		Email 5:	Jay.jones@teck.com	X	X	X			
City Sparwood	Province BC	City Calgary	Province AB	PO number	550369						
Postal Code V0B 2G0	Country Canada	Postal Code T2H 2K1	Country Canada								
Phone Number 1-250-425-7321	Phone Number 403-253-7121										
SAMPLE DETAILS				ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PREL	ANALYSIS	RESERV.	
CM_MC1_Q1_WS_20180313_N	CM_MC1	WS	n	3/13/2018	11:00	G	2		30 d early life stage fathead minnow P/F (10 ug/l CU Treated)		
CM_MC2_Q1_WS_20180313_N	CM_MC2	WS	n	3/13/2018	10:16	G	4		30 d early life stage fathead minnow P/F (20 ug/l CU Treated)		
2018/03/14 12:30 DU 6x 20L DROPOFF 70 NO S/I good											
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
Regular (default) X				Sampler's Name		Scott Holmgren/Don Sacino		Mobile #		250 425 7518	
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time		03/13/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge											
For Emergency <1 Day, ASAP or Weekend - Contact ALS											

COC ID: WEEKLY_CHRONIC_20180320_2		TURNAROUND TIME: Regular		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories		
Project Manager	Jay Jones			Lab Contact	Claudio Quineros		
Email	Jay.Jones@teck.com			Jacklyn Poole	Email 1:	Scott.Holmgren@teck.com	X
				Email	claudio@nautilusenvironmental.ca	teckcoal@equisonline.com	X
				Jacklyn Poole	Email 2:	Karen.Hannan@teck.com	X
				Email	jacklyn@nautilusenvironmental.ca	Don.Sacino@teck.com	X
Address	PO Box 3000			Address	#4, 6125-12th Street N.E.		
City	Sparwood	Province	BC	City	Calgary	Province	AB
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada
Phone Number	1-250-425-7321			Phone Number	403-253-7121		
					PO number	550369	

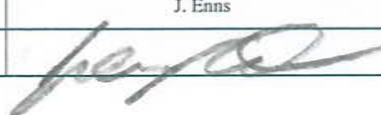
SAMPLE DETAILS								ANALYSIS REQUESTED								Filtered - F: Field, L: Lab, FL: Field & Lab, N: None	
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS		
CM_MC1_Q1_WS_20180320_N	CM_MC1	WS	n	3/20/2018		G	2	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)									
1718-0791																	
CM_MC2_Q1_WS_20180320_N	CM_MC2	WS	n	3/20/2018		G	4	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)	X								
1718-0792																	
2018/03/21																	
15:20																	
D4																	
6x20L																	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS Dropoff 11c NOS/I good NB OF BOTTLES RETURNED/DESCRIPTION								RELINQUISHED BY/AFFILIATION				DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
Regular (default) X								Sampler's Name				Scott Holmgren/Don Sacino		Mobile #		250 425 7518	
Priority (2-3 business days) - 50% surcharge								Sampler's Signature						Date/Time		03/20/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge																	
For Emergency <1 Day, ASAP or Weekend - Contact ALS																	

COC ID: **Q1 Chronic TOX Feb. 19_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:			
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com	EQuIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution			
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com			
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com			
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number			
Email 3: jeremy.enns@teck.com											

SAMPLE DETAILS								ANALYSIS REQUESTED																	
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																	
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A						
1718-0793 Sample ID								30 d early life stage fathead minnow P/F (10 ug/1 CU Treated)	30 d early life stage fathead minnow P/F (20 ug/1 CU Treated)																
GH_FR1_WS_2018-02-19_N	GH_FR1	WS	N	19-Feb-18	15:45	G	6	X	X			-10C	CO/DU												
GH_ER2_WS_2018-02-19_N	GH_ER2	WS	N	19-Feb-18	12:10	G	3	X				0C	20 ug/2/20												
1718-0794													1330												
													Do S I												
													9 x 202 casbuys												
													Manitowick / deep off												
													good partially frozen												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	2/19/2018				

SERVICE REQUEST (rush - subject to availability)			
Regular (default) X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name	J. Enns	Mobile #	
Sampler's Signature		Date/Time	

COC ID: Q1 Chronic TOX Feb. 27_Hyd **TURNAROUND TIME:** regular **RUSH:**

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:					
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com		EQuIS:	GHO	
Email	leigh.stickney@teck.com			Email				Report Format / Distribution					
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel		
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1:				leigh.stickney@teck.com	
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2:				jennifer.kropp@teck.com	
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number					

SAMPLE DETAILS								ANALYSIS REQUESTED															
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)															
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
								30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)														
GH_FR1_WS_2018-02-27_N 1718-0793	GH_FR1	WS	N	27-Feb-18		G	4	X	X														
GH_ER2_WS_2018-02-27_N 1718-0794	GH_ER2	WS	N	27-Feb-18	10:56	G	2	X															
2018/02/28																							
11:00																							
Du																							
6x 20 L carboys																							
Drop off																							
NOS/I																							
48																							
good																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	2/27/2018				

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	J. Enns
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge		Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	

COC ID: **Q1 Chronic TOX March 20_Hyd**

TURNAROUND TIME:

regular

RUSH:

PROJECT/CLIENT INFO

LABORATORY

OTHER INFO

Facility Name: Greenhills Operations
 Project Manager: Leigh Stickney
 Email: leigh.stickney@teck.com
 Address: PO Box 5000

Lab Name: Hydroqual Laboratories Ltd
 Lab Contact: Jacklyn Pool
 Email:
 Address: #4, 6125 - 12th Street S.E.

Site: leigh.stickney@teck.com
 EQuIS: GHO
 Report Format / Distribution
 Yes PDF Yes Excel

City: Elkford Province: BC
 Postal Code: V0B 1H0 Country: Canada

City: Calgary Province: AB
 Postal Code: T2H 2K1 Country: Can

Email 1: leigh.stickney@teck.com
 Email 2: jennifer.kropp@teck.com
 Email 3: jeremy.enns@teck.com

Phone Number: 250 865 3274

Phone Number: 403.253.7121

PO number:

SAMPLE DETAILS

ANALYSIS REQUESTED

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS															
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A				
GH_FR1_WS_2018-03-20_N	1718-0793 GH_FR1	WS	N	20-Mar-18	13:10	G	4	X	X														
GH_ER2_WS_2018-03-20_N	1718-0794 GH_ER2	WS	N	20-Mar-18	10:46	G	2	X															
2018/03/21 13:20 DU Drop off 102 NOS/I good 6x20L																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION

Date

Time

Accepted By/Affiliation

Date

Time

J. Enns

3/20/2018

SERVICE REQUEST (rush - subject to availability)

Regular (default) X

Priority (2-3 business days) - 50% surcharge

Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

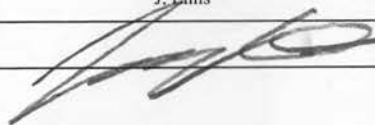
Sampler's Name

J. Enns

Mobile #

Sampler's Signature

Date/Time



END OF REPORT

Appendix B-2
Second Quarter 2018 Results: Toxicity testing on
Elk Valley samples with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata, *Hyalella azteca*,
Pimephales promelas and *Oncorhynchus mykiss*



**Toxicity testing on Elk Valley samples
with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata,
Hyalella azteca, *Pimephales promelas*
and *Oncorhynchus mykiss***

Second Quarter 2018 Results

Final Report

October 30, 2018

Submitted to: **Teck Coal Ltd.**
Sparwood, BC

TABLE OF CONTENTS

	Page
Signature Page.....	iii
Summary	iv
1.0 Introduction	1
2.0 Methods.....	4
3.0 Results.....	10
3.1 <i>Ceriodaphnia dubia</i>	10
3.2 <i>Pseudokirchneriella subcapitata</i>	10
3.3 <i>Hyaella azteca</i>	11
3.4 <i>Pimephales promelas</i>	11
3.5 <i>Oncorhynchus mykiss</i>	12
4.0 QA/QC.....	17
5.0 References	19

List of Tables

Table 1.	Summary of toxicity testing program.....	2
Table 2.	Test conditions: <i>Ceriodaphnia dubia</i> survival and reproduction test.	5
Table 3.	Test conditions: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	6
Table 4.	Test conditions: <i>Hyaella azteca</i> survival and growth test.	7
Table 5.	Test conditions: <i>Pimephales promelas</i> survival and growth test.	8
Table 6.	Test conditions: <i>Oncorhynchus mykiss</i> embryo-alevin test.	9
Table 7.	Results: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	13
Table 8.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	14
Table 9.	Results: <i>Hyaella azteca</i> survival and growth test.....	14
Table 10.	Results: <i>Pimephales promelas</i> survival and growth test.....	15
Table 11.	Results: <i>Oncorhynchus mykiss</i> embryo-alevin test.....	16
Table 12.	Reference toxicant test results.	18

List of Figures

Figure 1.	Chronic toxicity monitoring locations.	3
-----------	---	---

List of Appendices

APPENDIX A – <i>Ceriodaphnia dubia</i> Toxicity Test Data	
APPENDIX B – <i>Pseudokirchneriella subcapitata</i> Toxicity Test Data	
APPENDIX C – <i>Hyaella azteca</i> Toxicity Test Data	
APPENDIX D – <i>Pimephales promelas</i> Toxicity Test Data	
APPENDIX E – <i>Oncorhynchus mykiss</i> (rainbow trout) Toxicity Test Data	
APPENDIX F – Chain-of-Custody Forms	

SIGNATURE PAGE



Report By:
Jillian Sones, BAS
Laboratory Biologist



Reviewed By:
James Elphick, R.P.Bio.
Environmental Toxicologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Summaries of sample information and test results from the toxicity tests conducted on samples collected from the Elk Valley to meet requirements of the quarterly toxicity testing program required under BC Ministry of Environment and Climate Change permit number 107517 in the second quarter of 2018 are provided in the tables below.

Sample and Test Type Information

Sample IDs	FR_UFR1 (site control), GH_ER2 (site control), CM_MC1 (site control), LC_SLC ^β (site control), FR_FRCP1, GH_FR1, GH_ERC*, EV_MC2*, EV_HC1*, CM_MC2, CM_MC3 ^α and LC_LCDSSLCC ^β
Sample collection dates	April 30 and May 8, 15, 22, 29 and June 5, 2018
Sample receipt dates	May 1, 9, 16, 23, 30 and June 6, 2018
Sample receipt temperatures	Ranged from 4.4 to 13.6°C
Test types	<i>Ceriodaphnia dubia</i> 7-d survival and reproduction <i>Pseudokirchneriella subcapitata</i> 72-h growth inhibition <i>Hyaella azteca</i> 28-d survival and growth <i>Pimephales promelas</i> survival and growth <i>Oncorhynchus mykiss</i> embryo-alevin development

* Tested with *C. dubia*, *P. subcapitata* and *O. mykiss* only

^α Tested with *C. dubia* and *H. azteca* only

^β Tested with *C. dubia*, *P. subcapitata*, *H. azteca* and *O. mykiss* only

Summary of Results

Endpoint	Mean ± SD						
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	LC_SLC (Site Control)	FR_FRCP1	GH_FR1
<i>C. dubia</i>							
Survival (%)	100	100	90	100	100	100	100
Reproduction	17.6 ± 2.5	17.7 ± 7.3	13.3 ± 6.1 ^{*†}	22.3 ± 6.7	13.6 ± 3.5 ^{*†}	11.2 ± 4.2 ^{*α†}	12.6 ± 1.6 ^{*†}
<i>P. subcapitata</i>							
Cell Yield (x 10 ⁴ cells/mL)	33.8 ± 2.1	75.4 ± 5.6 ^{β1Σ}	123.3 ± 6.5 ^{1Σ}	145.3 ± 8.4	147.5 ± 3.1	94.0 ± 4.5 ^{β1Σ}	121.5 ± 2.6 ^{1Σ}
<i>H. azteca</i>							
Survival (%)	94.0 ± 5.5	96.0 ± 5.5	98.0 ± 4.5	96.0 ± 5.5	98.0 ± 4.5	98.0 ± 4.5	92.0 ± 13.0
Dry weight (mg)	0.34 ± 0.03	0.41 ± 0.02	0.40 ± 0.03	0.43 ± 0.03	0.43 ± 0.02	0.44 ± 0.02	0.50 ± 0.07

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

^Σ Result was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	GH_ERC	EV_MC2	EV_HC1	CM_MC2	CM_MC3	LC_LCDSSLCC
<i>C. dubia</i>						
Survival (%)	100	90	100	100	100	100
Reproduction	10.9 ± 1.9 ^{*αβ†}	16.6 ± 2.9 [†]	17.0 ± 5.2 [†]	7.4 ± 4.2 ^{*αβ‡Σ}	12.2 ± 4.1 ^{*†}	7.1 ± 2.0 ^{*αβ‡Σ}
<i>P. subcapitata</i>						
Cell Yield (x 10 ⁴ cells/mL)	122.8 ± 4.3 ^{‡Σ}	155.5 ± 5.3	122.3 ± 4.3 ^{‡Σ}	135.3 ± 6.2 ^{‡Σ}	NT	147.5 ± 4.8
<i>H. azteca</i>						
Survival (%)	NT	NT	NT	52.0 ± 27.8 ^{*αβ‡Σ}	96.0 ± 5.5	90.0 ± 14.1
Dry weight (mg)	NT	NT	NT	0.33 ± 0.04 ^{α‡Σ}	0.44 ± 0.05	0.37 ± 0.12

SD = Standard Deviation, NT = Not Tested

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

^Σ Result was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD						
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1	CM_MC2
<i>P. promelas</i>							
10 µg/L Cu							
Hatch (%)	100.0 ± 0.0	100 ± 0.0	96.7 ± 3.8	98.3 ± 3.4	100 ± 0.0	98.3 ± 3.3	98.3 ± 3.3
Survival (%)	82.1 ± 14.5	5.0 ± 6.4*	31.7 ± 6.4*	95.0 ± 3.3	95.0 ± 3.3	48.3 ± 35.0* [†]	71.7 ± 31.4 [†]
Biomass (mg)	2.58 ± 0.15	0.48 ± 0.55*	1.51 ± 0.05*	2.50 ± 0.31	2.51 ± 0.16	1.79 ± 1.24*	2.27 ± 0.45
Length (mm)	11.0 ± 0.4	16.5 ± 2.1	13.2 ± 1.0	11.0 ± 0.4	10.7 ± 0.5 ^{αβ}	12.1 ± 0.7 ^α	11.8 ± 1.3 ^α
Normal development (%)	93.1 ± 5.0	100 ± 0.0	89.6 ± 12.5	100 ± 0.0	100 ± 0.0	100 ± 0.0	93.8 ± 12.5
20 µg/L Cu							
Hatch (%)	100 ± 0.0	NT	NT	NT	93.3 ± 5.4	96.7 ± 3.8	100 ± 0.0
Survival (%)	80.0 ± 9.4	NT	NT	NT	83.3 ± 3.8	75.0 ± 32.8	90.0 ± 12.8
Biomass (mg)	2.49 ± 0.11	NT	NT	NT	2.31 ± 0.19	2.43 ± 0.59	2.61 ± 0.25
Length (mm)	11.0 ± 0.4	NT	NT	NT	10.7 ± 0.7	11.6 ± 1.1	11.0 ± 0.6
Normal development (%)	97.5 ± 5.0	NT	NT	NT	98.1 ± 3.8	100 ± 0.0	100 ± 0.0

SD = Standard Deviation, NT = Not Tested

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

^β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

[†] Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

Summary of Results (continued)

Endpoint	Mean ± SD						
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	LC_SLC (Site Control)	FR_FRCP1	GH_FR1
<i>O. mykiss</i>							
Survival (%)	92.7 ± 6.6	89.2 ± 8.7	90.0 ± 3.8	96.7 ± 0.0	93.4 ± 4.7	84.9 ± 12.6 [†]	88.1 ± 4.6
Viability (%)	88.7 ± 11.2	87.5 ± 9.6	89.2 ± 3.2	95.0 ± 1.9	91.7 ± 6.4	82.4 ± 11.0 [†]	84.7 ± 6.7
Length (mm)	21.9 ± 0.8	22.2 ± 0.3	23.1 ± 0.5	23.0 ± 0.8	23.0 ± 0.4	22.6 ± 0.8	23.2 ± 0.6
Wet weight (mg)	114.8 ± 20.0	115.2 ± 19.7	120.1 ± 20.8	120.3 ± 27.2	124.2 ± 22.7	123.7 ± 21.2	132.4 ± 16.0

SD = Standard Deviation

[†]Result was significantly lower than site control CM_MC1

Summary of Results (continued)

Endpoint	Mean ± SD				
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<i>O. mykiss</i>					
Survival (%)	91.0 ± 7.2	98.3 ± 2.0	86.7 ± 8.2 [†]	86.8 ± 7.8 [†]	94.2 ± 3.2
Viability (%)	90.1 ± 7.0	96.6 ± 4.7	85.0 ± 6.9	83.4 ± 6.7 [†]	91.7 ± 1.9
Length (mm)	23.0 ± 0.4	23.1 ± 0.6	23.4 ± 1.0	23.3 ± 0.4	22.7 ± 1.1
Wet weight (mg)	122.5 ± 21.3	127.0 ± 25.1	129.2 ± 23.8	129.4 ± 28.2	125.3 ± 18.0

SD = Standard Deviation, NT = Not Tested

[†]Result was significantly lower than the site control CM_MC1

1.0 INTRODUCTION

Nautilus Environmental conducted toxicity tests for Teck Coal Ltd. on samples collected from various locations in the Elk Valley as part of a quarterly toxicity testing program required under BC Ministry of Environment and Climate Change permit number 107517. Test species required to be tested quarterly include a cladoceran (*Ceriodaphnia dubia*), a unicellular green alga (*Pseudokirchneriella subcapitata*), an amphipod (*Hyaella azteca*), and the fathead minnow (*Pimephales promelas*). Tests are also required on a semi-annual basis (in alignment with second and fourth quarter testing) using rainbow trout (*Oncorhynchus mykiss*).

Water samples used for testing were transported in 20-L plastic containers in coolers containing ice packs, or in 200-L plastic drums. Samples were received at temperatures ranging from 4.4 to 13.6°C and were stored in the dark at $4 \pm 2^\circ\text{C}$ prior to testing. Table 1 summarizes the toxicity tests that were conducted on each sample as well as sample collection dates. Samples were collected weekly on the dates shown in Table 1 for the duration of the *H. azteca*, *P. promelas* and *O. mykiss* tests. The *P. promelas* test was conducted at the Nautilus Environmental laboratory in Calgary, AB; the other toxicity tests were conducted at the Burnaby, BC location.

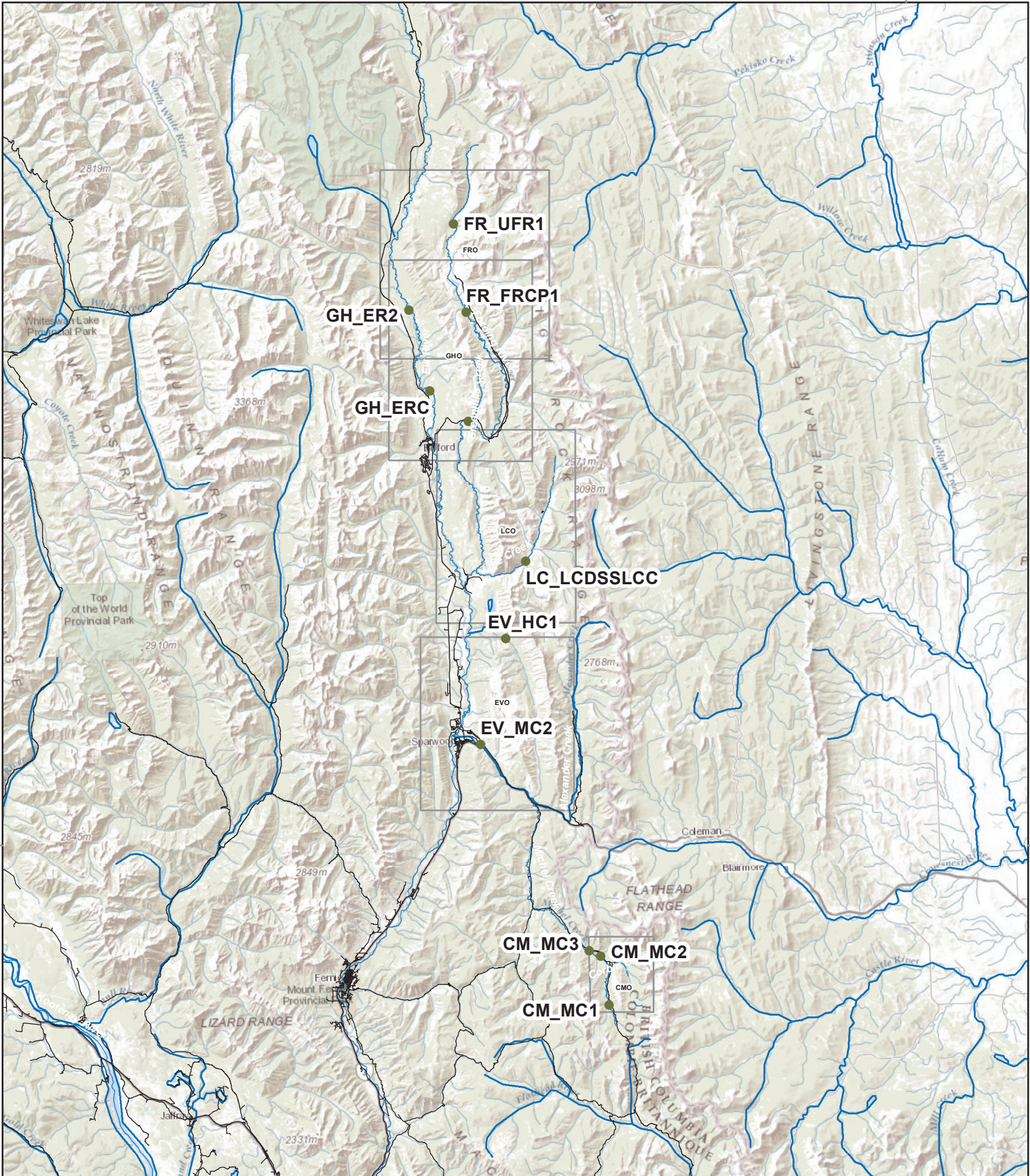
This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through E. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management System database. These samples were collected by Teck personnel at the same time the samples were collected for toxicity testing. The chain-of-custody forms are provided in Appendix F.

Table 1. Summary of toxicity testing program.

Sample ID	EMS Location ID	Species Tested	Sample Collection Dates †
FR_UFR1 *	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
LC_SLC *	E282149	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
GH_ERC	E300090	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
EV_MC2	E300091	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018 7
EV_HC1	E102682	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
CM_MC3		<i>C. dubia</i> and <i>H. azteca</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018
LC_LCDSSLCC	E297110	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>O. mykiss</i>	April 30 and May 8, 15, 22, 29 and June 5, 2018

* Site water controls

† The *C. dubia*, *P. subcapitata* and *H. azteca* tests began with samples collected on April 30, 2018 and the *O. mykiss* and *P. promelas* test began with samples collected on May 8, 2018.

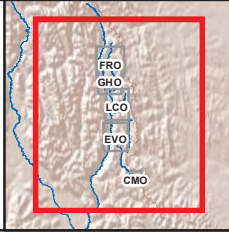


5,500,000

5,500,000

Teck

The maps and map data are provided 'as is' without any guarantee, representation, condition or warranty of any kind, either express, implied, or statutory. Teck Resources Limited assumes no liability with respect to any reliance the user places in the maps and map data, and the user assumes the entire risk as to the truth, accuracy, currency, or completeness of the information contained in the maps and map data.



Chronic Toxicity Monitoring Locations

- Roads
- Rivers
- Monitoring Locations

DATE: 7/24/2018	MINE OPERATION: Elk Valley
SCALE: 1:550,000	COORDINATE SYSTEM: NAD 1983 UTM Zone 11N

2.0 METHODS

Methods for the toxicity tests using *C. dubia*, *P. subcapitata*, *H. azteca*, *P. promelas* and *O. mykiss* are summarized in Tables 2 through 6. Laboratory control water was 20% Perrier water prepared with deionized water for *C. dubia*; dechlorinated City of Calgary municipal tap water for *P. promelas*; reconstituted water prepared by addition of reagent grade salts to dechlorinated Metro Vancouver municipal tap water according to a recipe provided in Environment Canada (2013) for *H. azteca*; and dechlorinated Metro Vancouver municipal tap water for *O. mykiss*.

For the *H. azteca* tests, all of the site waters were supplemented with 25 mg/L chloride and 0.02 mg/L bromide using NaCl and NaBr, respectively, according to recommendations of the *Hyaella* Advisory Group (chaired by Chris Ingersoll, USGS) (Norberg-King et al., 2014), since low concentrations of these halides are known to impair growth of this species. The laboratory control water contained approximately 75 mg/L chloride and 0.8 mg/L bromide, respectively.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Kszos et al., 1997; Downey et al. 2000). Results of toxicity tests and Toxicity Identification Evaluation efforts conducted in 2015 indicated that artefactual toxicity (i.e., adverse effects that were not associated with toxicants in the sample) had occurred in fathead minnow tests using ambient water samples from the Elk Valley and amendment of the samples with a low dose of copper appeared to counteract the adverse effect. Consequently, the *P. promelas* tests were tested on the samples with addition of 10 µg/L copper, in order to reduce the potential adverse effects caused by fungi and microbes in the samples. Three of the site waters (FR_FRCP1, GH_FR1 and CM_MC2) were also tested using 20 µg/L copper to evaluate whether higher concentration of copper was necessary to control microbial growth in these samples, which contained a higher hardness than the other samples. Copper-amended control water treatments using the same concentration of copper were also evaluated to test whether the copper itself caused any adverse response.

Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013), and involved comparison of results to both the laboratory and site water controls.

Table 2. Test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	<i>Ceriodaphnia dubia</i>
Organism source	In-house culture
Organism age	<24 hour old neonates, produced within a 12 hour window
Test type	Static-renewal
Test duration	7 ± 1 day
Test vessel	20-mL glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Control water	20% Perrier water and 80% deionized water + 5 µg/L Se and 2 µg/L vitamin B12
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with <i>Pseudokirchneriella subcapitata</i> and YCT (3:1 ratio)
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival and reproduction checked daily
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and reproduction ≥80% survival; ≥15 young per surviving control producing three broods; ≥60% of controls producing three or more broods; no ephippia present
Test acceptability criteria for controls	
Reference toxicant	Sodium chloride (NaCl)

Table 3. Test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	<i>Pseudokirchneriella subcapitata</i> , strain CPCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Full strength sample diluted to 95.2% (v/v) by addition of nutrients, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control and site control
Number of organisms	10,000 cells/mL
Control water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007b), EPS 1/RM/25
Statistical software	CETIS Version 1.8.7
Test endpoints	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as ZnSO ₄)

Table 4. Test conditions: *Hyalella azteca* survival and growth test.

Test species	<i>Hyalella azteca</i>
Organism source	Aquatic Research Organisms, NH
Organism age	7- to 8-days old
Test type	Static-renewal
Test duration	28 days
Test vessel	375-mL glass container
Test volume	300 mL
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	5 per treatment
Number of organisms	10 per replicate
Control water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples were supplemented with 25 mg/L Cl and 0.02 mg/L Br.
Test solution renewal	Twice daily (~80% renewal)
Test temperature	23 ± 1°C
Feeding	1 mL of YCT daily to each container. Tetramin daily, with amounts increasing weekly: Week 1: 0.25 mg, Week 2: 0.5 mg, Week 3: 1 mg, Week 4: 1.5 mg in each test container.
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; hardness and alkalinity measured at test termination; total ammonia measured at test initiation and termination
Test protocol	Modified from US EPA (2000), as described in Norberg-King et al. (2014)
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	Mean control survival of ≥80% survival
Reference toxicant	Sodium chloride (NaCl)

Table 5. Test conditions: *Pimephales promelas* survival and growth test.

Test species	<i>Pimephales promelas</i>
Organism source	Aquatox, Hot Springs, AR
Organism age	<24 hours
Test type	Static-renewal
Test duration	From egg stage until 28 days post hatch
Test vessel	1-L plastic container
Test volume	1 L
Test concentrations	100% (undiluted) sample amended with 10 or 20 µg/L Cu, plus laboratory control and control amended with 10 or 20 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control water	Dechlorinated City of Calgary municipal tapwater
Test solution renewal	Daily (80% renewal)
Test temperature	25 ± 1°C
Feeding	Twice a day, after hatch, with newly hatched brine shrimp (<i>Artemia nauplii</i>)
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None unless dissolved oxygen fell to less than 60% saturation
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; survival checked daily
Test protocol	US EPA (1996) and ASTM (2013)
Statistical software	CETIS Version 1.8.7
Test endpoints	Hatch, survival, length, biomass, normal development (which assesses incidence of deformities)
Test acceptability criteria for controls	>66% hatch, ≥70% post-hatch survival
Reference toxicant	Sodium chloride (NaCl)

Table 6. Test conditions: *Oncorhynchus mykiss* embryo-alevin test.

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Troutlodge, Sumner, WA
Gamete quality	Small amount of water added to milt on a dry glass slide; verification of vigorous sperm motility using a compound microscope (100 X magnification)
Organism age	<30 minutes post fertilization, <24 hour old gametes
Test type	Static-renewal
Test duration	Test terminated 7 days after $\geq 50\%$ of controls hatch
Test vessel	4-L plastic containers
Test volume	2 L
Test solution depth	17 cm
Test concentrations	100% (undiluted sample), plus laboratory control
Test replicates	4 per treatment
Number of organisms	30 per replicate
Control water	Dechlorinated Metro Vancouver municipal tap water
Test solution renewal	Daily (80% renewal)
Test temperature	14 \pm 1°C
Feeding	None
Light intensity	Dark
Photoperiod	24 hours dark; low intensity light used during solution renewals
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured upon arrival; survival checked daily
Test protocol	Environment Canada (1998), EPS 1/RM/28
Statistical software	CETIS Version 1.8.7
Test endpoint	Survival, viability (which assesses incidence of deformities), length, wet weight
Test acceptability criteria for controls	$\geq 65\%$ normally developed hatched fish
Reference toxicant	Sodium dodecyl sulphate (SDS)

3.0 RESULTS

3.1 *Ceriodaphnia dubia*

Results of the toxicity tests using *C. dubia* are provided in Table 7. The Fording River (FR_UFR1) and Michel Creek (CM_MC1) site waters performed similarly to the laboratory controls for this species, indicating that there were no adverse effects associated with the upstream Fording River and Michel Creek stations. Reproduction was reduced in Elk River (GH_ER2) and South Line Creek (LC_SLC) site water controls by 24% and 23% in comparison to the laboratory control and by 25% and 23% in comparison to Michel Creek (CM_MC1) site water control.

There were no adverse effects on *C. dubia* survival; survival ranged from 90 to 100% in all samples and control treatments. A statistically significant reduction in reproduction of *C. dubia* was observed in all samples compared to the laboratory control, with the exception of two samples (EV_HC1 and EV_MC2); the reduction in the affected samples ranged from 23 to 60%. Relative to the Fording River site water control, a significant reduction in reproduction was observed in four samples (FR_FRCP1, GH_ERC, CM_MC2 and LC_LCDSSLCC); reduction in reproduction ranged from 37 to 60%. A significant reduction was observed in three samples (GH_ERC, CM_MC2 and LC_LCDSSLCC) relative to the Elk River site water control; reduction in reproduction ranged from 38 to 60%. A significant reduction was observed in all samples relative to the Michel Creek site water control; reduction in reproduction ranged from 24 to 60%. Relative to the South Line Creek site water control, a significant reduction in reproduction was observed in two samples (CM_MC2 and LC_LCDSSLCC); the reduction in the affected samples ranged from 46 to 48%.

3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 8. In these tests, the four site water controls produced 2.2 to 4.4-fold greater growth than the laboratory control. This finding is not unusual, since the higher ionic strength associated with the site water controls would be expected to stimulate cell growth of this species relative to the very low ionic strength associated with the laboratory control water. There was a reduction of cell growth in the Fording River (FR_UFR1) site water control relative to Elk River (GH_ER2) and Michel Creek (CM_MC1) site water control. There was a reduction of cell growth in the Elk River (GH_ER2) site water control relative to Michel Creek (CM_MC1) site water control. There was a reduction of cell growth in the Fording River (FR_UFR1) and Elk River (GH_ER2) site water controls relative to the South Line Creek (LC_SLC) site water control.

There were no adverse effects on cell yield in any of the samples compared to the laboratory control; stimulation of cell growth relative to the control ranged between 178.5 and 360.7%. There was a statistically significant reduction of cell growth in all samples relative to Michel Creek (CM_MC1) and South Line Creek (LC_SLC) site water controls, with the exception of samples EV_MC2 and LC_LCDSSLCC; the reduction in the affected samples ranged from 7 to 36%. One sample (FR_FRCP1) exhibited a statistically significant reduction of 24% of growth relative to GH_ER2.

3.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 9. Survival and dry weight in the site water controls were similar to the laboratory control for this species, indicating that there was no adverse effect associated with the upstream Fording River (FR_UFR1), Elk River (GH_ER2) and Michel Creek (CM_MC1) stations for these endpoints. Survival of *H. azteca* in sample CM_MC2 was statistically reduced compared to the laboratory control, Fording River (FR_UFR1), Elk River (GH_ER2), Michel Creek (CM_MC2) and South Line Creek (LC_SLC); percent reduction ranged from 44 to 47%. Dry weight of *H. azteca* in sample CM_MC2 was statistically reduced relative to the FR_UFR1, CM_MC1 and LC_SLC site water controls; percent reduction ranged from 18 to 23%.

3.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 10. There were no adverse effects associated with the upstream Fording River (FR_UFR1), Elk River (GH_ER2) and Michel Creek stations (CM_MC1) for hatch, length and normal development (i.e., incidence of deformities) were similar between site water controls and the laboratory control. However, there was a reduction observed on survival and biomass in Fording River (FR_UFR1) and Elk River (GH_ER2) site water controls relative to the laboratory control; percent reduction was 94 and 64% for survival and 81 and 40% for biomass, respectively.

Sample GH_FR1 exhibited a 41 and 49% reduction in survival relative to the laboratory control and Michel Creek (CM_MC1) site water control, respectively.

Samples FR_FRCP1, GH_FR1 and CM_MC2 exhibited a significant reduction for the length endpoint relative to Fording River (FR_UFR1) site water controls and, in the case of FR_FRCP1 also to the Elk River site water control (GH_ER2). However, these two site water controls had significantly reduced survival and surviving fish exhibited greater growth in these controls, likely as a result of additional access to food resulting from the lower density (i.e., following mortality

of a subset of the fish in these samples). Thus, this apparent effect on length in these samples is not likely to have been a real adverse response, particularly since the samples did not show a reduction in length relative to the laboratory control.

For the three samples that were tested following amendment of the samples with 20 µg/L copper, survival was generally improved with 75 to 90% survival being observed in these samples, and no statistically significant adverse responses.

Microbial growth was noted on the mortalities in all of the site water samples tested with 10 µg/L copper, with the exceptions of samples CM_MC1 and FR_FRCP1. Microbial growth was also noted in one replicate of GH_FR1 treated with 20 µg/L copper; this replicate had 26.7% survival, compared with an average of 91% survival in the other three replicates. As with previous test events in which microbial growth was noted, the mortalities occurred predominantly between days 6 and 12 of exposure, which is consistent with the conclusion that the adverse responses were associated with microbial growth. Thus, it appears that 10 µg/L copper was not sufficient to curtail microbial growth in these tests with a subset of the samples.

3.5 *Oncorhynchus mykiss*

Results of the toxicity tests using *O. mykiss* are provided in Table 11. The Fording River (FR_UFR1), Elk River (GH_ER2), Michel Creek (CM_MC1) and South Line Creek (LC_SLC) site water controls and laboratory control performed similarly for this species, indicating that there were no adverse effects associated with the upstream stations.

There were no adverse effects observed in any of the samples relative to the laboratory control or Fording River (FR_UFR1), Elk River (GH_ER2) and South Line Creek (LC_SLC) site water controls. There was a small, but significant reduction of survival in samples FR_FRCP1, EV_HC1 and CM_MC2 relative to site water control CM_MC1; percent reduction was 12, 10 and 10%, respectively. There was also a small but significant reduction in viability in samples FR_FRCP1 and CM_MC2 relative to site water control CM_MC1; percent reduction was 13 and 12%.

Table 7. Results: *Ceriodaphnia dubia* survival and reproduction test.

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	17.6 ± 2.5
FR_UFR1 (Site Control)	100	17.7 ± 7.3
GH_ER2 (Site Control)	90	13.3 ± 6.1 ^{*†}
CM_MC1 (Site Control)	100	22.3 ± 6.7
LC_SLC (Site Control)	100	13.6 ± 3.5 ^{*†}
FR_FRCP1	100	11.2 ± 4.2 ^{*α†}
GH_FR1	100	12.6 ± 1.6 ^{*†}
GH_ERC	100	10.9 ± 1.9 ^{*αβ†}
EV_MC2	90	16.6 ± 2.9 [†]
EV_HC1	100	17.0 ± 5.2 [†]
CM_MC2	100	7.4 ± 4.2 ^{*αβ†Σ}
CM_MC3	100	12.2 ± 4.1 ^{*†}
LC_LCDSSLCC	100	7.1 ± 2.0 ^{*αβ†Σ}

SD = Standard Deviation

* Result was significantly lower than the laboratory control

α Result was significantly lower than the site control FR_UFR1

β Result was significantly lower than the site control GH_ER2

† Result was significantly lower than the site control CM_MC1

Σ Result was significantly lower than the site control LC_SLC

Table 8. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Sample ID	Cell Yield (x 10 ⁴ cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
Laboratory Control	33.8 ± 2.1	-
FR_UFR1 (Site Control)	75.4 ± 5.6 ^{*β§Σ}	123.3
GH_ER2 (Site Control)	123.3 ± 6.5 ^{*§Σ}	265.2
CM_MC1 (Site Control)	145.3 ± 8.4 [*]	330.4
LC_SLC (Site Control)	147.5 ± 3.1 [*]	337.0
FR_FRCP1	94.0 ± 4.5 ^{*β§Σ}	178.5
GH_FR1	121.5 ± 2.6 ^{*§Σ}	260.0
GH_ERC	122.8 ± 4.3 ^{*§Σ}	263.7
EV_MC2	155.5 ± 5.3 [*]	360.7
EV_HC1	122.3 ± 4.3 ^{*§Σ}	262.2
CM_MC2	135.3 ± 6.2 ^{*§Σ}	300.7
LC_LCDSSLCC	147.5 ± 4.8 [*]	337.0

SD = Standard Deviation

^{*} Result was significantly higher than the laboratory control^β Result was significantly lower than the site control GH_ER2[§] Result was significantly lower than the site control CM_MC1^Σ Result was significantly lower than the site control LC_SLC**Table 9. Results: *Hyalella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	94.0 ± 5.5	0.34 ± 0.03
FR_UFR1 (Site Control)	96.0 ± 5.5	0.41 ± 0.02
GH_ER2 (Site Control)	98.0 ± 4.5	0.40 ± 0.03
CM_MC1 (Site Control)	96.0 ± 5.5	0.43 ± 0.03
LC_SLC (Site Control)	98.0 ± 4.5	0.43 ± 0.02
FR_FRCP1	98.0 ± 4.5	0.44 ± 0.02
GH_FR1	92.0 ± 13.0	0.50 ± 0.07
CM_MC2	52.0 ± 27.8 [*]	0.33 ± 0.04 ^α
CM_MC3	96.0 ± 5.5	0.44 ± 0.05
LC_LCDSSLCC	90.0 ± 14.1	0.37 ± 0.12

SD = Standard Deviation

^{*} Result was significantly lower than the laboratory control, FR_UFR1, CM_MC1, GH_ER2 and LC_SLC^α Result was significantly lower than the site control FR_UFR1, CM_MC1 and LC_SLC

Table 10. Results: *Pimephales promelas* survival and growth test.

Sample ID	(Mean ± SD)				
	Hatch (%)	Survival (%)	Biomass (mg)	Length (mm)	Normal development (%)
Laboratory Control	96.7 ± 3.8	88.3 ± 3.3	2.54 ± 0.25	11.2 ± 0.3	96.2 ± 4.4
10 µg/L Cu treatment					
Laboratory Control [+Cu]	100.0 ± 0.0	82.1 ± 14.5	2.58 ± 0.15	11.0 ± 0.4	93.1 ± 5.0
FR_UFR1 (Site Control) [+Cu]	100 ± 0.0	5.0 ± 6.4 *	0.48 ± 0.55 *	16.5 ± 2.1	100 ± 0.0
GH_ER2 (Site Control) [+Cu]	96.7 ± 3.8	31.7 ± 6.4 *	1.51 ± 0.05 *	13.2 ± 1.0	89.6 ± 12.5
CM_MC1 (Site Control) [+Cu]	98.3 ± 3.3	95.0 ± 3.3	2.50 ± 0.31	11.0 ± 0.4	100 ± 0.0
FR_FRCP1 [+Cu]	100.0 ± 0.0	95.0 ± 3.3	2.51 ± 0.16	10.7 ± 0.5 ^{αβ}	100 ± 0.0
GH_FR1 [+Cu]	98.3 ± 3.3	48.3 ± 35.0 ^{*†}	1.79 ± 1.24 *	12.1 ± 0.7 ^α	100 ± 0.0
CM_MC2 [+Cu]	98.3 ± 3.3	71.7 ± 31.4 [†]	2.27 ± 0.45	11.8 ± 1.3 ^α	93.8 ± 12.5
20 µg/L Cu treatment					
Laboratory Control [+Cu]	100.0 ± 0.0	80.0 ± 9.4	2.49 ± 0.11	11.0 ± 0.4	97.5 ± 5.0
FR_FRCP1 [+Cu]	93.3 ± 5.4	83.3 ± 3.8	2.31 ± 0.19	10.7 ± 0.7	98.1 ± 3.8
GH_FR1 [+Cu]	96.7 ± 3.8	75.0 ± 32.8	2.43 ± 0.59	11.6 ± 1.1	100 ± 0.0
CM_MC2 [+Cu]	100.0 ± 0.0	90.0 ± 12.8	2.61 ± 0.25	11.0 ± 0.6	100 ± 0.0

SD = Standard Deviation

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

^β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

[†] Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

Table 11. Results: *Oncorhynchus mykiss* embryo-alevin test.

Sample ID	(Mean ± SD)			
	Survival (%)	Viability (%)	Length (mm)	Wet weight (mg)
Laboratory Control	92.7 ± 6.6	88.7 ± 11.2	21.9 ± 0.8	114.8 ± 20.0
FR_UFR1 (Site Control)	89.2 ± 8.7	87.5 ± 9.6	22.2 ± 0.3	115.2 ± 19.7
GH_ER2 (Site Control)	90.0 ± 3.8	89.2 ± 3.2	23.1 ± 0.5	120.1 ± 20.8
LC_SLC (Site Control)	93.4 ± 4.7	91.7 ± 6.4	23.0 ± 0.4	124.2 ± 22.7
CM_MC1 (Site Control)	96.7 ± 0.0	95.0 ± 1.9	23.0 ± 0.8	120.3 ± 27.2
FR_FRCP1	84.9 ± 12.6 ^α	82.4 ± 11.0 ^α	22.6 ± 0.8	123.7 ± 21.2
GH_FR1	88.1 ± 4.6	84.7 ± 6.7	23.2 ± 0.6	132.4 ± 16.0
GH_ERC	91.0 ± 7.2	90.1 ± 7.0	23.0 ± 0.4	122.5 ± 21.3
EV_MC2	98.3 ± 2.0	96.6 ± 4.7	23.1 ± 0.6	127.0 ± 25.1
EV_HC1	86.7 ± 8.2 ^α	85.0 ± 6.9	23.4 ± 1.0	129.2 ± 23.8
CM_MC2	86.8 ± 7.8 ^α	83.4 ± 6.7 ^α	23.3 ± 0.4	129.4 ± 28.2
LC_LCDSSLCC	94.2 ± 3.2	91.7 ± 1.9	22.7 ± 1.1	125.3 ± 18.0

SD = Standard Deviation

^α Result was significantly lower than the site control CM_MC1

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the test protocols. The tests met all control acceptability criteria and water quality parameters remained within the ranges specified in the protocols throughout the tests. Uncertainty associated with these tests is best described by the standard deviations around the means.

There were no deviations from test methodologies, other than the planned modification to the *H. azteca* method and addition of copper in the *P. promelas* tests, as described in Section 2.0, with the exception that the eggs in the rainbow trout embryo-alevin test were exposed using a blocked design (i.e., eggs from one fish was used for replicate A of each test concentration, eggs from the second fish for replicate B, and so on); this approach deviates from the Environment Canada test method, which indicates that the eggs should be pooled prior to testing. However, this modification is considered appropriate because it reduces the risk of non-viable eggs affecting the test results, since in the event that one of the batches of eggs had been non-viable, it would have been possible to exclude data for that replicate.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 12. Results for these tests fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate. The reference toxicant tests were performed under the same conditions as those used for the samples.

Table 12. Reference toxicant test results.

Test species	Endpoint	Historical mean (2 SD Range)	CV (%)	Test date
<i>C. dubia</i>	Survival (LC50): 2.1 g/L NaCl	2.0 (1.8 – 2.3)	7	May 2, 2018
	Reproduction (IC50): 1.5 g/L NaCl	1.3 (0.9 – 2.0)	23	
<i>P. subcapitata</i>	Growth (IC50): 28.8 µg/L Zn	31.8 (26.1 – 38.7)	10	April 20, 2018
<i>H. azteca</i>	Survival (LC50): 6.4 g/L NaCl	5.8 (5.0 – 6.7)	8	May 3, 2018
<i>P. promelas</i>	Survival (LC50): 4.4 g/L NaCl	6.6 (3.2 – 13.5)	24	May 15, 2018
	Biomass (IC25): 2.8 g/L NaCl	2.7 (1.2 – 6.0)	28	
<i>O. mykiss</i>	Viability (EC50): 4.9 mg/L SDS	4.2 (2.0 – 8.7)	45	May 9, 2018

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, EC = Effect Concentration

5.0 REFERENCES

- ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 p.
- ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates and amphibians. E729-80, 25p
- Downey PJ, Flemmin K, Guinn R, Chapman N, Varner P, Cooney JD. 2000. Sporadic mortality in chronic toxicity tests using *Pimephales promelas* (Rafinesque): Cases of characterization and control. *Environ Toxicol Chem* 19:248-255.
- Environment Canada. 2013. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyalella azteca*. EPS 1/RM/33, Second Edition, January 2013.
- Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.
- Environment Canada. 2007b. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.
- Environment Canada. 1998. Biological test method: toxicity tests using early life stages of salmonid fish (rainbow trout). Environmental Protection Series EPS 1/RM/28. Second Edition, July 1998. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 102 pp.
- Grothe DR, Johnson DE. 1996. Bacterial interference in whole-effluent toxicity tests. *Environ Toxicol Chem* 15:761-764.
- Kszos LA, Stewart AJ, Sumner JR. 1997. Evidence that variability in ambient fathead minnow short-term chronic tests is due to pathogenic infection. *Environ Toxicol Chem* 6:351-356
- Norberg-King TJ, Hockett R, Mount DR, Ivey C, Ingersoll C, Kemble N, Brumbaugh B, Hammer E, Soucek D, Taylor L. 2014. Inter-lab testing of *Hyalella azteca* water and sediment methods: 3. Results from 10- to 42-d tests conducted with the new water-only method. Proceedings of SETAC, Vancouver, BC, Canada, November 09 - 13, 2014.

USEPA. 1996. Ecological Effects Test Guidelines. OPPTS 850.1400 Fish Early-Life Stage Toxicity Test. EPA-712-C-96-121, Public Draft.

USEPA. 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. EPA 600/R-99/064. March 2000.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.8.7.16 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client: TECK
Work Order No.: 180710

Start Date/Time: May 3/18 @ 0700h
Set up by: KL

Sample Information:

Sample ID: various (see below)
Sample Date: Apr-May 30/18
Date Received: May 1/18
Sample Volume: 2-8 x 20L

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: B004251813
Age of young (Day 0): <24-h (within 12-h)
Avg No. young in first 3 broods of previous 7 d: 21
Mortality (%) in previous 7 d: 0
Individual female # used ≥ 8 young on test day: 21-29, 31-34

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cl 183
Stock Solution ID: 18 NaO1 (100g/L NaCl)
Date Initiated: May 2/18

7-d LC50 (95% CL): 21 (1.5-3.0) g/L NaCl
7-d IC50 (95% CL): 15 (4-17) (0.7-1.8) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 20 (1.8-2.3) g/L NaCl CV (%): 7
7-d IC50 Reference Toxicant Mean and Historical Range: 13 (0.8-2.0) g/L NaCl CV (%): 23

Test Results:

	Survival (%)	Reproduction (Mean \pm SD)	
Negative Control	100	17.6 \pm 2.5	*reproduction significantly less than control
Site Control FR-UPP1-WS-2018-04-30-124	100	17.7 \pm 7.3	
Site Control QH-EP2-WS-2018-04-30-N	90	13.3 \pm 6.1 ^{*c}	a-reproduction significantly less than site control FR-UPP1
Site Control CM-MC1-B2-WS-2018-04-30-N	100	22.3 \pm 6.7 ^{***}	
FR-FRCP1-WS-2018-04-30-156	100	11.2 \pm 4.2 ^{*ac}	b-reproduction significantly less than site control
QH-FR1-WS-2018-04-30-N	100	12.6 \pm 1.6 ^{*c}	
QH-EP1-WS-2018-04-30-N	100	10.9 \pm 1.9 ^{*abc}	
EV-HC1-WS-2018-04-30-N	100	17.0 \pm 5.2 ^c	c-site reproduction significantly less than site control
EV-MC2-WS-2018-04-30-N	90	16.6 \pm 2.9 ^c	

Reviewed by: [Signature]

Date reviewed: June 22, 2018

Ceriodaphnia dubia Summary Sheet

Client: Teche
 Work Order No.: 180710

Start Date/Time: May 3/18 @ 0700h
 Set up by: vi

Sample Information:

Sample ID: Various (see below)
 Sample Date: Apr-May 30/18
 Date Received: May 1/18
 Sample Volume: 2-8 x 20L

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: B8042518 B
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 21
 Mortality (%) in previous 7 d: 0
 Individual female # used ≥ 8 young on test day: 21-29, 31-34

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cd183
 Stock Solution ID: 18NaO1 (100g/L NaCl)
 Date Initiated: May 2/18

7-d LC50 (95% CL): 2.1 (1.5 - 3.0) g/L NaCl
 7-d IC50 (95% CL): 1.5 (0.7 - 1.8) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.3) g/L NaCl CV (%): 7
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.3 (0.9 - 2.0) g/L NaCl CV (%): 23

Test Results:

d. reproduction significantly less than LC_SLC (site control)

site control

	Survival (%)	Reproduction (Mean \pm SD)
Negative Control	100	17.6 \pm 2.5
CM_M12_02_W5_20180430_N	100	7.4 \pm 4.2 *abc d
CM_M13_02_W5_20180430_N	100	12.2 \pm 4.1 *c
LC_LC05SLC_W5_2017-04-24_N	100	7.1 \pm 2.0 *abc d
LC_SLC_W5_2017-04-25_N	100	13.6 \pm 3.5 *c
		\pm nk
		\pm
		\pm
		\pm

a. reproduction significantly less than control
b. reproduction significantly less than site control (site control)
c. reproduction significantly less than site control
CM_M12

Reviewed by: [Signature]

Date reviewed: June 22, 2018

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teel
 Sample ID: various (see below)
 Work Order #: 180710

Start Date & Time: May 2/18 @ 07:00h
 Stop Date & Time: May 9/18 @ 15:00h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration COMPO	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	25.0	25.0	25.0	25.0	26.0			
DO (mg/L)	7.9	7.0	8.2	7.5	8.0	7.1	8.2	7.3	7.8	7.4	7.9	7.0				
pH	8.1	8.2	8.0	7.7	7.7	7.8	8.0	7.8	7.9	7.7	7.8	7.5				
Cond. (µS/cm)	222		220		222		223		223		221		221			
Initials	W		W		A		A		W		W		CW			

Concentration FRUPE1	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	25.0	25.0	26.0				
DO (mg/L)	8.4	7.7	8.2	7.6	8.1	7.3	8.1	7.5	8.4	7.6	8.2	7.3				
pH	8.0	7.9	8.1	8.0	7.9	7.8	8.0	7.7	7.8	7.7	7.8	7.6				
Cond. (µS/cm)	232		231		236		239		234		234		230			
Initials	W		W		A		A		W		W		CW			

Concentration GHEP2	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	25.0	24.0	25.0				
DO (mg/L)	8.2	7.7	8.2	7.6	8.1	7.7	8.1	7.5	8.4	7.5	8.2	7.6				
pH	7.9	7.9	8.1	7.8	8.0	8.0	8.0	8.0	7.9	7.9	7.8	7.9				
Cond. (µS/cm)	306		302		296		300		306		306		298			
Initials	W		W		A		A		W		W		CW			

Concentration CM.MCI	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	25.0	24.0	25.0				
DO (mg/L)	8.2	7.7	8.2	7.7	8.1	7.3	8.1	7.5	8.4	7.5	8.2	7.3				
pH	7.8	7.9	8.0	7.9	8.0	7.8	8.0	7.8	7.8	7.8	7.8	7.7				
Cond. (µS/cm)	240		239		239		243		240		239		236			
Initials	W		W		A		A		W		W		CW			

Thermometer: 4 DO meter/probe: 1/1 pH meter/probe: 1/1 Conductivity meter/probe: 1/1

	Control	FRUPE1	GHEP2	CM.MCI
Hardness*	100	148	270	126
Alkalinity*	98	102	152	108

Analysts: W, A, CW

Reviewed by: [Signature]

Date reviewed: June 1, 2018

* mg/L as CaCO3

Sample Description: ① & ②: clear, colourless, odourless, some brown particulates; ③: clear, colourless, odourless, no particulates.

Comments: Broodboard Used: B8042518 B (#21-29, 31, 32, 34, 33)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: various (see below)
 Work Order #: 180710

Start Date & Time: May 3/18 @ 0700h
 Stop Date & Time: May 9/18 @ 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

④ ^{6L/10} Concentration FR-FRCP1	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	25.0		
DO (mg/L)	8.1	7.7	8.1	7.5	8.1	7.2	8.0	7.6	8.4	7.5	8.2	7.2			
pH	8.0	7.9	8.1	8.0	8.0	8.0	8.0	7.8	7.8	7.8	7.8	7.9			
Cond. (µS/cm)	609		611		616		618	616	624		612		601		
Initials	K		K		A		A		K		K		CW		

⑤ Concentration CH-FR1	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	25.0			
DO (mg/L)	8.1	7.7	8.1	7.4	8.1	7.1	8.0	7.5	8.4	7.5	8.2	7.4			
pH	8.0	7.9	8.1	8.0	8.0	8.0	8.0	7.9	7.9	8.0	7.9	7.9			
Cond. (µS/cm)	600		593		595		600	596		594		583			
Initials	K		K		A		A		K		K		CW		

⑥ Concentration CH-ERC	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	25.0			
DO (mg/L)	8.1	7.7	8.1	7.5	8.2	7.3	8.0	7.5	8.4	7.5	8.2	7.4			
pH	7.9	8.0	8.1	8.0	8.0	8.0	8.0	7.9	7.9	7.9	8.0	7.9			
Cond. (µS/cm)	357		354		356		360	356	350		356		350		
Initials	K		K		A		A		K		K		CW		

⑦ Concentration EV-HCI	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	25.0			
DO (mg/L)	8.1	7.7	8.1	7.6	8.2	7.3	8.1	7.5	8.4	7.5	8.2	7.4			
pH	8.1	8.0	8.2	8.0	8.0	8.1	8.0	7.9	7.9	8.0	8.0	7.9			
Cond. (µS/cm)	514		502		508		511	510		513		499			
Initials	K		K		A		A		K		K		CW		

Thermometer: 4 DO meter/probe: 1, 1 pH meter/probe: 1, 1 Conductivity meter/probe: 1, 1

	Control	CH-FR1	CH-ERC	EV-HCI
Hardness*	350	420	250	370
Alkalinity*	138	150	146	154

Analysts: KL, AWO, CW
 Reviewed by: [Signature]
 Date reviewed: June 1, 2018

* mg/L as CaCO3

Sample Description: ④⑥⑦: clear, colourless, odourless, some brown particulates ; ⑤: slightly turbid, colourless, odourless, brown particulates

Comments: Broodboard Used: B60425 i&B (#21-29, 31-34)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various (see below)
 Work Order #: 18010

Start Date & Time: May 3/18 0700h
 Stop Date & Time: May 9/18 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration Ev-MC2	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	25.0		
DO (mg/L)	8.1	7.9	8.1	7.5	8.1	7.4	8.1	7.7	8.4	7.4	8.2	7.4			
pH	7.9	8.0	8.0	8.0	8.0	7.8	8.0	7.7	7.9	7.8	8.0	7.8			
Cond. (µS/cm)	339		336		342		347		343		342		338		
Initials	K		K		A		A		K		K		CW		

Concentration CM-MC2	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	26.0			
DO (mg/L)	8.1	7.9	8.1	7.4	8.1	7.2	8.0	7.5	8.4	7.2	8.2	8.4			
pH	7.9	8.0	8.1	8.0	8.0	8.0	8.0	8.2	7.9	8.0	7.9	8.2			
Cond. (µS/cm)	706		698		699		699		697		690		690		
Initials	K		K		A		A		K		K		CW		

① 7.4

Concentration CM-MC3	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	26.0			
DO (mg/L)	8.1	7.9	8.1	7.5	8.1	7.3	8.1	7.4	8.4	7.5	8.2	8.4			
pH	8.0	8.1	8.1	8.1	8.0	8.0	8.0	8.2	7.9	8.0	8.1	8.2			
Cond. (µS/cm)	477		477		480		483		476		471		466		
Initials	K		K		A		A		K		K		CW		

Concentration U-CCOSS-LL	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	26.0			
DO (mg/L)	8.1	7.8	8.1	7.5	8.1	7.3	8.0	7.6	8.4	7.6	8.1	7.7			
pH	8.2	8.1	8.2	8.1	8.1	8.1	8.1	8.1	7.9	8.1	8.0	8.1			
Cond. (µS/cm)	477		711		712		712		706		706		694		
Initials	K		K		A		A		K		K		CW		

Thermometer: 4 DO meter/probe: 1 / 1 pH meter/probe: 1 / 1 Conductivity meter/probe: 1 / 1

	Control	CM-MC2	CM-MC3	U-CCOSS-LL
Hardness*	140	420	152	400
Alkalinity*	110	170	144	156

Analysts: KL, PLD, CW
 Reviewed by: [Signature]
 Date reviewed: June 1, 2018

* mg/L as CaCO3

Sample Description: ⑧, ⑩, ⑪: clear, colourless, odourless, some brown particulates

Comments: Broodboard Used: B804518B (#21-29, 31-34)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECC
 Sample ID: Nauticus (see below)
 Work Order #: 180710

Start Date & Time: May 2/18 @ 0700h
 Stop Date & Time: May 9/18 @ 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration <i>to LC-50</i>	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	26.0			
DO (mg/L)	8.1	7.8	8.2	7.5	8.1	7.3	8.1	7.7	8.4	7.4	8.1	7.8				
pH	8.1	8.4	8.2	8.1	8.0	7.9	8.1	7.9	7.9	7.8	8.1	7.9				
Cond. (µS/cm)	296	296		296		300	300		296		297		292			
Initials	KL	KL		A		A			KL		KL		CW			

Concentration	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)																
DO (mg/L)																
pH																
Cond. (µS/cm)																
Initials																

Concentration	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)																
DO (mg/L)																
pH																
Cond. (µS/cm)																
Initials																

Concentration	Days															
	0		1		2		3		4		5		6		7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)																
DO (mg/L)																
pH																
Cond. (µS/cm)																
Initials																

Thermometer: 4 DO meter/probe: 1 / 1 pH meter/probe: 1 / 1 Conductivity meter/probe: (/)

	Control	KL	LC-50														
Hardness*			162														
Alkalinity*			134														

Analysts: KL, AMP, CW
 Reviewed by: [Signature]
 Date reviewed: June 1, 2018

* mg/L as CaCO3

Sample Description: clear, colorless, odourless, some brown particulates

Comments: Broodboard Used: BBO42518B (#21-29, 31-34)

Chronic Freshwater Toxicity Test *C. dubia* Reproduction Data

Client: Teck
 Sample ID: VARIOUS (see below)
 Work Order: 180710

Start Date & Time: May 3 19C 0700h
 Stop Date & Time: May 9 19C 1500h
 Set up by: K

0.6 (1/10)

Days	Concentration: <u>Control</u>											Concentration: <u>FR-HFP1 (100)</u>											Concentration: <u>AH-GR2 (100)</u>												
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init		
1	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K
2	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2
3	3	4	4	✓	✓	4	4	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	CW
4	✓	✓	✓	3	4	✓	4	4	3	2	CW	5	3	6	5	6	5	4	6	5	4	CW	7	5	X	2	4	✓	4	4	✓	5	CW		
5	5	5	6	5	6	5	7	8	5	6	CW	2	✓	6	✓	✓	7	✓	9	✓	7	CW	✓	✓		2	2	4	7	✓	7	✓	CW		
6	8	8	9	10	6	7	9	11	8	7	K	4	6	12	8	8	14	8	13	9	15	K	9	7		10	10	5	10	7	11	8	K		
7																																			
8																																			
Total	16	17	19	18	16	16	20	23	16	15	K	11	9	24	13	14	17	12	28	14	26	K	16	12	0 ^x	14	16	9	21	11	21	13	K		

Days	Concentration: <u>CM-MC1 (100)</u>											Concentration: <u>FR-FRCP1 (100)</u>											Concentration: <u>AH-FR1 (100)</u>												
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init		
1	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K
2	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2
3	2	✓	3	✓	✓	✓	✓	✓	3	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
4	✓	6	5	6	3	6	7	5	✓	6	CW	5	4	6	7	2	✓	4	5	5	5	CW	✓	3	✓	4	✓	4	4	4	2	4	CW		
5	8	11	✓	8	✓	✓	10	10	7	10	CW	✓	✓	✓	✓	5	✓	✓	✓	✓	✓	CW	5	✓	4	✓	5	✓	✓	✓	5	✓	CW		
6	12	14	8	11	9	7	11	13	11	11	K	9	7	8	8	4	✓	7	6	7	8	K	10	7	8	8	9	8	8	8	8	8	K		
7																																			
8																																			
Total	22	31	16	25	12	13	28	28	21	27	K	14	11	14	15	11	0	11	11	12	13	K	15	10	12	12	14	12	12	12	15	12	K		

Days	Concentration: <u>AH-FR2 (100)</u>											Concentration: <u>EV-MC1 (100)</u>											Concentration: <u>EV-MC2 (100)</u>												
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init		
1	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K	/	/	/	/	/	/	/	/	/	/	/	K
2	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2	/	/	/	/	/	/	/	/	/	/	/	2
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	3	✓	4	3	4	4	✓	✓	3	✓	CW	
4	3	5	6	4	4	4	4	4	2	5	CW	5	5	✓	5	3	6	5	5	4	5	CW	✓	7	✓	✓	✓	✓	5	6	✓	✓	CW		
5	✓	✓	✓	✓	✓	✓	✓	✓	4	✓	CW	7	8	5	✓	7	✓	5	7	✓	7	CW	6	✓	8	8	5	7	7	✓	6	9	CW		
6	6	7	6	9	4	4	7	8	7	6	K	9	✓	6	8	11	7	11	9	7	13	K	4	8 ^x	10	7	9	7	✓	9	8	9	K		
7																																			
8																																			
Total	9	12	12	13	8	8	11	12	13	11	K	21	13	11	13	21	13	21	21	11	25	K	13	15 ^x	22	18	18	18	12	15	17	18	K		

Notes: X = mortality.

Sample Description: See Well Sheet

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: [Signature]

Date reviewed: June 1, 2018

Chronic Freshwater Toxicity Test C. dubia Reproduction Data

Client: TeX
 Sample ID: Various (see below)
 Work Order: 180410

Start Date & Time: May 3 11:00 0700h
 Stop Date & Time: May 9 1:00 1500h
 Set up by: W

% (w/w)

Days	Concentration: <u>0.1-100 (100)</u>												Concentration: <u>0.1-100 (100)</u>												Concentration: <u>0.1-100 (100)</u>											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W		
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W		
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	OW	✓	2	✓	✓	✓	✓	✓	✓	✓	3	OW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	OW			
4	4	✓	2	✓	✓	3	4	5	4	✓	CW	5	✓	6	3	4	6	5	6	2	✓	CW	✓	3	2	✓	3	3	✓	✓	3	2	CW			
5	✓	5	4	✓	✓	✓	✓	✓	✓	3	CW	✓	7	✓	5	✓	✓	✓	✓	3	5	CW	2	✓	3	4	✓	✓	4	3	✓	4	CW			
6	3	3	3	✓	✓	4	4	3	8	6	CW	6	6	7	9	2	6	7	8	✓	9	CW	2	2	5	3	3	3	5	6	3	3	CW			
7																																				
8																																				
Total	9	10	11	0	0	7	8	8	12	9	W	11	15	13	17	6	12	12	14	5	17	W	4	5	10	7	6	6	9	9	6	9	W			

Days	Concentration: <u>0.1-100 (100)</u>												Concentration:												Concentration:											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W	X																								
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W	W																								
3	✓	✓	4	✓	✓	4	✓	✓	✓	✓	OW																									
4	4	4	✓	✓	5	✓	5	5	6	5	OW																									
5	✓	✓	7	3	✓	6	7	9	✓	✓	OW																									
6	7	7	6	6	8	5	9	✓	8	6	CW																									
7																																				
8																																				
Total	11	11	17	9	13	15	21	14	14	11	W																									

Days	Concentration:												Concentration:												Concentration:											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1																																				
2																																				
3																																				
4																																				
5																																				
6																																				
7																																				
8																																				
Total																																				

Notes: X = mortality.

Sample Description: See well sheet
 Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: [Signature] Date reviewed: June 1, 2018

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 1 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Batch ID: 14-8708-8534 Test Type: Reproduction-Survival (7d) Analyst: Jill Sones
 Start Date: 03 May-18 07:00 Protocol: EC/EPS 1/RM/21 Diluent:
 Ending Date: 09 May-18 15:00 Species: Ceriodaphnia dubia Brine:
 Test Length: 6d 8h Taxon: Branchiopoda Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	① FR_UFR1, GH_ER2, CM_MC1 + LC_SLC are reference sites	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed 7d survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 4 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed 7d survival rate	1
12-8860-7495	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed 7d survival rate	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9962	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9474	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	LC_SLC passed reproduction	1

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 5 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.6008	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8426	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.2100	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.9985	GH_FR1 passed reproduction	1

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 6 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	1.0000	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	CM_MC2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	CM_MC3 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	FR_UFR1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	LC_SLC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	LC_LCDSSLCC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	Lab Control failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	GH_ERC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	GH_ER2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	EV_MC2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	FR_FRCP1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	GH_FR1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	EV_HC1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0078	CM_MC1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	GH_FR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	LC_SLC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	FR_FRCP1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	GH_ER2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	GH_ERC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	LC_LCDSSLCC passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	CM_MC3 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	EV_HC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	FR_UFR1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	CM_MC1 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	EV_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	Lab Control passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.8310	CM_MC2 passed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	GH_ERC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	Lab Control failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	GH_FR1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	LC_LCDSSLCC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	LC_SLC failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	EV_HC1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	CM_MC2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	CM_MC3 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	FR_UFR1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	CM_MC1 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	EV_MC2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	GH_ER2 failed reproduction	1
18-6306-5153	Reproduction	Steel Many-One Rank Sum Test	0.0016	FR_FRCP1 failed reproduction	1

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 7 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

7d Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
LC_SLC	XC	10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_UFR1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_ER2		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
CM_MC1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_FRCP1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_FR1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_ERC		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
EV_HC1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
EV_MC2		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
CM_MC2		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC3		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
LC_LCDSSLCC		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	10	17.6	15.84	19.36	15	23	0.7775	2.459	13.97%	0.00%
LC_SLC	XC	10	13.6	11.09	16.11	9	21	1.108	3.502	25.75%	22.73%
FR_UFR1		10	17.7	12.44	22.96	9	28	2.324	7.349	41.52%	-0.57%
GH_ER2		10	13.3	8.928	17.67	0	21	1.932	6.111	45.95%	24.43%
CM_MC1		10	22.3	17.51	27.09	12	31	2.119	6.701	30.05%	-26.70%
FR_FRCP1		10	11.2	8.188	14.21	0	15	1.332	4.211	37.60%	36.36%
GH_FR1		10	12.6	11.47	13.73	10	15	0.4989	1.578	12.52%	28.41%
GH_ERC		10	10.9	9.532	12.27	8	13	0.6046	1.912	17.54%	38.07%
EV_HC1		10	17	13.24	20.76	11	25	1.66	5.249	30.88%	3.41%
EV_MC2		10	16.6	14.52	18.68	12	22	0.9214	2.914	17.55%	5.68%
CM_MC2		10	7.4	4.418	10.38	0	12	1.318	4.169	56.33%	57.95%
CM_MC3		10	12.2	9.283	15.12	5	17	1.289	4.077	33.42%	30.68%
LC_LCDSSLCC		10	7.1	5.652	8.548	4	10	0.6403	2.025	28.52%	59.66%

CETIS Summary Report

Report Date: 10 Oct-18 13:43 (p 8 of 8)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	N	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	N	16	17	19	18	16	16	20	23	16	15
LC_SLC	XC	11	11	17	9	13	15	21	14	14	11
FR_UFR1		11	9	24	13	14	26	12	28	14	26
GH_ER2		16	12	0	14	16	9	21	11	21	13
CM_MC1		22	31	16	25	12	13	28	28	21	27
FR_FRCP1		14	11	14	15	11	0	11	11	12	13
GH_FR1		15	10	12	12	14	12	12	12	15	12
GH_ERC		9	12	12	13	8	8	11	12	13	11
EV_HC1		21	13	11	13	21	13	21	21	11	25
EV_MC2		13	15	22	18	18	18	12	15	17	18
CM_MC2		9	10	11	0	0	7	8	8	12	9
CM_MC3		11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC		4	5	10	7	6	6	9	9	6	9

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	N	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC	XC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 22 May-18 16:45 (p 1 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-2481-1996	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 22 May-18 16:27	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 8h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-5429-2697	02 May-18	02 May-18	31h	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Teck Coal	Lab Control (20% perrier)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Control	FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Lab Control	GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
Lab Control	CM_MC1	1	1.0000	Exact	Non-Significant Effect
Lab Control	FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Lab Control	GH_FR1	1	1.0000	Exact	Non-Significant Effect
Lab Control	GH_ERC	1	1.0000	Exact	Non-Significant Effect
Lab Control	EV_HC1	1	1.0000	Exact	Non-Significant Effect
Lab Control	EV_MC2	0.5	1.0000	Exact	Non-Significant Effect
Lab Control	CM_MC2	1	1.0000	Exact	Non-Significant Effect
Lab Control	CM_MC3	1	1.0000	Exact	Non-Significant Effect
Lab Control	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
Lab Control	LC_SLC	1	1.0000	Exact	Non-Significant Effect

FR_UFR1, GH_ER2 and CM_MC1 are site controls

CETIS Analytical Report

Report Date: 22 May-18 16:45 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-2481-1996 Endpoint: 7d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 22 May-18 16:27 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Negative Contr	10	0	10	1	0	0.0%
FR_UFR1	10	0	10	1	0	0.0%
GH_ER2	9	1	10	0.9	0.1	10.0%
CM_MC1	10	0	10	1	0	0.0%
FR_FRCP1	10	0	10	1	0	0.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
EV_MC2	9	1	10	0.9	0.1	10.0%
CM_MC2	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
LC_SLC	10	0	10	1	0	0.0%

7d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	1	0	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
FR_FRCP1	1	1	1	1	1	1	1	1	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	0	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
LC_SLC	1	1	1	1	1	1	1	1	1	1

7d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

EW
 June 1/18

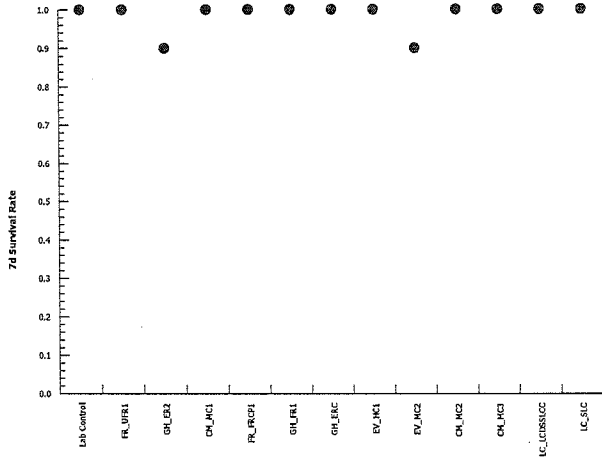
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-2481-1996 Endpoint: 7d Survival Rate
Analyzed: 22 May-18 16:27 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 22 May-18 16:46 (p 1 of 3)
Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-4889-2659	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 22 May-18 16:30	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 8h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ERC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_MC2	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC3	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_SLC	1	1.0000	Exact	Non-Significant Effect

FR_UFR1, GH_ER2 and CM_MC1 are the controls

[Signature]
June 11/18

CETIS Analytical Report

Report Date: 22 May-18 16:46 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-4889-2659 Endpoint: 7d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 22 May-18 16:30 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	10	0	10	1	0	0.0%
GH_ER2	9	1	10	0.9	0.1	10.0%
CM_MC1	10	0	10	1	0	0.0%
FR_FRCP1	10	0	10	1	0	0.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
EV_MC2	9	1	10	0.9	0.1	10.0%
CM_MC2	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
LC_SLC	10	0	10	1	0	0.0%

7d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	1	0	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
FR_FRCP1	1	1	1	1	1	1	1	1	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	0	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
LC_SLC	1	1	1	1	1	1	1	1	1	1

7d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

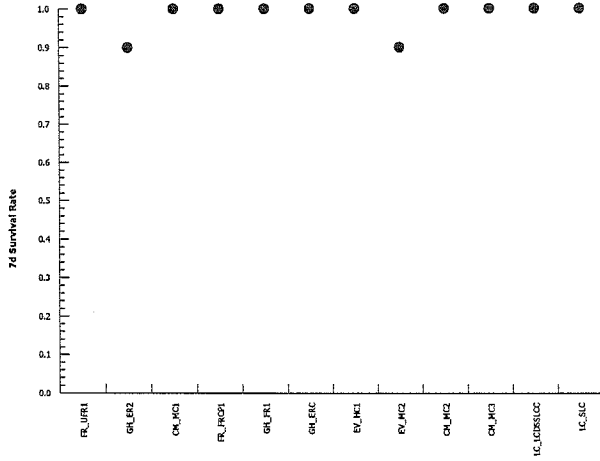
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-4889-2659 Endpoint: 7d Survival Rate
Analyzed: 22 May-18 16:30 Analysis: STP 2X2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 22 May-18 16:46 (p 3 of 3)
Test Code: 180710 | 07-4140-7544

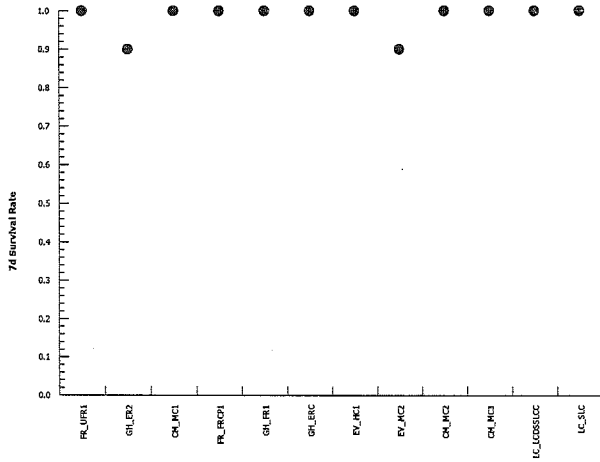
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-5842-5675 Endpoint: 7d Survival Rate
Analyzed: 22 May-18 16:33 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 22 May-18 16:47 (p 1 of 3)
Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-4313-5496	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 22 May-18 16:35	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 8h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	Teck Coal	
① GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
① CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① CM_MC1	① FR_UFR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1	① GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1	FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
CM_MC1	GH_FR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1	GH_ERC	1	1.0000	Exact	Non-Significant Effect
CM_MC1	EV_HC1	1	1.0000	Exact	Non-Significant Effect
CM_MC1	EV_MC2	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1	CM_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1	CM_MC3	1	1.0000	Exact	Non-Significant Effect
CM_MC1	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
CM_MC1	LC_SLC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 and CM_MC1 are site controls

[Handwritten Signature]
 June 1/18

CETIS Analytical Report

Report Date: 22 May-18 16:47 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-4313-5496 Endpoint: 7d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 22 May-18 16:35 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	10	0	10	1	0	0.0%
GH_ER2	9	1	10	0.9	0.1	10.0%
CM_MC1 Site Control	10	0	10	1	0	0.0%
FR_FRCP1	10	0	10	1	0	0.0%
GH_FR1	10	0	10	1	0	0.0%
GH_ERC	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
EV_MC2	9	1	10	0.9	0.1	10.0%
CM_MC2	10	0	10	1	0	0.0%
CM_MC3	10	0	10	1	0	0.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
LC_SLC	10	0	10	1	0	0.0%

7d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	1	0	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1
FR_FRCP1	1	1	1	1	1	1	1	1	1	1
GH_FR1	1	1	1	1	1	1	1	1	1	1
GH_ERC	1	1	1	1	1	1	1	1	1	1
EV_HC1	1	1	1	1	1	1	1	1	1	1
EV_MC2	1	0	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	1	1	1	1	1	1	1
CM_MC3	1	1	1	1	1	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
LC_SLC	1	1	1	1	1	1	1	1	1	1

7d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_FR1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 10 Oct-18 11:51 (p 1 of 3)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-8860-7495	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 11:46	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-8708-8534	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent:
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 8h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-2018043000	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	1.0000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect

① site control = LC_SLC

CETIS Analytical Report

Report Date: 10 Oct-18 11:51 (p 2 of 3)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-8860-7495 Endpoint: 7d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 11:46 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
LC_SLC	XC	10	0	10	1	0	0.0%
FR_UFR1		10	0	10	1	0	0.0%
GH_ER2		9	1	10	0.9	0.1	10.0%
CM_MC1		10	0	10	1	0	0.0%
FR_FRCP1		10	0	10	1	0	0.0%
GH_FR1		10	0	10	1	0	0.0%
GH_ERC		10	0	10	1	0	0.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		9	1	10	0.9	0.1	10.0%
CM_MC2		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
LC_SLC	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
LC_SLC	XC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 10 Oct-18 11:51 (p 3 of 3)
Test Code/ID: 180710c / 11-8330-6532

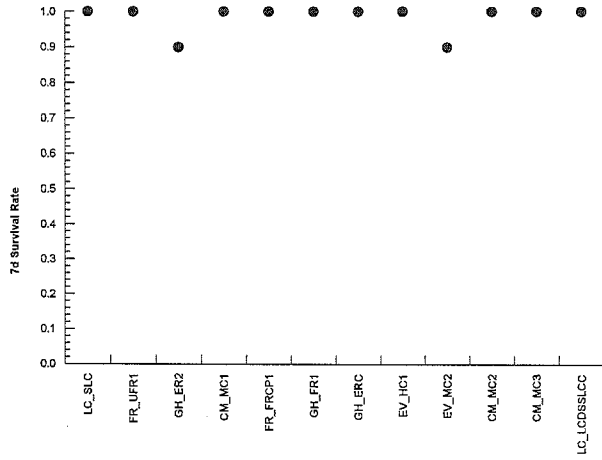
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-8860-7495 Endpoint: 7d Survival Rate
Analyzed: 10 Oct-18 11:46 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 1 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-7507-9103	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 20 Jun-18 18:49	Analysis: Nonparametric-Two Sample	Official Results: Yes
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 8h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-5429-2697	02 May-18	02 May-18	31h	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Teck Coal	Lab Control (20% perrier)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.4%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control	①	FR_UFR1	95	NA	0	18	0.2340	Exact	Non-Significant Effect
	②	GH_ER2	79	NA	1	18	0.0232	Exact	Significant Effect
	③	CM_MC1	126	NA	1	18	0.9471	Exact	Non-Significant Effect
		FR_FRCP1	55.5	NA	1	18	<0.0001	Exact	Significant Effect
		GH_FR1	56	NA	1	18	<0.0001	Exact	Significant Effect
		GH_ERC	55	NA	0	18	<0.0001	Exact	Significant Effect
		EV_HC1	101	NA	0	18	0.3956	Exact	Non-Significant Effect
		EV_MC2	96.5	NA	3	18	0.2683	Exact	Non-Significant Effect
		CM_MC2	55	NA	0	18	<0.0001	Exact	Significant Effect
		CM_MC3	66.5	NA	2	18	0.0010	Exact	Significant Effect
		LC_LCDSSLCC	55	NA	0	18	<0.0001	Exact	Significant Effect
		LC_SLC	70	NA	2	18	0.0030	Exact	Significant Effect

① FR_UFR1, GH_ER2, CM_MC1 are site controls

[Handwritten signature]
 Analyst: QA:

CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-7507-9103 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Jun-18 18:49 Analysis: Nonparametric-Two Sample Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2252.892	187.741	12	9.662	<0.0001	Significant Effect
Error	2273.3	19.42991	117			
Total	4526.192		129			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	45.29	26.22	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9841	0.9727	0.1321	Normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	17.6	15.84	19.36	16.5	15	23	0.7775	13.97%	0.0%
FR_UFR1	10	17.7	12.44	22.96	14	9	28	2.324	41.52%	-0.57%
GH_ER2	10	13.3	8.928	17.67	13.5	0	21	1.932	45.95%	24.43%
CM_MC1	10	22.3	17.51	27.09	23.5	12	31	2.119	30.05%	-26.7%
FR_FRCP1	10	11.2	8.188	14.21	11.5	0	15	1.332	37.6%	36.36%
GH_FR1	10	12.6	11.47	13.73	12	10	15	0.4989	12.52%	28.41%
GH_ERC	10	10.9	9.532	12.27	11.5	8	13	0.6046	17.54%	38.07%
EV_HC1	10	17	13.24	20.76	17	11	25	1.66	30.88%	3.41%
EV_MC2	10	16.6	14.52	18.68	17.5	12	22	0.9214	17.55%	5.68%
CM_MC2	10	7.4	4.418	10.38	8.5	0	12	1.318	56.33%	57.95%
CM_MC3	10	12.2	9.283	15.12	12.5	5	17	1.289	33.42%	30.68%
LC_LCDSSLCC	10	7.1	5.652	8.548	6.5	4	10	0.6403	28.52%	59.66%
LC_SLC	10	13.6	11.09	16.11	13.5	9	21	1.108	25.75%	22.73%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	16	17	19	18	16	16	20	23	16	15
FR_UFR1	11	9	24	13	14	26	12	28	14	26
GH_ER2	16	12	0	14	16	9	21	11	21	13
CM_MC1	22	31	16	25	12	13	28	28	21	27
FR_FRCP1	14	11	14	15	11	0	11	11	12	13
GH_FR1	15	10	12	12	14	12	12	12	15	12
GH_ERC	9	12	12	13	8	8	11	12	13	11
EV_HC1	21	13	11	13	21	13	21	21	11	25
EV_MC2	13	15	22	18	18	18	12	15	17	18
CM_MC2	9	10	11	0	0	7	8	8	12	9
CM_MC3	11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC	4	5	10	7	6	6	9	9	6	9
LC_SLC	11	11	17	9	13	15	21	14	14	11

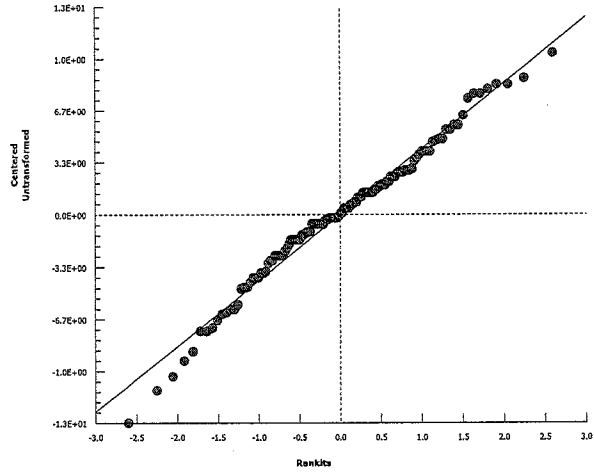
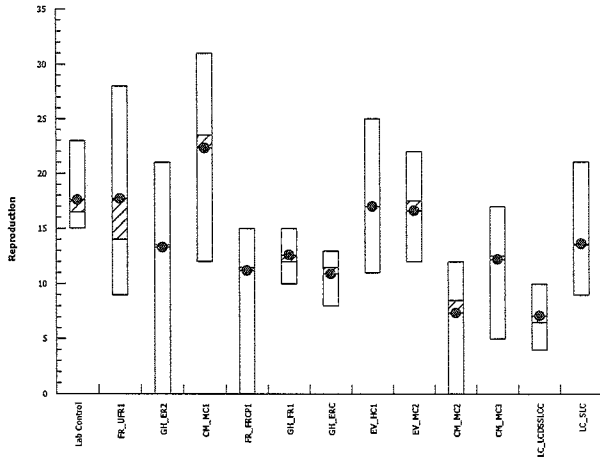
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-7507-9103 Endpoint: Reproduction
Analyzed: 20 Jun-18 18:49 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 1 of 3)
Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 15-9086-8395	Endpoint: Reproduction	CETIS Version: CETISv1.8.7			
Analyzed: 20 Jun-18 18:50	Analysis: Nonparametric-Two Sample	Official Results: Yes			
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:			
Duration: 6d 8h	Source: In-House Culture	Age: <24h			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	Teck Coal	
② GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
③ CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
② GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
③ CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.9%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① FR_UFR1		① GH_ER2	92	NA	5	18	0.1702	Exact	Non-Significant Effect
		② CM_MC1	124	NA	3	18	0.9264	Exact	Non-Significant Effect
		FR_FRCP1	83	NA	4	18	0.0485	Exact	Significant Effect
		GH_FR1	88	NA	2	18	0.0991	Exact	Non-Significant Effect
		GH_ERC	73	NA	4	18	0.0069	Exact	Significant Effect
		EV_HC1	99.5	NA	2	18	0.3474	Exact	Non-Significant Effect
		EV_MC2	109	NA	2	18	0.6233	Exact	Non-Significant Effect
		CM_MC2	61	NA	3	18	0.0002	Exact	Significant Effect
		CM_MC3	88	NA	4	18	0.1040	Exact	Non-Significant Effect
		LC_LCDSSLCC	57.5	NA	1	18	<0.0001	Exact	Significant Effect
		LC_SLC	91.5	NA	4	18	0.1597	Exact	Non-Significant Effect

FR_UFR1, GH_ER2, CM_MC1 are site controls.

June 21/18

CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental**

Analysis ID: 15-9086-8395 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Jun-18 18:50 Analysis: Nonparametric-Two Sample Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2097.092	190.6447	11	9.279	<0.0001	Significant Effect
Error	2218.9	20.54537	108			
Total	4315.991		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	40.98	24.72	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9841	0.9706	0.1707	Normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	17.7	12.44	22.96	14	9	28	2.324	41.52%	0.0%
GH_ER2	10	13.3	8.928	17.67	13.5	0	21	1.932	45.95%	24.86%
CM_MC1	10	22.3	17.51	27.09	23.5	12	31	2.119	30.05%	-25.99%
FR_FRCP1	10	11.2	8.188	14.21	11.5	0	15	1.332	37.6%	36.72%
GH_FR1	10	12.6	11.47	13.73	12	10	15	0.4989	12.52%	28.81%
GH_ERC	10	10.9	9.532	12.27	11.5	8	13	0.6046	17.54%	38.42%
EV_HC1	10	17	13.24	20.76	17	11	25	1.66	30.88%	3.96%
EV_MC2	10	16.6	14.52	18.68	17.5	12	22	0.9214	17.55%	6.22%
CM_MC2	10	7.4	4.418	10.38	8.5	0	12	1.318	56.33%	58.19%
CM_MC3	10	12.2	9.283	15.12	12.5	5	17	1.289	33.42%	31.07%
LC_LCDSSLCC	10	7.1	5.652	8.548	6.5	4	10	0.6403	28.52%	59.89%
LC_SLC	10	13.6	11.09	16.11	13.5	9	21	1.108	25.75%	23.16%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	11	9	24	13	14	26	12	28	14	26
GH_ER2	16	12	0	14	16	9	21	11	21	13
CM_MC1	22	31	16	25	12	13	28	28	21	27
FR_FRCP1	14	11	14	15	11	0	11	11	12	13
GH_FR1	15	10	12	12	14	12	12	12	15	12
GH_ERC	9	12	12	13	8	8	11	12	13	11
EV_HC1	21	13	11	13	21	13	21	21	11	25
EV_MC2	13	15	22	18	18	18	12	15	17	18
CM_MC2	9	10	11	0	0	7	8	8	12	9
CM_MC3	11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC	4	5	10	7	6	6	9	9	6	9
LC_SLC	11	11	17	9	13	15	21	14	14	11

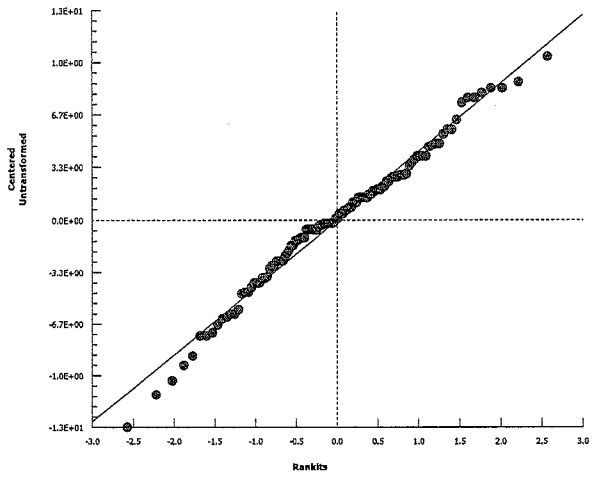
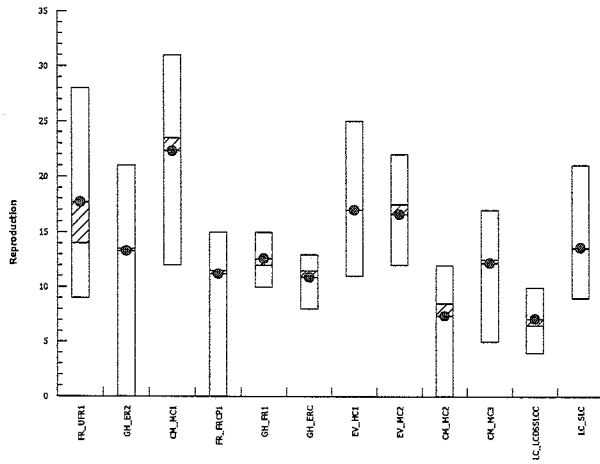
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 15-9086-8395 Endpoint: Reproduction
Analyzed: 20 Jun-18 18:50 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 1 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test				Nautilus Environmental	
Analysis ID:	19-5085-0197	Endpoint:	Reproduction	CETIS Version:	CETISv1.8.7
Analyzed:	20 Jun-18 18:52	Analysis:	Nonparametric-Two Sample	Official Results:	Yes
Batch ID:	19-6786-4943	Test Type:	Reproduction-Survival (7d)	Analyst:	Kania Lywe
Start Date:	03 May-18 07:00	Protocol:	EC/EPS 1/RM/21	Diluent:	20% Perrier Water
Ending Date:	09 May-18 15:00	Species:	Ceriodaphnia dubia	Brine:	
Duration:	6d 8h	Source:	In-House Culture	Age:	<24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	Teck Coal	
① GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
① CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	26.4%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① GH_ER2	① FR_UFR1	118	NA	5	18	0.8390	Exact	Non-Significant Effect
	① CM_MC1	139	NA	5	18	0.9966	Exact	Non-Significant Effect
	FR_FRCP1	90.5	NA	5	18	0.1381	Exact	Non-Significant Effect
	GH_FR1	95.5	NA	2	18	0.2437	Exact	Non-Significant Effect
	GH_ERC	83	NA	4	18	0.0490	Exact	Significant Effect
	EV_HC1	119.5	NA	4	18	0.8671	Exact	Non-Significant Effect
	EV_MC2	125	NA	2	18	0.9375	Exact	Non-Significant Effect
	CM_MC2	70	NA	4	18	0.0032	Exact	Significant Effect
	CM_MC3	98.5	NA	4	18	0.3214	Exact	Non-Significant Effect
	LC_LCDSSLCC	67.5	NA	1	18	0.0015	Exact	Significant Effect
	LC_SLC	102.5	NA	6	18	0.4330	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2, CM_MC1 are site controls.

[Signature]
 June 21/18

CETIS Analytical Report

Report Date: 20 Jun-18 18:52 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-5085-0197 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 20 Jun-18 18:52 Analysis: Nonparametric-Two Sample Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2097.092	190.6447	11	9.279	<0.0001	Significant Effect
Error	2218.9	20.54537	108			
Total	4315.991		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	40.98	24.72	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9841	0.9706	0.1707	Normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	17.7	12.44	22.96	14	9	28	2.324	41.52%	0.0%
GH_ER2	10	13.3	8.928	17.67	13.5	0	21	1.932	45.95%	24.86%
CM_MC1	10	22.3	17.51	27.09	23.5	12	31	2.119	30.05%	-25.99%
FR_FRCP1	10	11.2	8.188	14.21	11.5	0	15	1.332	37.6%	36.72%
GH_FR1	10	12.6	11.47	13.73	12	10	15	0.4989	12.52%	28.81%
GH_ERC	10	10.9	9.532	12.27	11.5	8	13	0.6046	17.54%	38.42%
EV_HC1	10	17	13.24	20.76	17	11	25	1.66	30.88%	3.96%
EV_MC2	10	16.6	14.52	18.68	17.5	12	22	0.9214	17.55%	6.22%
CM_MC2	10	7.4	4.418	10.38	8.5	0	12	1.318	56.33%	58.19%
CM_MC3	10	12.2	9.283	15.12	12.5	5	17	1.289	33.42%	31.07%
LC_LCDSSLCC	10	7.1	5.652	8.548	6.5	4	10	0.6403	28.52%	59.89%
LC_SLC	10	13.6	11.09	16.11	13.5	9	21	1.108	25.75%	23.16%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	11	9	24	13	14	26	12	28	14	26
GH_ER2	16	12	0	14	16	9	21	11	21	13
CM_MC1	22	31	16	25	12	13	28	28	21	27
FR_FRCP1	14	11	14	15	11	0	11	11	12	13
GH_FR1	15	10	12	12	14	12	12	12	15	12
GH_ERC	9	12	12	13	8	8	11	12	13	11
EV_HC1	21	13	11	13	21	13	21	21	11	25
EV_MC2	13	15	22	18	18	18	12	15	17	18
CM_MC2	9	10	11	0	0	7	8	8	12	9
CM_MC3	11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC	4	5	10	7	6	6	9	9	6	9
LC_SLC	11	11	17	9	13	15	21	14	14	11

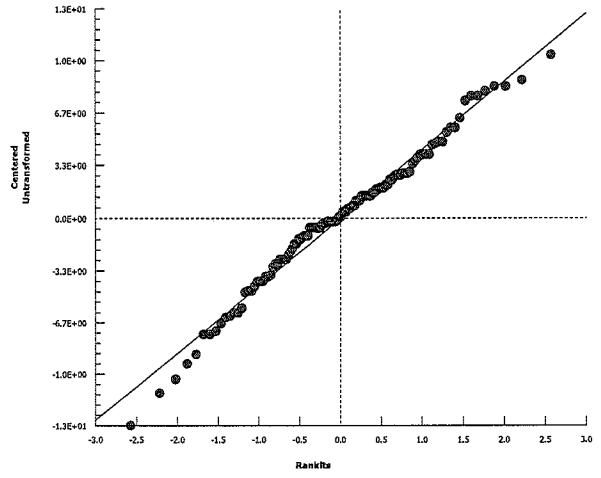
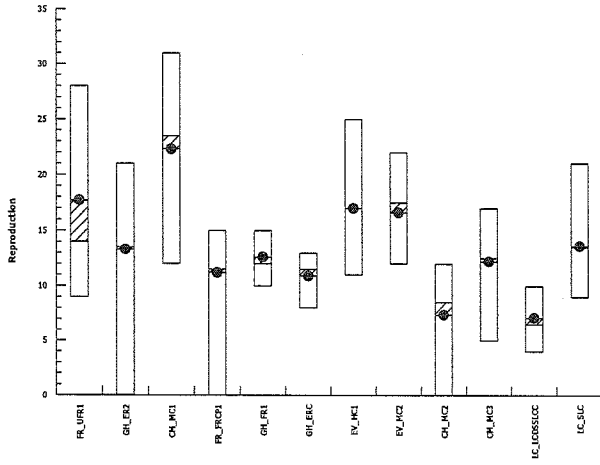
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-5085-0197 Endpoint: Reproduction
 Analyzed: 20 Jun-18 18:52 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7
 Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 21 Jun-18 19:24 (p 1 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 21-1495-1274	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 21 Jun-18 19:24	Analysis: Nonparametric-Two Sample	Official Results: Yes
Batch ID: 19-6786-4943	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 8h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)	Teck Coal	
① GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
① CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	15.8%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① CM_MC1	①	FR_UFR1	86	NA	3	18	0.0791	Exact	Non-Significant Effect
		GH_ER2	71	NA	4	18	0.0042	Exact	Significant Effect
		FR_FRCP1	63	NA	2	18	0.0003	Exact	Significant Effect
		GH_FR1	64	NA	1	18	0.0004	Exact	Significant Effect
		GH_ERC	59.5	NA	2	18	<0.0001	Exact	Significant Effect
		EV_HC1	79	NA	3	18	0.0231	Exact	Significant Effect
		EV_MC2	80.5	NA	3	18	0.0322	Exact	Significant Effect
		CM_MC2	55.5	NA	1	18	<0.0001	Exact	Significant Effect
		CM_MC3	67.5	NA	2	18	0.0015	Exact	Significant Effect
		LC_LCDSSLCC	55	NA	0	18	<0.0001	Exact	Significant Effect
		LC_SLC	69	NA	2	18	0.0024	Exact	Significant Effect

*←
 OFF-THE FR_UFR1, GH_ER2 and CM_MC1 are site controls*

CETIS Analytical Report

Report Date: 21 Jun-18 19:24 (p 2 of 3)
 Test Code: 180710 | 07-4140-7544

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 21-1495-1274 Endpoint: Reproduction CETIS Version: CETISv1.8.7
 Analyzed: 21 Jun-18 19:24 Analysis: Nonparametric-Two Sample Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2097.092	190.6447	11	9.279	<0.0001	Significant Effect
Error	2218.9	20.54537	108			
Total	4315.991		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	40.98	24.72	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9841	0.9706	0.1707	Normal Distribution

Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	17.7	12.44	22.96	14	9	28	2.324	41.52%	0.0%
GH_ER2	10	13.3	8.928	17.67	13.5	0	21	1.932	45.95%	24.86%
CM_MC1	10	22.3	17.51	27.09	23.5	12	31	2.119	30.05%	-25.99%
FR_FRCP1	10	11.2	8.188	14.21	11.5	0	15	1.332	37.6%	36.72%
GH_FR1	10	12.6	11.47	13.73	12	10	15	0.4989	12.52%	28.81%
GH_ERC	10	10.9	9.532	12.27	11.5	8	13	0.6046	17.54%	38.42%
EV_HC1	10	17	13.24	20.76	17	11	25	1.66	30.88%	3.96%
EV_MC2	10	16.6	14.52	18.68	17.5	12	22	0.9214	17.55%	6.22%
CM_MC2	10	7.4	4.418	10.38	8.5	0	12	1.318	56.33%	58.19%
CM_MC3	10	12.2	9.283	15.12	12.5	5	17	1.289	33.42%	31.07%
LC_LCDSSLCC	10	7.1	5.652	8.548	6.5	4	10	0.6403	28.52%	59.89%
LC_SLC	10	13.6	11.09	16.11	13.5	9	21	1.108	25.75%	23.16%

Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	11	9	24	13	14	26	12	28	14	26
GH_ER2	16	12	0	14	16	9	21	11	21	13
CM_MC1	22	31	16	25	12	13	28	28	21	27
FR_FRCP1	14	11	14	15	11	0	11	11	12	13
GH_FR1	15	10	12	12	14	12	12	12	15	12
GH_ERC	9	12	12	13	8	8	11	12	13	11
EV_HC1	21	13	11	13	21	13	21	21	11	25
EV_MC2	13	15	22	18	18	18	12	15	17	18
CM_MC2	9	10	11	0	0	7	8	8	12	9
CM_MC3	11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC	4	5	10	7	6	6	9	9	6	9
LC_SLC	11	11	17	9	13	15	21	14	14	11

Handwritten signature and date: Jme 22/18

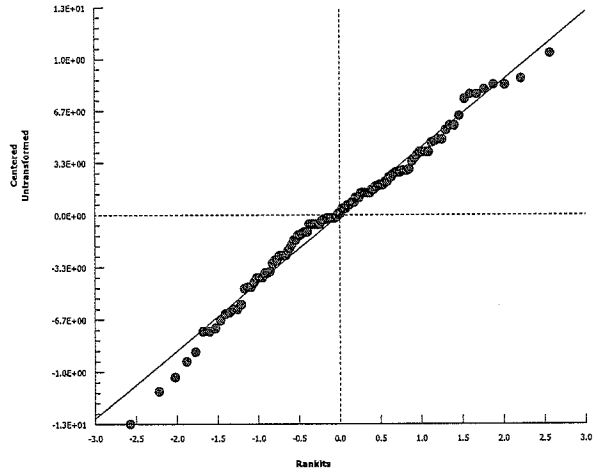
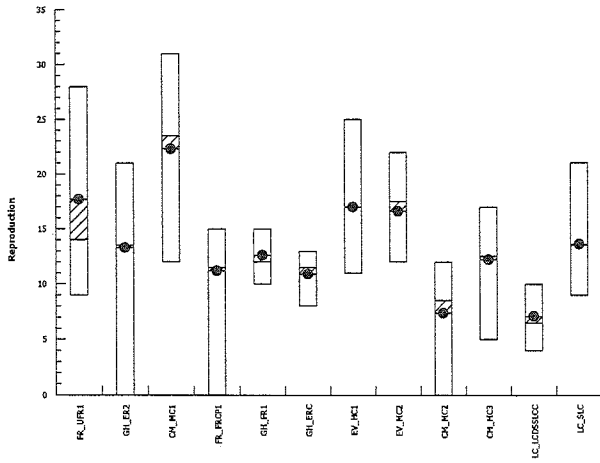
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 21-1495-1274 Endpoint: Reproduction
Analyzed: 21 Jun-18 19:24 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 10 Oct-18 11:50 (p 1 of 3)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 18-6306-5153	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 11:47	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 14-8708-8534	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 03 May-18 07:00	Protocol: EC/EPS 1/RM/21	Diluent:
Ending Date: 09 May-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 8h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	67h (4.8 °C)	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	67h (7.1 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	66h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	67h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	69h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	69h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	64h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	69h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	67h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	68h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	67h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	66h (6.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	

CETIS Analytical Report

Report Date: 10 Oct-18 11:50 (p 2 of 3)
 Test Code/ID: 180710c / 11-8330-6532

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 18-6306-5153 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 11:47 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	37.42%
		GH_ER2 passed reproduction	37.42%
		CM_MC1 passed reproduction	37.42%
		FR_FRCP1 passed reproduction	37.42%
		GH_FR1 passed reproduction	37.42%
		GH_ERC passed reproduction	37.42%
		EV_HC1 passed reproduction	37.42%
		EV_MC2 passed reproduction	37.42%
		CM_MC2 failed reproduction	37.42%
		CM_MC3 passed reproduction	37.42%
		LC_LCDSSLCC failed reproduction	37.42%

① site control = LC_SLC

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	118.5	72	4	18	CDF	0.9962	Non-Significant Effect
		GH_ER2	107.5	72	5	18	CDF	0.9474	Non-Significant Effect
		CM_MC1	141	72	2	18	CDF	1.0000	Non-Significant Effect
		FR_FRCP1	93	72	4	18	CDF	0.6008	Non-Significant Effect
		GH_FR1	101	72	2	18	CDF	0.8426	Non-Significant Effect
		GH_ERC	81.5	72	3	18	CDF	0.2100	Non-Significant Effect
		EV_HC1	121.5	72	3	18	CDF	0.9985	Non-Significant Effect
		EV_MC2	133	72	3	18	CDF	1.0000	Non-Significant Effect
		CM_MC2*	63.5	72	2	18	CDF	0.0078	Significant Effect
		CM_MC3	100.5	72	5	18	CDF	0.8310	Non-Significant Effect
	LC_LCDSSLCC*	57.5	72	1	18	CDF	0.0016	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2097.09	190.645	11	9.279	<1.0E-37	Significant Effect
Error	2218.9	20.5454	108			
Total	4315.99		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	40.98	24.72	2.4E-05	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9841	0.9706	0.1707	Normal Distribution

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
LC_SLC	XC	10	13.6	11.09	16.11	13.5	9	21	1.108	25.75%	0.00%
FR_UFR1		10	17.7	12.44	22.96	14	9	28	2.324	41.52%	-30.15%
GH_ER2		10	13.3	8.928	17.67	13.5	0	21	1.932	45.95%	2.21%
CM_MC1		10	22.3	17.51	27.09	23.5	12	31	2.119	30.05%	-63.97%
FR_FRCP1		10	11.2	8.188	14.21	11.5	0	15	1.332	37.60%	17.65%
GH_FR1		10	12.6	11.47	13.73	12	10	15	0.4989	12.52%	7.35%
GH_ERC		10	10.9	9.532	12.27	11.5	8	13	0.6046	17.54%	19.85%
EV_HC1		10	17	13.24	20.76	17	11	25	1.66	30.88%	-25.00%
EV_MC2		10	16.6	14.52	18.68	17.5	12	22	0.9214	17.55%	-22.06%
CM_MC2		10	7.4	4.418	10.38	8.5	0	12	1.318	56.33%	45.59%
CM_MC3		10	12.2	9.283	15.12	12.5	5	17	1.289	33.42%	10.29%
LC_LCDSSLCC		10	7.1	5.652	8.548	6.5	4	10	0.6403	28.52%	47.79%

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

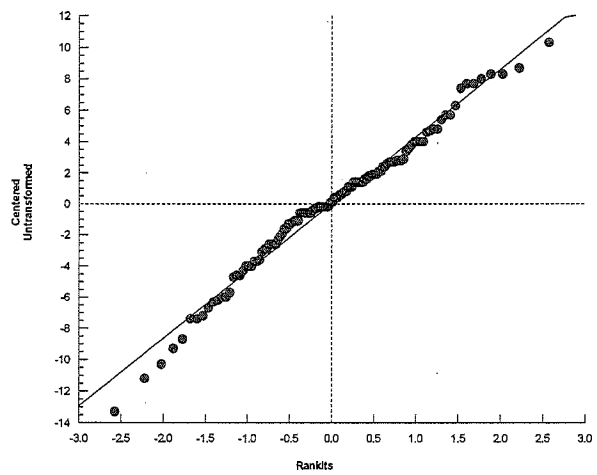
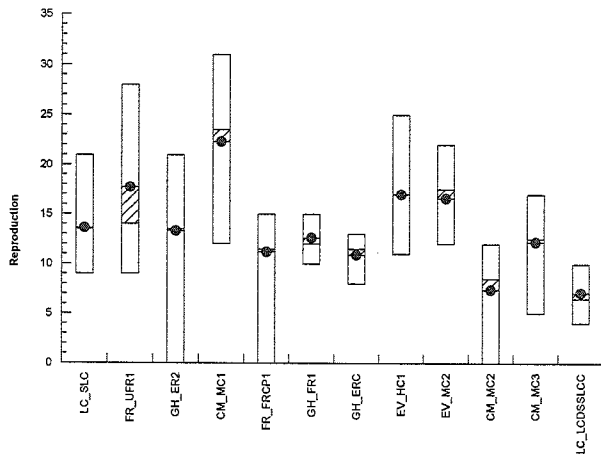
Analysis ID: 18-6306-5153 Endpoint: Reproduction
 Analyzed: 10 Oct-18 11:47 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
LC_SLC	XC	11	11	17	9	13	15	21	14	14	11
FR_UFR1		11	9	24	13	14	26	12	28	14	26
GH_ER2		16	12	0	14	16	9	21	11	21	13
CM_MC1		22	31	16	25	12	13	28	28	21	27
FR_FRCP1		14	11	14	15	11	0	11	11	12	13
GH_FR1		15	10	12	12	14	12	12	12	15	12
GH_ERC		9	12	12	13	8	8	11	12	13	11
EV_HC1		21	13	11	13	21	13	21	21	11	25
EV_MC2		13	15	22	18	18	18	12	15	17	18
CM_MC2		9	10	11	0	0	7	8	8	12	9
CM_MC3		11	15	13	17	6	12	12	14	5	17
LC_LCDSSLCC		4	5	10	7	6	6	9	9	6	9

Graphics



Client: Teck

W.O.#: 180710

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
FR_UFP1	May 3/18	May 3/18	50	5.3	5.5	102	50	7.4	148	MS
CH_LER2	↓	↓	50	7.7	7.8	152	100 ^{MS}	2.7	270	MS
CM_MCI	↓	↓	50	5.5	5.6	108	50	6.3	126	MS
FR_PRCPI	May 3/18	May 3/18	50	7.0	7.1	138	100	3.5	350	MS
CH_FRI	May 3/18	May 3/18	50	7.7	7.9	150	100 ^{MS}	4.2	420	MS
CH_LRC	↓	↓	50	7.5	7.7	146	100 ^{MS}	2.5	250	MS
EV_HCI	May 3/18	May 3/18	50	7.9	8.1	154	100 ^{MS}	2.837	370	MS
EV_MCI	May 3/18	May 3/18	50	5.6	5.7	110	50	7.0	140	MS
CM_MCI	↓	↓	50	MS 9.1 8.7	MS 9.3 8.9	MS 178 170	100	4.2	420	MS
CM_MCI	↓	↓	50	7.4	7.6	144	50	7.6	152	MS
LC_CROSSLC	↓	↓	50	7.9	8.0	156	100	4.0	400	MS
LC_SLC	May 3/18	May 3/18	50	6.8	6.9	134	50	8.1	162	MS
20% peiner	May 3/18	May 3/18	50	5.0	5.1 STK	98	50	5.0	100	↓

Notes: (1) Dilute up to 100mL with DI water

Reviewed by: 

Date Reviewed: June 1, 2018

APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck
 Work Order No.: 180711

Start Date: May 1/18
 Set up by: MLG

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: April 30/18
 Date Received: May 1/18
 Sample Volume: various

Test Organism Information:

Culture Date: April 27/18
 Age of culture (Day 0): 4d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC169
 Stock Solution ID: 182nol
 Date Initiated: April 20/18

72-h IC50 (95% CL): 22.8 (22.8 - 34.8) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 31.8 (26.1 - 38.7) µg/L Zn CV (%): 10

Test Results:

	Cell Yield (Mean ± SD)
Negative Control	33.8 ± 2.1
FR-WFRI-WS-201804301224 ①	75.4 ± 5.6 * bdf
GH-ER2-WS-2018-04-30-N ①	123.3 ± 6.5 * adf
CM-MCLQ2-WS-20180430-N ①	149.3 ± 8.4 * ace
FR-FRCPI-WS-201804300956	94.0 ± 4.5 * abdf
GH-FRLWS-2018-04-30-N	121.5 ± 2.6 * adf
GH-ERC-WS-2018-04-30-N	122.8 ± 4.3 * adf
EV-HCL-WS-2018-04-30-N	122.3 ± 4.3 * adf
EV-MC2-WS-2018-04-30-N	155.5 ± 5.3 * ace

① site control
 * indicates cell yield that were significantly greater than the lab control
 ac indicates cell yield that were significantly greater than site control
 FR-WFRI

b. indicates cell yield that were significantly lower than site control GH-ER2

c. indicates cell yield that were significantly greater than site control GH-ER2

d. indicates cell yield that were significantly lower than site control CM-MCL

e. indicates cell yield that were significantly greater than site control CM-MCL

Reviewed by: [Signature]

Date reviewed: June 4, 2018

f. indicates cell yield that were significantly lower than site control CC-SLC

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck
 Work Order No.: 180711

Start Date: May 1/18
 Set up by: MLJ

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Apr 30/18
 Date Received: May 1/18
 Sample Volume: various

Test Organism Information:

Culture Date: Apr 27/18
 Age of culture (Day 0): 4d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC169
 Stock Solution ID: 18Zn01
 Date Initiated: Apr 20/18
 72-h IC50 (95% CL): 28.8 (22.8 - 34.8) ug/L Zn

72-h IC50 Reference Toxicant Mean and Range: 31.8 (26.1 - 38.7) ug/L Zn CV (%): 10.

Test Results:

① site control
 * indicates cell yield that were significantly greater than the lab control
 a. indicates cell yield that were significantly greater than site control FR-UFR1

	Cell Yield (Mean ± SD)
Negative Control	33.8 ± 2.1 _{mn}
CM-MC2-Q2-WS-20180430-N	135.3 ± 6.2 * a b c d f
LC-LEOSSLCC-WS-2017-04-24-N	147.5 ± 4.8 * a b c
LC-SLC-WS-2017-04-25-N ①	147.5 ± 3.1 * a b c
	±
	±
	±
	±
	±

d. indicates cell yield that were significantly lower than site control CM-MC1

c. indicates cell yield that were significantly greater than site control GH-ER2.

Reviewed by: [Signature]

Date reviewed: June 4, 2018

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Setup by: MG
 Sample ID: Various Test Date/Time: May 1/18 @ 13:55h
 Work Order No.: 180711 CER #: 4
 Test Species: Pseudokirchneriella subcapitata

Culture Date: April 27/18 Age of Culture: 4d Culture Health: Good
 Culture Count: 1 440 2 450 Average: 445 Culture Cell Density (c1): 445 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 445 \times 10^4 \quad \text{cells/mL}} = 4.94 \text{ mL}$$

Time Zero Counts: 1 21 2 23 Average: 22

No. of Cells/mL: 22 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 10 000 cells/mL

Concentration 0.5.2% (v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	°C				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.1	24.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
(site control) FRUFRI	8.2	24.0	✓	✓	✓	✓	✓	✓	✓	✓
(site control) GHLER2	8.3	24.0	✓	✓	✓	✓	✓	✓	✓	✓
(site control) QMLMCI	8.1	24.0	✓	✓	✓	✓	✓	✓	✓	✓
FRCP1 FRCP2	8.2	24.0	✓	✓	✓	✓	✓	✓	✓	✓
GHLFRI	8.3	24.0	✓	✓	✓	✓	✓	✓	✓	✓
GHLERC	8.3	24.0	✓	✓	✓	✓	✓	✓	✓	✓
EV_HCI	8.3	24.0	✓	✓	✓	✓	✓	✓	✓	✓
EV_MC2	8.2	24.0	✓	✓	✓	✓	✓	✓	✓	✓
QMLMC2	8.3	24.0	✓	✓	✓	✓	✓	✓	✓	✓
Initials	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG

Initial control pH: Well 1: 7.1 Well 2: 7.1

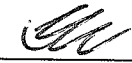
Final control pH: Well 1: 7.2 Well 2: 7.2

Light intensity (lux): 4150 Date measured: May 1/18

Thermometer: 4 Light meter: 1 pH meter/probe: 1,1

Sample Description: ① clear, colourless, odourless, no particulates

Comments: ② clear, colourless, odourless, some brown particulates
③ slightly turbid, colourless, odourless, brown particulates.

Reviewed: 

Date reviewed: June 4, 2018

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Setup by: ML7
 Sample ID: various Test Date/Time: May 1/18 @ 1355h
 Work Order No.: 180711 CER #: 4
 Test Species: Pseudokirchneriella subcapitata
 Culture Date: April 27/18 Age of Culture: 4d Culture Health: Good
 Culture Count: 1 4402 450 Average: 445 Culture Cell Density (c1): 445 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/ml} \times 100 \text{ ml}}{(c1) \quad 445 \times 10^4 \text{ cells/ml}} = 4.94 \text{ mL}$$

 Time Zero Counts: 1 21 2 23 Average: 22
 No. of Cells/mL: 22 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 15000 cells/mL

Concentration 95.2% (v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	(°C)							
	0 h	0 h	0 h	24 h	48 h	72 h	0 h	24 h	48 h	72 h
Control	7.1	24.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
① LC50	8.3	24.0	↓	↓	↓	↓	✓	✓	✓	✓
① LC50C	8.2	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7

Initial control pH: Well 1: 7.1 Well 2: 7.1
 Final control pH: Well 1: 7.2 Well 2: 7.2
 Light intensity (lux): 450 Date measured: May 1/18
 Thermometer: 4 Light meter: 1 pH meter/probe: 1/1

Sample Description: ① clear, colourless, odourless, some brown particulates

Comments: _____

Reviewed: [Signature] Date reviewed: June 4, 2018

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: TECK Start Date/Time: May 1/18 @ 1355h

Work Order #: 180711 Termination Date: May 4/18 @ 1355h

Sample ID: Various Test set up by: ML

95.2 % (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	34					ML
	B	34					
	C	35					
	D	33					
	E	32					
	F	36					
	G	35					
	H	39					
(site control) FR-WFP1	A	75					
	B	76					
	C	71					
	D	69					
	EA	82					
	FB	80					
	GC	73					
	HD	85					
(site control) GH-ER2	A	136					
	B	130					
	C	121					
	D	127					
	EA	120					
	FB	125					
	GC	118					
	HD	117					
(site control) CN-MC1	A	150					
	B	145					
	C	158					
	D	153					
	EA	152					
	FB	140					
	GC	139					
	HD	134					
FR-FRCP1	A	96					
	B	91					
	C	92					
	D	101					

Comments: _____

Reviewed by:  Date Reviewed: June 4, 2018

Pseudokirchneriella subcapitata Toxicity Test Data Sheet 72-h Algal Cell Counts

Client: Teck Start Date/Time: May 1/18 @ 1355h
 Work Order #: 180711 Termination Date: May 4/18 @ 1355h
 Sample ID: Various Test set up by: MLG

95.2 % (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						MLG
	B						
	C						
	D						
	E						
	F						
	G						
	H						
GH-FR1	A	119					
	B	125					
	C	122					
	D	124					
GH-ERC	A	130					
	B	122					
	C	123					
	D	120					
EV-HCl	A	125					
	B	128					
	C	118					
	D	122					
EV-MC2	A	160					
	B	151					
	C	162					
	D	153					
CM-MC2	A	143					
	B	140					
	C	130					
	D	132					
LC-LC05SLCC	A	144					
	B	149					
	C	155					
	D	146					
LC-SLC	A	147					
	B	152					
	C	145					
	D	150					

Comments: _____

Reviewed by:  Date Reviewed: June 4, 2018

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 1 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Batch ID: 07-9507-9829	Test Type: Cell Growth	Analyst: Jill Sones
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 4d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-2018043000	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

① FR_UFR1,
 GH_ER2,
 CM_MC1,
 LC_SLC
 one reference sites

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	FR_FRCP1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_ERC failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 2 of 6)

Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	GH_ERC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.0E-06	FR_FRCP1 failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	LC_LCDSSLCC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	Lab Control passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	EV_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	FR_UFR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	EV_HC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	CM_MC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	GH_ER2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	CM_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	GH_FR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	FR_FRCP1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	LC_SLC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.6835	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.9781	LC_LCDSSLCC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	FR_FRCP1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_ERC failed cell yield	1

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 3 of 6)

Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	9.3E-07	EV_HC1 failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	GH_ERC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.3E-06	FR_FRCP1 failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	FR_FRCP1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	GH_ERC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	Lab Control failed cell yield	1

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 4 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	2.1E-06	CM_MC2 failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	FR_FRCP1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	GH_ERC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	1.7E-06	LC_LCDSSLCC failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	GH_ERC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	EV_HC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	GH_FR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	LC_SLC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	EV_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	FR_FRCP1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	CM_MC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	GH_ER2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	FR_UFR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	Lab Control passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	CM_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.9998	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	GH_ERC passed cell yield	1

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 5 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.1446	CM_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	LC_LCDSSLCC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	EV_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	CM_MC2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	LC_SLC failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	FR_FRCP1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	EV_HC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	FR_UFR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	GH_ER2 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	CM_MC1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	Lab Control failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	GH_FR1 failed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.0155	GH_ERC failed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	EV_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	CM_MC2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	1.0000	Lab Control passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_ER2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	EV_HC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_ERC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	EV_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_FR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	FR_FRCP1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	CM_MC1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	LC_LCDSSLCC passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	Lab Control passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	CM_MC2 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	FR_UFR1 passed cell yield	1
06-7251-7922	Cell Yield	Dunnett Multiple Comparison Test	0.8939	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	CM_MC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	FR_UFR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_ER2 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	FR_FRCP1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_FR1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	GH_ERC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	EV_HC1 passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	EV_MC2 passed cell yield	1

CETIS Summary Report

Report Date: 10 Oct-18 13:37 (p 6 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	LC_LCDSSLCC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	LC_SLC passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	Lab Control passed cell yield	1
18-3949-2147	Cell Yield	Dunnett Multiple Comparison Test	0.8939	CM_MC2 passed cell yield	1

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	8	33.75	31.98	35.52	31	38	0.75	2.121	6.29%	0.00%
FR_UFR1		8	75.38	70.73	80.02	68	84	1.963	5.553	7.37%	-123.33%
GH_ER2		8	123.2	117.8	128.7	116	135	2.313	6.541	5.31%	-265.19%
CM_MC1		8	145.2	138.3	152.2	133	157	2.957	8.362	5.76%	-330.37%
FR_FRCP1		4	94	86.77	101.2	90	100	2.273	4.546	4.84%	-178.52%
GH_FR1		4	121.5	117.3	125.7	118	124	1.323	2.646	2.18%	-260.00%
GH_ERC		4	122.8	115.8	129.7	119	129	2.175	4.349	3.54%	-263.70%
EV_HC1		4	122.2	115.5	129	117	127	2.136	4.272	3.49%	-262.22%
EV_MC2		4	155.5	147	164	150	161	2.661	5.323	3.42%	-360.74%
CM_MC2		4	135.2	125.3	145.2	129	142	3.119	6.238	4.61%	-300.74%
LC_LCDSSLCC		4	147.5	139.9	155.1	143	154	2.398	4.796	3.25%	-337.04%
LC_SLC	XC	4	147.5	142.6	152.4	144	151	1.555	3.109	2.11%	-337.04%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	33	33	34	32	31	35	34	38
FR_UFR1		74	75	70	68	81	79	72	84
GH_ER2		135	129	120	126	119	124	117	116
CM_MC1		149	144	157	152	151	139	137	133
FR_FRCP1		95	90	91	100				
GH_FR1		118	124	121	123				
GH_ERC		129	121	122	119				
EV_HC1		124	127	117	121				
EV_MC2		159	150	161	152				
CM_MC2		142	139	129	131				
LC_LCDSSLCC		143	148	154	145				
LC_SLC	XC	146	151	144	149				

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7109-7946	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:49	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	11-6985-8312	01 May-18	01 May-18	14h	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	25.7%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		FR_UFR1	15.34	2.606	7.069	14	<0.0001	CDF	Significant Effect
		GH_ER2	32.99	2.606	7.069	14	<0.0001	CDF	Significant Effect
		CM_MC1	41.1	2.606	7.069	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	18.13	2.606	8.657	10	<0.0001	CDF	Significant Effect
		GH_FR1	26.41	2.606	8.657	10	<0.0001	CDF	Significant Effect
		GH_ERC	26.79	2.606	8.657	10	<0.0001	CDF	Significant Effect
		EV_HC1	26.64	2.606	8.657	10	<0.0001	CDF	Significant Effect
		EV_MC2	36.65	2.606	8.657	10	<0.0001	CDF	Significant Effect
		CM_MC2	30.55	2.606	8.657	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	34.24	2.606	8.657	10	<0.0001	CDF	Significant Effect
		LC_SLC	34.24	2.606	8.657	10	<0.0001	CDF	Significant Effect

[Signature]
 June 4/18

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7109-7946 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:49 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.4054	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	91902.81	8354.801	11	283.8	<0.0001	Significant Effect
Error	1530.625	29.4351	52			
Total	93433.44		63			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.24	24.72	0.2198	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9862	0.9488	0.6934	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	33.75	31.98	35.52	33.5	31	38	0.75	6.29%	0.0%
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	-123.3%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-265.2%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-330.4%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-178.5%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-260.0%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-263.7%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-262.2%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-360.7%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-300.7%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-337.0%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-337.0%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	33	33	34	32	31	35	34	38
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

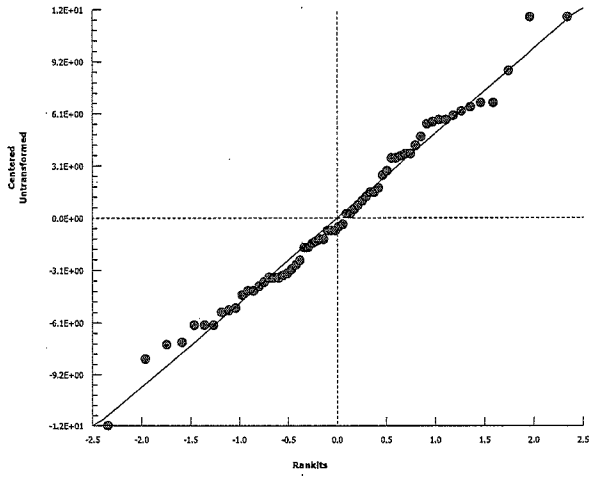
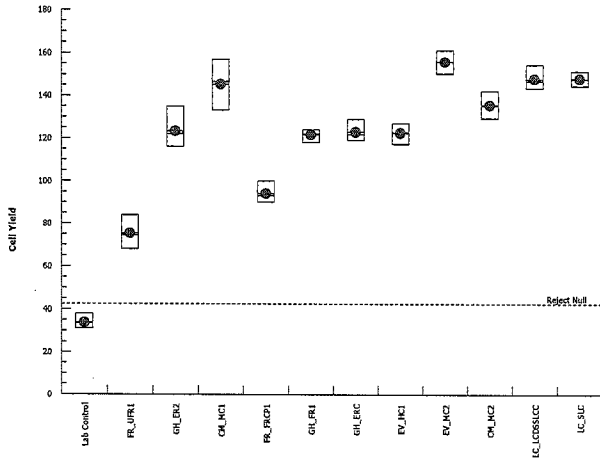
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7109-7946 Endpoint: Cell Yield
Analyzed: 23 May-18 15:49 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-3313-0096	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:49	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	12.1%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	16.59	2.59	7.476	14	<0.0001	CDF	Significant Effect
		CM_MC1	24.21	2.59	7.476	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	5.269	2.59	9.156	10	<0.0001	CDF	Significant Effect
		GH_FR1	13.05	2.59	9.156	10	<0.0001	CDF	Significant Effect
		GH_ERC	13.4	2.59	9.156	10	<0.0001	CDF	Significant Effect
		EV_HC1	13.26	2.59	9.156	10	<0.0001	CDF	Significant Effect
		EV_MC2	22.67	2.59	9.156	10	<0.0001	CDF	Significant Effect
		CM_MC2	16.94	2.59	9.156	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	20.41	2.59	9.156	10	<0.0001	CDF	Significant Effect
		LC_SLC	20.41	2.59	9.156	10	<0.0001	CDF	Significant Effect

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 08-3313-0096 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:49 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.73	3506.773	10	105.3	<0.0001	Significant Effect
Error	1499.125	33.31389	45			
Total	36566.86		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.0%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-92.7%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.3%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

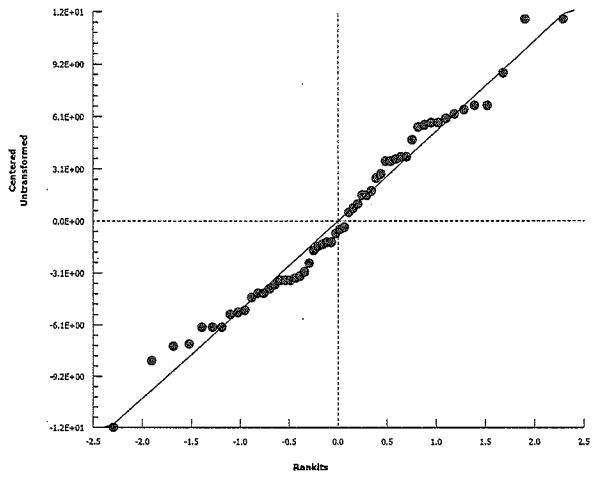
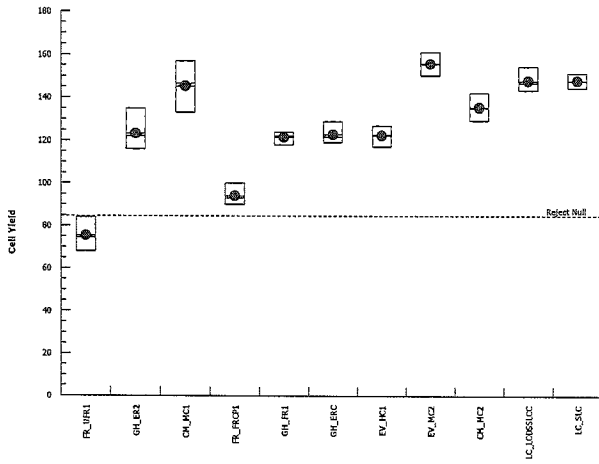
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-3313-0096 Endpoint: Cell Yield
Analyzed: 23 May-18 15:49 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4589-4678	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:51	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.43%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	16.59	2.59	7.476	14	<0.0001	CDF	Significant Effect
		CM_MC1	-7.623	2.59	7.476	14	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	8.276	2.59	9.156	10	<0.0001	CDF	Significant Effect
		GH_FR1	0.4951	2.59	9.156	10	0.8330	CDF	Non-Significant Effect
		GH_ERC	0.1415	2.59	9.156	10	0.9261	CDF	Non-Significant Effect
		EV_HC1	0.2829	2.59	9.156	10	0.8952	CDF	Non-Significant Effect
		EV_MC2	-9.124	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		CM_MC2	-3.395	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-6.861	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		LC_SLC	-6.861	2.59	9.156	10	1.0000	CDF	Non-Significant Effect

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4589-4678 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:51 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.73	3506.773	10	105.3	<0.0001	Significant Effect
Error	1499.125	33.31389	45			
Total	36566.86		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.0%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-92.7%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.3%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4589-4678

Endpoint: Cell Yield

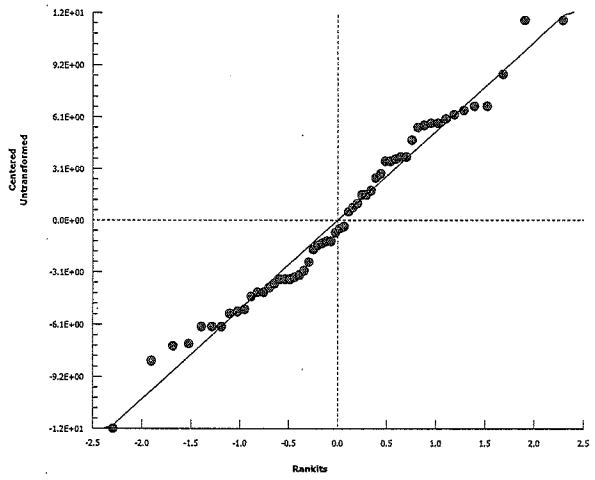
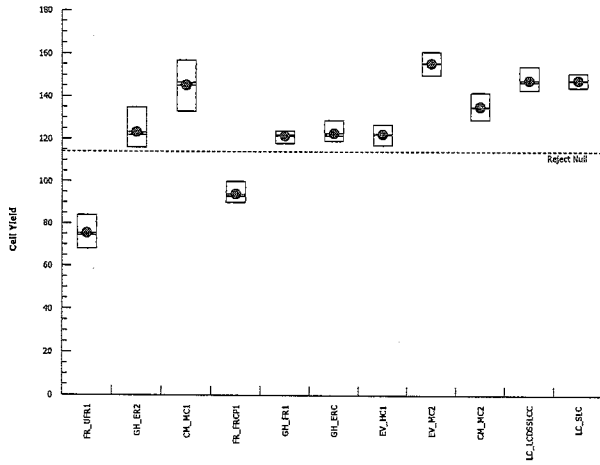
CETIS Version: CETISv1.8.7

Analyzed: 23 May-18 15:51

Analysis: Parametric-Control vs Treatments

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-1702-2153	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:51	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	7.43%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	-16.59	2.59	7.476	14	1.0000	CDF	Non-Significant Effect
		CM_MC1	7.623	2.59	7.476	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	-8.276	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-0.4951	2.59	9.156	10	0.9898	CDF	Non-Significant Effect
		GH_ERC	-0.1415	2.59	9.156	10	0.9667	CDF	Non-Significant Effect
		EV_HC1	-0.2829	2.59	9.156	10	0.9787	CDF	Non-Significant Effect
		EV_MC2	9.124	2.59	9.156	10	<0.0001	CDF	Significant Effect
		CM_MC2	3.395	2.59	9.156	10	0.0064	CDF	Significant Effect
		LC_LCDSSLCC	6.861	2.59	9.156	10	<0.0001	CDF	Significant Effect
		LC_SLC	6.861	2.59	9.156	10	<0.0001	CDF	Significant Effect

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-1702-2153 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:51 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.73	3506.773	10	105.3	<0.0001	Significant Effect
Error	1499.125	33.31389	45			
Total	36566.86		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.0%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-92.7%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.3%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

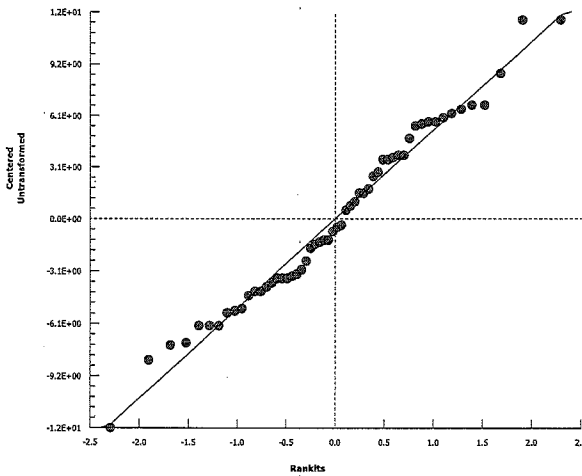
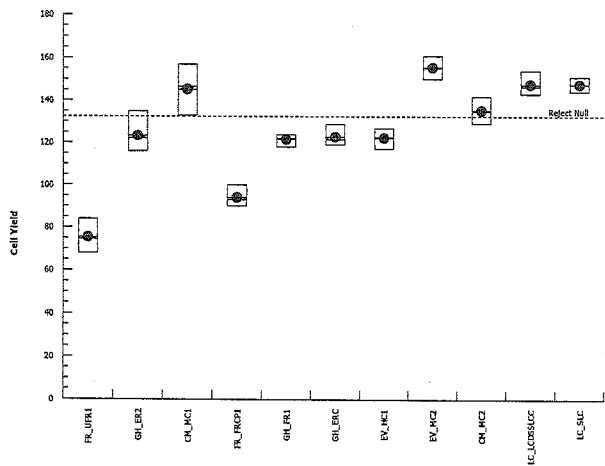
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-1702-2153 Endpoint: Cell Yield
Analyzed: 23 May-18 15:51 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



ML7
June 4 18

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 14-1383-7871	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:51	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.3%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	24.21	2.59	7.476	14	<0.0001	CDF	Significant Effect
		GH_ER2	7.623	2.59	7.476	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	14.5	2.59	9.156	10	<0.0001	CDF	Significant Effect
		GH_FR1	6.719	2.59	9.156	10	<0.0001	CDF	Significant Effect
		GH_ERC	6.366	2.59	9.156	10	<0.0001	CDF	Significant Effect
		EV_HC1	6.507	2.59	9.156	10	<0.0001	CDF	Significant Effect
		EV_MC2	-2.9	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		CM_MC2	2.829	2.59	9.156	10	0.0284	CDF	Significant Effect
		LC_LCDSSLCC	-0.6366	2.59	9.156	10	0.9939	CDF	Non-Significant Effect
		LC_SLC	-0.6366	2.59	9.156	10	0.9939	CDF	Non-Significant Effect

MD
June 4/18

CETIS Analytical Report

Report Date: 23 May-18 15:52 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 14-1383-7871 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:51 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.0610	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.73	3506.773	10	105.3	<0.0001	Significant Effect
Error	1499.125	33.31389	45			
Total	36566.86		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.0%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-92.7%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.3%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

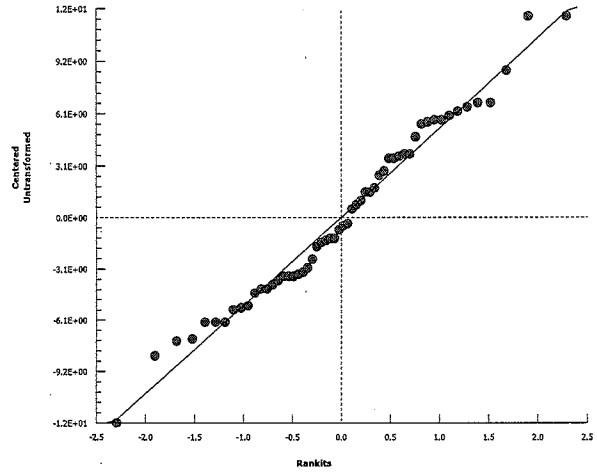
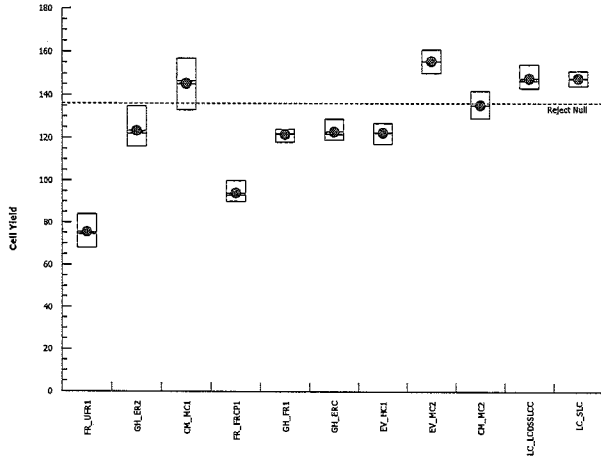
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 14-1383-7871 Endpoint: Cell Yield
Analyzed: 23 May-18 15:51 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 23 May-18 15:53 (p 1 of 3)
Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-7186-2813	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 23 May-18 15:52	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-3341-9170	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	6.3%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	-24.21	2.59	7.476	14	1.0000	CDF	Non-Significant Effect
		GH_ER2	-7.623	2.59	7.476	14	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	-14.5	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-6.719	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-6.366	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	-6.507	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		EV_MC2	2.9	2.59	9.156	10	0.0238	CDF	Significant Effect
		CM_MC2	-2.829	2.59	9.156	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	0.6366	2.59	9.156	10	0.7808	CDF	Non-Significant Effect
		LC_SLC	0.6366	2.59	9.156	10	0.7808	CDF	Non-Significant Effect

CETIS Analytical Report

Report Date: 23 May-18 15:53 (p 2 of 3)
 Test Code: 180711 | 03-9732-2479

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 08-7186-2813 Endpoint: Cell Yield CETIS Version: CETISv1.8.7
 Analyzed: 23 May-18 15:52 Analysis: Parametric-Control vs Treatments Official Results: Yes

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.0610	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.73	3506.773	10	105.3	<0.0001	Significant Effect
Error	1499.125	33.31389	45			
Total	36566.86		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.0%
GH_ER2	8	123.3	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1	8	145.3	138.3	152.2	146.5	133	157	2.957	5.76%	-92.7%
FR_FRCP1	4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1	4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC	4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1	4	122.3	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2	4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.3%
CM_MC2	4	135.3	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC	4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	74	75	70	68	81	79	72	84
GH_ER2	135	129	120	126	119	124	117	116
CM_MC1	149	144	157	152	151	139	137	133
FR_FRCP1	95	90	91	100				
GH_FR1	118	124	121	123				
GH_ERC	129	121	122	119				
EV_HC1	124	127	117	121				
EV_MC2	159	150	161	152				
CM_MC2	142	139	129	131				
LC_LCDSSLCC	143	148	154	145				
LC_SLC	146	151	144	149				

CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 1 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 06-7251-7922	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4			
Analyzed: 10 Oct-18 13:36	Analysis: Parametric-Control vs Treatments	Status Level: 1			
Batch ID: 07-9507-9829	Test Type: Cell Growth	Analyst: Jill Sones			
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:			
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 4d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 failed cell yield	6.92%
		GH_ER2 failed cell yield	6.92%
		CM_MC1 passed cell yield	6.92%
		FR_FRCP1 failed cell yield	6.92%
		GH_FR1 failed cell yield	6.92%
		GH_ERC failed cell yield	6.92%
		EV_HC1 failed cell yield	6.92%
		EV_MC2 passed cell yield	6.92%
		CM_MC2 failed cell yield	6.92%
		LC_LCDSSLCC passed cell yield	6.92%

LC_SLC = site control

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1*	20.41	2.501	8.842	10	CDF	9.3E-07	Significant Effect
		GH_ER2*	6.861	2.501	8.842	10	CDF	1.0E-06	Significant Effect
		CM_MC1	0.6366	2.501	8.842	10	CDF	0.6835	Non-Significant Effect
		FR_FRCP1*	13.11	2.501	10.21	6	CDF	9.3E-07	Significant Effect
		GH_FR1*	6.371	2.501	10.21	6	CDF	1.3E-06	Significant Effect
		GH_ERC*	6.064	2.501	10.21	6	CDF	2.1E-06	Significant Effect
		EV_HC1*	6.187	2.501	10.21	6	CDF	1.7E-06	Significant Effect
		EV_MC2	-1.96	2.501	10.21	6	CDF	0.9998	Non-Significant Effect
		CM_MC2*	3.002	2.501	10.21	6	CDF	0.0155	Significant Effect
		LC_LCDSSLCC	0	2.501	10.21	6	CDF	0.8939	Non-Significant Effect

CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 2 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7251-7922 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 13:36 Analysis: Parametric-Control vs Treatments Status Level: 1

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.7	3506.77	10	105.3	<1.0E-37	Significant Effect
Error	1499.12	33.3139	45			
Total	36566.9		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.00%
GH_ER2		8	123.2	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1		8	145.2	138.3	152.2	146.5	133	157	2.957	5.76%	-92.70%
FR_FRCP1		4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1		4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC		4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1		4	122.2	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2		4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.30%
CM_MC2		4	135.2	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC		4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	XC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		74	75	70	68	81	79	72	84
GH_ER2		135	129	120	126	119	124	117	116
CM_MC1		149	144	157	152	151	139	137	133
FR_FRCP1		95	90	91	100				
GH_FR1		118	124	121	123				
GH_ERC		129	121	122	119				
EV_HC1		124	127	117	121				
EV_MC2		159	150	161	152				
CM_MC2		142	139	129	131				
LC_LCDSSLCC		143	148	154	145				
LC_SLC	XC	146	151	144	149				

CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 3 of 6)
Test Code/ID: 180711b / 02-8545-8725

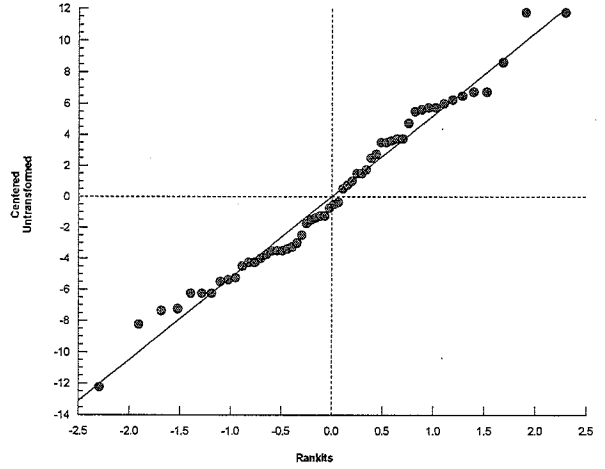
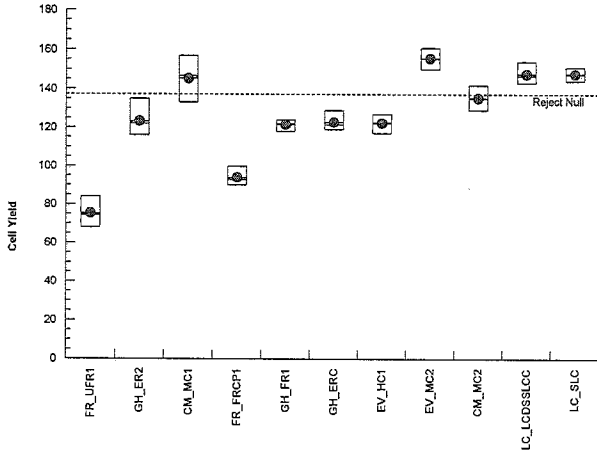
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7251-7922 Endpoint: Cell Yield
Analyzed: 10 Oct-18 13:36 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 4 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 18-3949-2147	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 13:37	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 07-9507-9829	Test Type: Cell Growth	Analyst: Jill Sones
Start Date: 01 May-18 13:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 04 May-18 13:55	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 4d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	26h (7.1 °C)	Teck Coal	
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	25h (7.5 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	26h (5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	28h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	28h (8.5 °C)		
GH_ERC	04-0019-8604	30 Apr-18 15:05	01 May-18 11:05	23h (7 °C)		
EV_HC1	19-6017-4601	30 Apr-18 09:40	01 May-18 11:05	28h (6.5 °C)		
EV_MC2	13-9765-5660	30 Apr-18 12:10	01 May-18 11:05	26h (6.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	27h (5 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	25h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	26h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-04-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-04-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	6.92%
		GH_ER2 passed cell yield	6.92%
		CM_MC1 passed cell yield	6.92%
		FR_FRCP1 passed cell yield	6.92%
		GH_FR1 passed cell yield	6.92%
		GH_ERC passed cell yield	6.92%
		EV_HC1 passed cell yield	6.92%
		EV_MC2 passed cell yield	6.92%
		CM_MC2 passed cell yield	6.92%
		LC_LCDSSLCC passed cell yield	6.92%

LC_SLC = site control

Dunnnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	-20.41	2.501	8.842	10	CDF	1.0000	Non-Significant Effect
		GH_ER2	-6.861	2.501	8.842	10	CDF	1.0000	Non-Significant Effect
		CM_MC1	-0.6366	2.501	8.842	10	CDF	0.9781	Non-Significant Effect
		FR_FRCP1	-13.11	2.501	10.21	6	CDF	1.0000	Non-Significant Effect
		GH_FR1	-6.371	2.501	10.21	6	CDF	1.0000	Non-Significant Effect
		GH_ERC	-6.064	2.501	10.21	6	CDF	1.0000	Non-Significant Effect
		EV_HC1	-6.187	2.501	10.21	6	CDF	1.0000	Non-Significant Effect
		EV_MC2	1.96	2.501	10.21	6	CDF	0.1446	Non-Significant Effect
		CM_MC2	-3.002	2.501	10.21	6	CDF	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0	2.501	10.21	6	CDF	0.8939	Non-Significant Effect

CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 5 of 6)
 Test Code/ID: 180711b / 02-8545-8725

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 18-3949-2147 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 13:37 Analysis: Parametric-Control vs Treatments Status Level: 1

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	35067.7	3506.77	10	105.3	<1.0E-37	Significant Effect
Error	1499.12	33.3139	45			
Total	36566.9		55			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.308	23.21	0.6961	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9796	0.9426	0.4587	Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	75.38	70.73	80.02	74.5	68	84	1.963	7.37%	0.00%
GH_ER2		8	123.2	117.8	128.7	122	116	135	2.313	5.31%	-63.52%
CM_MC1		8	145.2	138.3	152.2	146.5	133	157	2.957	5.76%	-92.70%
FR_FRCP1		4	94	86.77	101.2	93	90	100	2.273	4.84%	-24.71%
GH_FR1		4	121.5	117.3	125.7	122	118	124	1.323	2.18%	-61.19%
GH_ERC		4	122.8	115.8	129.7	121.5	119	129	2.175	3.54%	-62.85%
EV_HC1		4	122.2	115.5	129	122.5	117	127	2.136	3.49%	-62.19%
EV_MC2		4	155.5	147	164	155.5	150	161	2.661	3.42%	-106.30%
CM_MC2		4	135.2	125.3	145.2	135	129	142	3.119	4.61%	-79.44%
LC_LCDSSLCC		4	147.5	139.9	155.1	146.5	143	154	2.398	3.25%	-95.69%
LC_SLC	XC	4	147.5	142.6	152.4	147.5	144	151	1.555	2.11%	-95.69%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		74	75	70	68	81	79	72	84
GH_ER2		135	129	120	126	119	124	117	116
CM_MC1		149	144	157	152	151	139	137	133
FR_FRCP1		95	90	91	100				
GH_FR1		118	124	121	123				
GH_ERC		129	121	122	119				
EV_HC1		124	127	117	121				
EV_MC2		159	150	161	152				
CM_MC2		142	139	129	131				
LC_LCDSSLCC		143	148	154	145				
LC_SLC	XC	146	151	144	149				

CETIS Analytical Report

Report Date: 10 Oct-18 13:37 (p 6 of 6)
Test Code/ID: 180711b / 02-8545-8725

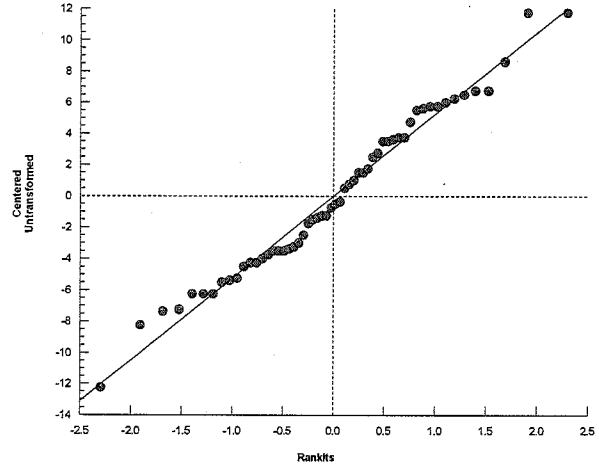
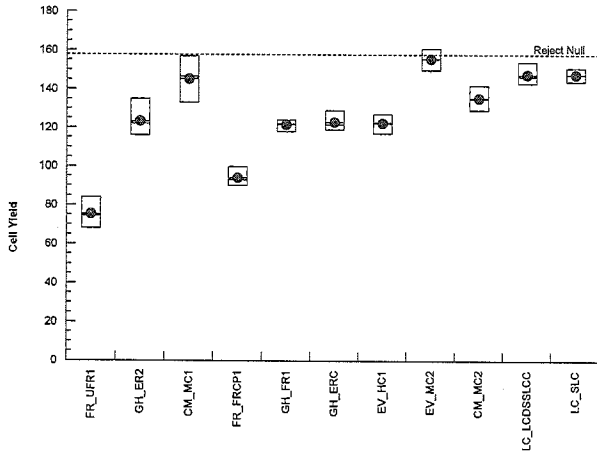
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 18-3949-2147 Endpoint: Cell Yield
Analyzed: 10 Oct-18 13:37 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



APPENDIX C – *Hyaella azteca* Toxicity Test Data

Hyalella azteca Water-only Test Summary Sheet

Client: Teck
 Work Order No.: 180713

Start Date: May 3/18
 Set up by: EL

Sample Information:

Sample ID: See below
 Sample Date: Apr 30, 2018, May 8, 15 & 22, 2018
 Date Received: May 1, 9, 16 & 23, 2018
 Sample Volume: various (see C.O.C.)

Test Organism Information:

Species: Hyalella azteca
 Supplier: Aquatic Biosystem
 Date received: May 3/18
 Age or size (Day 0): 7-8 days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA149
 Stock Solution ID: n/a
 Date Initiated: May 3/18

96-h LC50 (95% CL): 6.4 (5.2-8.0) g/L NaCl
 96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.0-6.7) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	94.0 ± 5.5	0.34 ± 0.03
FR-UFR1	96.0 ± 5.5	0.41 ± 0.02
CM-MC1	96.0 ± 5.5	0.43 ± 0.03
GH-ERZ	98.0 ± 4.5	0.40 ± 0.03
FR ^{EV} -FR/PI	98.0 ± 4.5	0.44 ± 0.02
GH-FR1	92.0 ± 13.0	0.50 ± 0.07
CM-MC2	52.0 ± 27.8 (2)	0.33 ± 0.04 (1)
CM-MC3	96.0 ± 5.5	0.44 ± 0.05

(1) There is a significant difference when compared to FR-UFR1, CM-MC1 & LC-SLC
 (2) There is a significant difference when compared to control, FR-UFR1, CM-MC1 & GH-ERZ + LC-SLC

Reviewed by: JLH Date reviewed: June 19/18

Hyaella azteca Water-only Test Summary Sheet

Client: Teck
Work Order No.: 180713

Start Date: May 3/18
Set up by: EC

Sample Information:

Sample ID: See below
Sample Date: Apr 30, 2018, May 8, 15 & 22, 2018
Date Received: May 1, 9, 16 & 23, 2018
Sample Volume: various (see C.O.C.)

Test Organism Information:

Species: Hyaella azteca
Supplier: Aquatic Biosystem
Date received: May 3/18
Age or size (Day 0): 7-8 days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA149
Stock Solution ID: n/a
Date Initiated: May 3/18

96-h LC50 (95% CL): 6.4 (5.2-8.0) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.0-6.7) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
LC-LC05SLC	90.0 ± 14.1	0.37 ± 0.12
LC-SLC	98.0 ± 4.5	0.43 ± 0.02
C+I + EDTA	98.0 ± 4.5	0.36 ± 0.09
CM-MC2 + EDTA	100 ± 0.0	0.40 ± 0.03
FR-FRCPI + EDTA	86.0 ± 8.9 ①	0.43 ± 0.08
	±	±
	±	±
	±	±

① There is a significant ~~effect~~ difference when compared to (control+EDTA).

Reviewed by: JGH

Date reviewed: June 19/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater ^{or} Sediment Water Quality
 Water-only

Client: Teck
 WO #: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	22.5	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
FR-VFRI	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC1	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
GH-ERZ	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
FR-FRCPI	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
GH-FRI	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC2	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC3	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
LC-LC05SLC	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
LC-SLC	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Technician Initials	EL	EL	MA	MA	EL	EL	EL	EL	EL	EL	MA	MA	EL	MA	EL

Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
FR-VFRI	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC1	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
GH-ERZ	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
FR-FRCPI	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
GH-FRI	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC2	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC3	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
LC-LC05SLC	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
LC-SLC	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Technician Initials	EL	MA	MA	EL	EL	EL	EL	EL	MA	MA	EL	MA	EL	EL

Thermometer: CER#11 Light meter: Lit 1 Light intensity (Lux): 500-1000

Comments: _____

Reviewed by: JOB Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater ^{Sediment} Water Quality
 water only

Client: Teck
 WO #: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(+I + EDTA)	22.5	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
CM-MC2+EDTA	22.5	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
FR-FRCPI+EDTA	22.0	22.5	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

Temperature (°C)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
(+I + EDTA)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	
CM-MC2+EDTA	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	
FR-FRCPI+EDTA	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	

Thermometer: CER#11 Light meter: LIT 1 Light intensity (Lux): 500-1000

Comments: _____

Reviewed by: Joh Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater ^{EW} Sediment Water Quality
 water only

Client: Teck
 WO #: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: H. azteca

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	421	442	447	452	445	446	449	438	437	442	437	441	438	437	419
FR-VFR1	301	314	319	311	314	314	313	305	296	292	292	294	289	290	277
CM-MC1	308	320	325	317	318	320	317	315	281 [ⓐ]	275	272	268	270	267	250
GH-ER2	373	385	390	379	386	388	389	370	361	368	371	361	363	365	339
FR-FRCP1	670	680	684	681	682	687	713	694	644 [ⓐ]	658	640	602	613	627	544
GH-FR1	654	667	676	665	665	662	670	662	613 [ⓐ]	621	615	612	577	577	560
CM-MC2	764	763	776	768	759	773	762	744	711	610	615	573	570	570	538
CM-MC3	539	549	558	554	558	560	554	544	460 [ⓐ]	450	423	417	415	412	383
LC-LCDSLCC	779	768	787	775	773	782	781	781	654 [ⓐ]	654	633	605	607	590	518
LC-SLC	360	380	378	362	378	381	379	376	341	333	320	339	326	330	355
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	453	439	445	456	463	469	455	441	450	442	452	448	449	462
FR-VFR1	288	284	286	281	270	278	287	303	311	310	318	312	319	315
CM-MC1	264	257	261	267	267	254	256	267	271	268	275	271	280	273
GH-ER2	354	346	350	363	354	347	347	355	362	359	370	366	372	365
FR-FRCP1	583	555	560	586	567	570	568	610	632	637	659	651	655	650
GH-FR1	564	548	550	575	557	553	563	609	625	621	652	624	641	628
CM-MC2	568	552	542	572	567	566	571	639	611	607	623	614	623	633
CM-MC3	403	401	407	419	414	401	403	418	435	433	441	438	445	436
LC-LCDSLCC	535	526	516	548	541	544	535	571	398 [ⓐ]	529	580	590	612	599
LC-SLC	330	316	316	319	319	303	310	311	354 [ⓐ]	340	348	331	334	333
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

Conductivity meter/probe: C-4 / Cp-4

Comments: ⓐ 381 ⓑ Check-out w/ C-3
ⓐ rechecked, confirmed w/ Rep E's

Reviewed by: John Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater ~~Sediment~~ Water Quality
 water only

Client: Teck
 WO #: 120713
 Sample ID: See below

Start Date: May 31/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(+I) + EDTA	427	437	439	435	438	442	451	438	440	438	443	442	444	449	439
CM-MC2 + EDTA	766	757	773	760	780	778	777	757	6450	632	586	590	575	575	546
FR-FRCPI + EDTA	674	686	690	691	627	688	694	683	656	623	622	617	619	613	555
Technician Initials	EL	EL	M	A	EL	EL	EL	EL	EL	A	N	EL	M	EL	EL

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
(+I) + EDTA	440	433	440	455	456	449	450	445	442	446	457	458	466	458
CM-MC2 + EDTA	570	565	561	568	574	555	544	588	601	610	623	622	625	618
FR-FRCPI + EDTA	578	563	563	575	571	564	557	609	626	636	650	651	653	648
Technician Initials	EL	A	M	EL	EL	EL	EL	EL	A	A	EL	M	EL	EL

Conductivity meter/probe: C4 / Cp-4

Comments: ⓪ Checked w/ C-3

Reviewed by: JOU

Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality
 water only

Client: Teck
 WO #: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	7.8	7.8	7.9	7.7	7.4	7.5	7.5	7.6	7.5	7.4	7.4	7.1	7.2	7.0	7.2
FR-UFR1	8.1	8.0	8.0	8.0	7.6	7.6	7.6	7.7	7.6	7.5	7.4	7.3	7.3	7.1	7.0
CM-MC1	7.9	7.9	8.0	8.1	7.6	7.6	7.6	7.7	7.6	7.6	7.5	7.3	7.4	7.1	7.0
GH-ERZ	8.1	7.9	8.1	8.0	7.7	7.6	7.6	7.6	7.8	7.7	7.5	7.3	7.5	7.0	7.1
FR-FRCP1	8.1	8.1	8.0	8.1	7.8	7.6	7.6	7.7	7.8	7.7	7.6	7.3	7.7	7.0	7.1
GH-FR1	8.1	8.1	8.0	8.0	7.9	7.7	7.7	7.7	7.8	7.6	7.6	7.5	7.7	7.1	7.3
CM-MC2	8.1	8.1	8.1	8.0	7.9	7.7	7.7	7.6	7.8	7.7	7.6	7.5	7.6	7.2	7.4
CM-MC3	8.1	8.2	8.1	8.0	7.9	7.8	7.8	7.9	7.9	7.7	7.6	7.6	7.6	7.2	7.4
LC-LC05SLC	7.2	8.2	8.1	8.1	7.9	7.7	7.8	7.9	7.8	7.7	7.5	7.6	7.7	7.2	7.5
LC-SLC	7.1	8.1	8.1	8.0	8.0	7.8	7.9	7.9	7.9	7.7	7.6	7.6	7.6	7.2	7.5
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

pH

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Control	7.0	7.2	7.4	7.1	7.1	7.1	7.1	7.3	7.5	7.4	7.0	7.1	7.1	7.4	
FR-UFR1	7.1	7.3	7.5	7.3	7.4	7.4	7.4	7.6	7.6	7.6	7.3	7.5	7.4	7.8	
CM-MC1	7.1	7.4	7.5	7.4	7.4	7.4	7.3	7.6	7.7	7.5	7.3	7.4	7.4	7.8	
GH-ERZ	7.2	7.4	7.5	7.4	7.4	7.4	7.3	7.8	7.7	7.6	7.3	7.5	7.3	7.8	
FR-FRCP1	7.3	7.5	7.6	7.4	7.4	7.4	7.4	7.9	7.7	7.6	7.5	7.6	7.4	7.8	
GH-FR1	7.5	7.5	7.6	7.5	7.5	7.5	7.5	7.8	7.7	7.6	7.6	7.6	7.5	7.9	
CM-MC2	7.5	7.6	7.5	7.5	7.5	7.6	7.6	7.9	7.6	7.7	7.7	7.6	7.5	7.9	
CM-MC3	7.6	7.6	7.6	7.5	7.6	7.6	7.6	7.7	7.7	7.6	7.7	7.7	7.6	8.0	
LC-LC05SLC	7.5	7.5	7.6	7.5	7.5	7.6	7.6	7.9	7.7	7.7	7.6	7.6	7.6	7.9	
LC-SLC	7.6	7.6	7.6	7.6	7.6	7.7	7.6	7.7	7.7	7.7	7.7	7.7	7.6	8.0	
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	

pH meter/probe: pH 4 / p.4

Comments: _____

Reviewed by: Joh

Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater ^{Sediment} ~~Sediment~~ Water Quality
 water only

Client: Teck
 WO #: 120713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LT1+EDTA	7.8	7.8	7.8	7.9	7.7	7.6	7.8	7.9	7.8	7.7	7.6	7.5	7.3	7.1	7.2
CM-MCZ+EDTA	8.0	8.0	8.1	8.0	7.9	7.8	7.7	7.8	7.8	7.7	7.6	7.5	7.5	7.0	7.2
FR-FRCP1+EDTA	8.0	8.0	8.0	8.0	7.9	7.8	7.8	7.8	7.8	7.7	7.6	7.5	7.6	7.1	7.2
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL

pH

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
LT1+EDTA	7.4	7.4	7.5	7.3	7.3	7.2	7.3	7.4	7.5	7.5	7.2	7.2	7.3	7.8	
CM-MCZ+EDTA	7.4	7.5	7.5	7.5	7.6	7.6	7.6	7.8	7.7	7.6	7.5	7.6	7.4	7.8	
FR-FRCP1+EDTA	7.5	7.6	7.6	7.5	7.6	7.6	7.6	7.8	7.7	7.6	7.6	7.6	7.5	7.8	
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	EL	

pH meter/probe: pH4 / p-4

Comments: _____

Reviewed by: JOU

Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality
 water only

Client: Teck
 WO #: 120713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: H. azteca

Dissolved oxygen (mg/L)

Sample ID	Day															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Control	8.1	7.9	7.4	7.5	7.2	7.0	7.3	7.2	7.7	7.5	7.7	7.1	7.1	5.9	4.1	
FR_UFRI	8.1	7.1	7.3	7.2	7.2	7.0	7.3	7.3	7.6	7.6	7.7	7.1	6.7	6.1	4.2	
CM-MCI	8.1	7.2	7.1	7.1	7.2	7.0	7.4	7.1	7.7	7.6	7.7	7.2	7.3	6.2	4.1	
GH-ERZ	8.1	7.2	6.8	7.2	7.3	7.0	7.5	7.2	7.7	7.5	7.7	7.1	6.7	6.1	4.1	
FR-FRCP1	8.1	7.3	6.6	7.1	7.2	7.6	7.5	7.2	7.7	7.6	7.6	7.1	7.3	6.1	4.3	
GH-FRI	8.2	7.2	6.7	7.2	7.2	6.9	7.5	7.2	7.7	7.7	7.7	7.1	7.2	6.3	4.1	
CM-MC2	8.1	7.2	6.6	7.1	7.1	7.0	7.5	7.3	7.7	7.6	7.7	7.2	6.6	6.0	4.0	
CM-MC3	8.1	7.2	6.9	7.0	7.2	7.0	7.5	7.2	7.7	7.6	7.7	7.2	7.2	5.9	4.1	
LC-LOSSLCL	8.1	7.2	7.3	7.1	7.2	6.9	7.5	7.2	7.7	7.5	7.6	7.1	6.8	6.0	4.1	
LC-SLC	8.1	7.2	7.4	7.2	7.2	7.0	7.5	7.2	7.7	7.6	7.7	7.1	7.1	6.0	4.1	
Technician Initials	EL	EL	AL	AL	EL	EL	EL	EL	EL	EL	AL	AL	EL	AL	EL	

Dissolved oxygen (mg/L)

Sample ID	Day															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
Control	5.7	5.9	5.4	6.2	6.9	7.3	7.3	7.2	6.9	6.8	6.5	7.0	6.6	7.4		
FR_UFRI	5.6	6.0	5.5	6.1	6.8	7.3	7.2	7.1	7.0	6.8	6.7	7.2	6.8	7.3		
ex CM-MCI	5.3	6.1	5.6	6.6	6.7	7.3	7.1	7.1	7.0	6.9	6.8	7.2	6.9	7.2		
GH-ERZ	5.2	6.0	5.7	6.7	6.6	7.2	7.1	7.1	6.9	7.0	6.9	6.5	6.8	7.1		
FR-FRCP1	5.1	6.1	5.4	6.7	6.6	7.1	7.0	7.1	7.0	6.9	6.8	6.5	6.4	7.0		
GH-FRI	5.4	6.0	5.7	6.6	6.5	7.0	7.0	7.0	7.0	6.8	6.8	6.6	6.3	6.8		
CM-MC2	5.5	5.8	5.7	6.6	6.3	6.7	7.0	6.9	7.0	6.9	6.9	6.5	6.2	6.6		
CM-MC3	5.3	5.9	5.8	6.6	6.2	6.7	6.9	7.0	7.1	6.9	6.9	6.7	6.2	6.4		
LC-LOSSLCL	5.3	6.0	5.7	6.7	6.1	6.7	6.9	7.2	7.0	7.0	6.9	6.6	6.3	7.1		
LC-SLC	5.3	6.1	5.7	6.5	6.1	6.9	6.9	7.1	7.0	6.9	7.1	6.7	6.2	6.9		
Technician Initials	EL	AL	AL	EL	EL	EL	EL	AL	AL	EL	AL	EL	AL	EL		

DO meter/probe: DO-4 10-4

Comments: FL @ 10:00. The low D.O. level in the jars is probably due to excessive left over food in the jars. Solutions in the jars appeared cloudy. >80% solution change was done in am @ pm on Day 14.

Reviewed by: JBW

Date Reviewed: June 8/18

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality
water only

Client: Teck
 WO #: 120713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 CER #: 11
 Test Organism: *H. azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CTI + EDTA	8.1	7.2	7.4	7.2	7.2	7.0	7.5	7.2	7.7	7.6	7.7	7.1	7.2	5.7	3.9
CM-MCZ + EDTA	8.1	7.2	6.4	7.1	7.2	7.1	7.5	7.2	7.7	7.5	7.6	7.2	6.6	6.1	4.1
FR-FRCPI + EDTA	8.2	7.3	6.6	7.2	7.2	7.0	7.5	7.2	7.7	7.6	7.7	7.2	6.3	6.2	4.1
Technician Initials	EL	EL	AL	A	EL	A	EL	EL	EL	A	A	EL	AL	EL	EL

Dissolved oxygen (mg/L)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
CTI + EDTA	5.1	6.0	5.4	6.7	6.2	6.9	7.0	6.8	7.1	6.9	7.1	6.2	6.4	6.9	
CM-MCZ + EDTA	5.0	5.9	5.7	6.4	6.2	6.8	7.0	6.8	7.1	6.8	6.9	6.4	6.0	6.9	
FR-FRCPI + EDTA	5.0	6.0	5.8	6.7	6.5	6.9	7.0	6.8	7.0	6.9	6.6	6.4	6.0	6.9	
Technician Initials	EL	A	A	EL	EL	EL	EL	AL	A	A	EL	ML	EL	EL	

DO meter/probe: DO-4, DO-4

Comments: _____

Reviewed by: JGU

Date Reviewed: June 8/18

H. azteca Water-only Toxicity Test Data Sheet

28 ~~14~~-d Survival and Weight

Client: Teck
 Work Order No: 180713
 Sample ID: See below

Start Date: May 3 / 18
 Termination Date: May 31 / 18
 Test Organism: Hyalella azteca
 Balance: 1

① 1019.20

Sample ID	TRJ Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control	1	A	9	0	1	EC	1006.31	1009.14	9	EC
	2	B	9	0	1		996.53	999.35	9	
	3	C	10	0	0		981.92	985.32	10	
	4	D	9	0	1		999.66	1002.83	9	
	5	E	10	0	0		994.91	998.85	10	
FR-UFRI	21 36	A	10	0	0		1015.23	1026.20 1026.20	10	
	22 37	B	9	0	1		991.65	995.27	9	
	23 38	C	9	0	1		999.64	1003.20	9	
	24 39	D	10	0	0		1062.63	1067.08	10	
	25 40	E	10	0	0		1021.82	1025.89	10	
CM-MCI	31	A	10	0	0		1027.99	1032.12	10	
	32	B	10	0	0		1035.04	1038.95	10	
	33	C	9	0	1		1033.86	1037.98	9	
	34	D	9	0	1		997.65	1001.81	9	
	35	E	10	0	0		1013.68	1018.16	10	
GH-ER2	26	A	10	0	0		1005.29	1009.45	10	
	27	B	10	0	0		1057.77	1061.67	10	
	28	C	10	0	0		1012.59	1016.22	10	
	29	D	10	0	0		1073.60	1077.38	10	
	30	E	9	0	1	✓	1008.20	1012.13	9	✓

Comments: Reweighed on Pan # 2 : 999.49mg, Pan # 39 : 1067.08mg, Pan # 40 : 1025.86mg

Reviewed by: JCM

Date Reviewed: June 11 / 18

H. azteca Water-only Toxicity Test Data Sheet

28 ^{EL} 14-d Survival and Weight

Client: Teck
 Work Order No: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	TKZ Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
EL Control	21	A	10	0	0	EL	1016.07	1020.57 ^{EL}	10	EL
FR-FRCP1	22	B	10	0	0		1040.50	1044.53 ⁹	10	
	23	C	10	0	0		1026.85	1011.46	10	
	24	D	10	0	0		983.43	987.79	10	
	25	E	9	0	1		1080.99	1084.84	9	
	GH-FR1	16	A	10	0		0	1013.79	1018.93	
17	B	10	0	0	1026.70	1031.95	10			
18	C	7	0	3	1014.12	1018.19	7			
19	D	9	0	1	1009.51	1013.14	9			
20	E	10	0	0	1051.75	1056.58	10			
CM-MC2	11	A	8	0	2		1038.67	1041.25	8	
	12	B	4	0	6		1021.45	1022.87	4	
	13	C	6	0	EL 4		1033.69	1035.42	6	
	14	D	7	0	EL 3		1027.17	1029.21	7	
	15	E	1	0	9		1021.24	1021.61	1	
CM-MC3	6	A	9	0	1		1017.98	1022.06	9	
	7	B	10	0	0		1023.01	1027.68	10	
	8	C	10	0	0		1018.59	1022.22	10	
	9	D	9	0	1		1027.17 ⁰	1013.09	9	
	10	E	10	0	0		1021.24 ³	1046.77	10	

Comments:

Reweighed on Pan #19: 1013.20 mg, Pan #23: 1011.43 mg,
Pan #10: 1046.75 mg

Reviewed by:

JGw

Date Reviewed:

June 11/18

H. azteca Water-only Toxicity Test Data Sheet

28^{EC} d Survival and Weight

Client: Teck
 Work Order No: 180713
 Sample ID: See below

Start Date: May 3/18
 Termination Date: May 31/18
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
^{EC} Control	41	A	10	0	0	EC	1028.14	1032.73 ⁹	10	EC
LL-LCDSSLCC	42	B	10	0	0	↓	1065.77	1069.78	10	↓
	43	C	10	0	0		1011.85	1016.09	10	
	44	D	7 ⁰	0	3		1028.55	1029.69	7	
	45	E	8	0	2		1047.90	1050.62	8	
	46	A	10	0	0		988.54	992.29	^{EC} 10	
LLSLC	47	B	9	0	1	↓	1031.69	1035.59	9	↓
	48	C	10	0	0		1004.49	1008.58	10	
	49	D	10	0	0		1040.28	1044.52	10	
	50	E	10	0	0		1037.03	1041.87 ⁴	10	
		A								
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									

Comments: ① Organisms appear ^{EC} pale light in color.
Reweighed on Pan # 43: 1016.12 mg

Reviewed by: JCH

Date Reviewed: June 1/18

H. azteca Water-only Toxicity Test Data Sheet

28 14-d Survival and Weight
EL

Client:

Teck

Work Order No:

180713

Sample ID:

See below

Start Date:

May 3/18

Termination Date:

May 31/18

Test Organism:

Hyalella azteca

Balance:

1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control + EDTA	51	A	10 ⁰	0	0	EL	1006.03	1008.78	10	EL
	52	B	10	0	0		1030.35	1035.29	10	
	53	C	10	0	0		979.67	983.17	10	
	54	D	10	0	0		1077.15	1081.30	10	
	55	E	9 ⁰	0	1		1051.20	1053.79	9	
CM. m12 + EDTA	56	A	10	0	0			1017.06	1021.56	
	57	B	10	0	0	1029.85		1033.70	10	
	58	C	10	0	0	1019.71		1023.850	10	
	59	D	10	0	0	1022.89		1027.14 ^{EL}	10	
	60	E	10	0	0	1044.17		1047.92	10	
FR-FRCP1 + EDTA	61	A	8	2 ⁰	0 ²		1039.75	1043.59	8	
	62	B	9	1 ⁰	0 ¹		982.46	985.23	9	
	63	C	8	2 ⁰	0 ²		1030.51	1033.99	7 ⁽²⁾	
	64	D	8	2 ⁰	0 ²		996.77	1000.49	8	
	65	E	10	0 ⁰	0 ⁰		1028.19	1032.29	10	
		A		EL	EL					
		B								
		C								
		D								
		E								

Comments:

① Organisms appear light in color. ② lost in transfer.

Reweighed on Pan #154 = 1081.19mg, Pan #161 = 1043.63 mg

Reviewed by:

Joh

Date Reviewed:

June 11/18

Client: Teck

W.O.#: 180713

Hardness and Alkalinity Datasheet

Day 28 Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Control	May 31/18	Jun 5/18	100 [Ⓢ]	0.8	0.9	70	100 [Ⓢ]	1.4	140	EC
FR-VFR1				1.2	1.3	110		1.2	120	
CM-MC1				1.0	1.1	90		1.0	100	
GH-ER2				1.4	1.5	130		1.3	130	
FR-FRCP1				1.5	1.6	140		2.5	250	
GH-FR1				1.5	1.6	140		2.5	250	
CM-MC2				1.4	1.5	130		2.6	260	
CM-MC3				1.2	1.3	110		2.6	260	
LC-LCD-SSLCC				1.6	1.7	150		2.5	250	
LC-SLC				1.2	1.3	110		1.2	120	
(+)+EDTA				0.8	0.9	70		1.3	130	
CM-MC2+EDTA				1.4	1.5	130		2.6	260	
FR-FRCP1+EDTA				1.6	1.7	150		2.5	250	

Notes: [Ⓢ] Diluted to 100 mL w/ D-Z-

Reviewed by: JOU

Date Reviewed: June 11/18

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 1 of 6)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Batch ID: 03-9736-3154 Test Type: Survival-Growth Analyst: Jill Sones
 Start Date: 03 May-18 Protocol: EPA/600/R-99/064 (2000) Diluent: Reconstituted Water
 Ending Date: 31 May-18 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		

① FR_UFR1, GH_ER2, CM_MC1
 + LC_SLC are reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.1760	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9114	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	LC_LCDSSLCC passed mean dry weight-	1

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 2 of 6)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.2476	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9460	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9992	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	Lab Control failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	LC_LCDSSLCC failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	CM_MC3 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	LC_SLC failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	GH_ER2 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	FR_UFR1 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	FR_FRCP1 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	GH_FR1 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	CM_MC1 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.0279	CM_MC2 failed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	GH_FR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.9915	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	GH_ER2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	LC_SLC passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	CM_MC2 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	FR_UFR1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	CM_MC1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	LC_LCDSSLCC passed mean dry weight-	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	Lab Control passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	FR_FRCP1 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	CM_MC3 passed mean dry weight-mg	1
03-5625-7763	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	0.3329	GH_FR1 passed mean dry weight-mg	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 3 of 6)
 Test Code/ID: 180713b / 16-9507-4060

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	FR_UFR1 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	CM_MC3 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	LC_SLC failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	CM_MC1 failed survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 4 of 6)
 Test Code/ID: 180713b / 16-9507-4060

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	FR_FRCP1 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	GH_ER2 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	GH_FR1 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	CM_MC2 failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	LC_LCDSSLCC failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	2.0E-07	Lab Control failed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	FR_UFR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	CM_MC1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	GH_ER2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	Lab Control passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	FR_FRCP1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	GH_FR1 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	CM_MC2 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	LC_LCDSSLCC passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	CM_MC3 passed survival rate	1
08-1936-9360	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.7154	LC_SLC passed survival rate	1

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits		Overlap	Decision
				Lower	Upper		
08-1936-9360	Survival Rate	Control Resp	0.96	0.8	>>	Yes	Passes Criteria

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 5 of 6)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	5	0.3428	0.3017	0.3839	0.3133	0.394	0.01482	0.03313	9.66%	0.00%
FR_UFR1		5	0.4094	0.384	0.4347	0.3956	0.445	0.009137	0.02043	4.99%	-19.41%
CM_MC1		5	0.434	0.3959	0.472	0.391	0.4622	0.01369	0.03061	7.05%	-26.59%
GH_ER2		5	0.3967	0.36	0.4335	0.363	0.4367	0.01323	0.02958	7.46%	-15.73%
FR_FRCP1		5	0.4368	0.4118	0.4617	0.409	0.461	0.008987	0.02009	4.60%	-27.41%
GH_FR1		5	0.5014	0.4202	0.5825	0.4033	0.5814	0.02922	0.06534	13.03%	-46.25%
CM_MC2		5	0.3255	0.2798	0.3711	0.2884	0.37	0.01643	0.03674	11.29%	5.06%
CM_MC3		5	0.4415	0.3836	0.4995	0.363	0.4833	0.02086	0.04665	10.57%	-28.80%
LC_LCDSSLCC		5	0.3686	0.2214	0.5158	0.1628	0.465	0.05301	0.1185	32.16%	-7.52%
LC_SLC	XC	5	0.4345	0.4061	0.4629	0.409	0.471	0.01023	0.02288	5.27%	-26.74%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	5	0.9400	0.8720	1.0000	0.9000	1.0000	0.0245	0.0548	5.83%	0.00%
FR_UFR1		5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-2.13%
CM_MC1		5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-2.13%
GH_ER2		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-4.26%
FR_FRCP1		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-4.26%
GH_FR1		5	0.9200	0.7581	1.0000	0.7000	1.0000	0.0583	0.1304	14.17%	2.13%
CM_MC2		5	0.5200	0.1755	0.8645	0.1000	0.8000	0.1241	0.2775	53.36%	44.68%
CM_MC3		5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-2.13%
LC_LCDSSLCC		5	0.9000	0.7244	1.0000	0.7000	1.0000	0.0633	0.1414	15.71%	4.26%
LC_SLC	XC	5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-4.26%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.3144	0.3133	0.34	0.3522	0.394
FR_UFR1		0.397	0.4022	0.3956	0.445	0.407
CM_MC1		0.413	0.391	0.4556	0.4622	0.448
GH_ER2		0.416	0.39	0.363	0.378	0.4367
FR_FRCP1		0.45	0.409	0.461	0.436	0.4278
GH_FR1		0.514	0.525	0.5814	0.4033	0.483
CM_MC2		0.3225	0.355	0.2884	0.2914	0.37
CM_MC3		0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC		0.465	0.401	0.424	0.1628	0.39
LC_SLC	XC	0.435	0.4333	0.409	0.424	0.471

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.9000	0.9000	1.0000	0.9000	1.0000
FR_UFR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC1		1.0000	1.0000	0.9000	0.9000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000	0.9000
GH_FR1		1.0000	1.0000	0.7000	0.9000	1.0000
CM_MC2		0.8000	0.4000	0.6000	0.7000	0.1000
CM_MC3		0.9000	1.0000	1.0000	0.9000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	0.7000	0.8000
LC_SLC	XC	1.0000	0.9000	1.0000	1.0000	1.0000

CETIS Summary Report

Report Date: 10 Oct-18 13:42 (p 6 of 6)
Test Code/ID: 180713b / 16-9507-4060

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	9/10	9/10	10/10	9/10	10/10
FR_UFR1		10/10	9/10	9/10	10/10	10/10
CM_MC1		10/10	10/10	9/10	9/10	10/10
GH_ER2		10/10	10/10	10/10	10/10	9/10
FR_FRCP1		10/10	10/10	10/10	10/10	9/10
GH_FR1		10/10	10/10	7/10	9/10	10/10
CM_MC2		8/10	4/10	6/10	7/10	1/10
CM_MC3		9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC		10/10	10/10	10/10	7/10	8/10
LC_SLC	XC	10/10	9/10	10/10	10/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 1 of 14)
 Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test			Nautilus Environmental		
Analysis ID: 11-0418-2652	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 05 Jun-18 15:06	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung			
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water			
Ending Date: 31 May-18	Species: Hyaella azteca	Brine:			
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	10-2099-4429	03 May-18	03 May-18	NA	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Control		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Control		CM_MC1	1	1.0000	Exact	Non-Significant Effect
Control		GH_ER2	1	1.0000	Exact	Non-Significant Effect
Control		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Control		GH_FR1	0.5	1.0000	Exact	Non-Significant Effect
Control		CM_MC2	1.327E-06	<0.0001	Exact	Significant Effect
Control		CM_MC3	1	1.0000	Exact	Non-Significant Effect
Control		LC_LCDSSLCC	0.3575	1.0000	Exact	Non-Significant Effect
Control		LC_SLC	1	1.0000	Exact	Non-Significant Effect
Control		Control+EDTA	1	1.0000	Exact	Non-Significant Effect
Control		CM_MC2+EDTA	1	1.0000	Exact	Non-Significant Effect
Control		FR_FRCP1+EDTA	0.1589	1.0000	Exact	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 2 of 14)
 Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 11-0418-2652 Endpoint: 10d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:06 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	47	3	50	0.94	0.06	0.0%
FR_UFR1	48	2	50	0.96	0.04	-2.13%
CM_MC1	48	2	50	0.96	0.04	-2.13%
GH_ER2	49	1	50	0.98	0.02	-4.26%
FR_FRCP1	49	1	50	0.98	0.02	-4.26%
GH_FR1	46	4	50	0.92	0.08	2.13%
CM_MC2	26	24	50	0.52	0.48	44.68%
CM_MC3	48	2	50	0.96	0.04	-2.13%
LC_LCDSSLCC	45	5	50	0.9	0.1	4.26%
LC_SLC	49	1	50	0.98	0.02	-4.26%
Control+EDTA	49	1	50	0.98	0.02	-4.26%
CM_MC2+EDTA	50	0	50	1	0	-6.38%
FR_FRCP1+EDTA	43	7	50	0.86	0.14	8.51%

10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.9	0.9	1	0.9	1
FR_UFR1	1	0.9	0.9	1	1
CM_MC1	1	1	0.9	0.9	1
GH_ER2	1	1	1	1	0.9
FR_FRCP1	1	1	1	1	0.9
GH_FR1	1	1	0.7	0.9	1
CM_MC2	0.8	0.4	0.6	0.7	0.1
CM_MC3	0.9	1	1	0.9	1
LC_LCDSSLCC	1	1	1	0.7	0.8
LC_SLC	1	0.9	1	1	1
Control+EDTA	1	1	1	1	0.9
CM_MC2+EDTA	1	1	1	1	1
FR_FRCP1+EDTA	0.8	0.9	0.8	0.8	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	9/10	9/10	10/10	9/10	10/10
FR_UFR1	10/10	9/10	9/10	10/10	10/10
CM_MC1	10/10	10/10	9/10	9/10	10/10
GH_ER2	10/10	10/10	10/10	10/10	9/10
FR_FRCP1	10/10	10/10	10/10	10/10	9/10
GH_FR1	10/10	10/10	7/10	9/10	10/10
CM_MC2	8/10	4/10	6/10	7/10	1/10
CM_MC3	9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC	10/10	10/10	10/10	7/10	8/10
LC_SLC	10/10	9/10	10/10	10/10	10/10
Control+EDTA	10/10	10/10	10/10	10/10	9/10
CM_MC2+EDTA	10/10	10/10	10/10	10/10	10/10
FR_FRCP1+EDTA	8/10	9/10	8/10	8/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 3 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 11-0418-2652

Endpoint: 10d Survival Rate

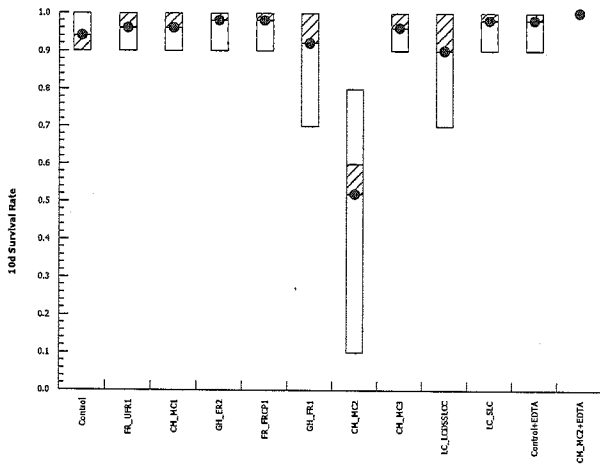
CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:06

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 4 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 06-6184-9326	Endpoint: 28d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:12	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	0.6913	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ER2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.3389	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	2.22E-07	<0.0001	Exact	Significant Effect
FR_UFR1		CM_MC3	0.6913	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	0.218	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_SLC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		Control+EDTA	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2+EDTA	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1+EDTA	0.07975	0.7975	Exact	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 5 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 06-6184-9326

Endpoint: 10d Survival Rate

CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:12

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Site Control	48	2	50	0.96	0.04	0.0%
CM_MC1	48	2	50	0.96	0.04	0.0%
GH_ER2	49	1	50	0.98	0.02	-2.08%
FR_FRCP1	49	1	50	0.98	0.02	-2.08%
GH_FR1	46	4	50	0.92	0.08	4.17%
CM_MC2	26	24	50	0.52	0.48	45.83%
CM_MC3	48	2	50	0.96	0.04	0.0%
LC_LCDSSLCC	45	5	50	0.9	0.1	6.25%
LC_SLC	49	1	50	0.98	0.02	-2.08%
Control+EDTA	49	1	50	0.98	0.02	-2.08%
CM_MC2+EDTA	50	0	50	1	0	-4.17%
FR_FRCP1+EDTA	43	7	50	0.86	0.14	10.42%

10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	0.9	0.9	1	1
CM_MC1	1	1	0.9	0.9	1
GH_ER2	1	1	1	1	0.9
FR_FRCP1	1	1	1	1	0.9
GH_FR1	1	1	0.7	0.9	1
CM_MC2	0.8	0.4	0.6	0.7	0.1
CM_MC3	0.9	1	1	0.9	1
LC_LCDSSLCC	1	1	1	0.7	0.8
LC_SLC	1	0.9	1	1	1
Control+EDTA	1	1	1	1	0.9
CM_MC2+EDTA	1	1	1	1	1
FR_FRCP1+EDTA	0.8	0.9	0.8	0.8	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	9/10	9/10	10/10	10/10
CM_MC1	10/10	10/10	9/10	9/10	10/10
GH_ER2	10/10	10/10	10/10	10/10	9/10
FR_FRCP1	10/10	10/10	10/10	10/10	9/10
GH_FR1	10/10	10/10	7/10	9/10	10/10
CM_MC2	8/10	4/10	6/10	7/10	1/10
CM_MC3	9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC	10/10	10/10	10/10	7/10	8/10
LC_SLC	10/10	9/10	10/10	10/10	10/10
Control+EDTA	10/10	10/10	10/10	10/10	9/10
CM_MC2+EDTA	10/10	10/10	10/10	10/10	10/10
FR_FRCP1+EDTA	8/10	9/10	8/10	8/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 6 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth ~~Sediment~~ Test

Nautilus Environmental

Analysis ID: 06-6184-9326

Endpoint: 10d Survival Rate

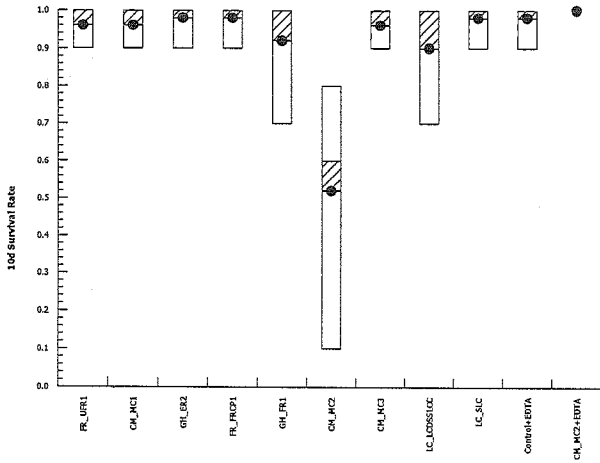
CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:12

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 10 of 14)

Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 08-3426-8928	Endpoint: 28d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:17	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyaella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.7525	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	0.1811	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0	<0.0001	Exact	Significant Effect
GH_ER2		CM_MC3	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_LCDSSLCC	0.1022	0.9198	Exact	Non-Significant Effect
GH_ER2		LC_SLC	0.7525	1.0000	Exact	Non-Significant Effect
GH_ER2		Control+EDTA	0.7525	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2+EDTA	1	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1+EDTA	0.02972	0.2972	Exact	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 11 of 14)
 Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 08-3426-8928 Endpoint: 10d Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:17 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	48	2	50	0.96	0.04	2.04%
CM_MC1	48	2	50	0.96	0.04	2.04%
GH_ER2 Site Control	49	1	50	0.98	0.02	0.0%
FR_FRCP1	49	1	50	0.98	0.02	0.0%
GH_FR1	46	4	50	0.92	0.08	6.12%
CM_MC2	26	24	50	0.52	0.48	46.94%
CM_MC3	48	2	50	0.96	0.04	2.04%
LC_LCDSSLCC	45	5	50	0.9	0.1	8.16%
LC_SLC	49	1	50	0.98	0.02	0.0%
Control+EDTA	49	1	50	0.98	0.02	0.0%
CM_MC2+EDTA	50	0	50	1	0	-2.04%
FR_FRCP1+EDTA	43	7	50	0.86	0.14	12.24%

10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	0.9	0.9	1	1
CM_MC1	1	1	0.9	0.9	1
GH_ER2	1	1	1	1	0.9
FR_FRCP1	1	1	1	1	0.9
GH_FR1	1	1	0.7	0.9	1
CM_MC2	0.8	0.4	0.6	0.7	0.1
CM_MC3	0.9	1	1	0.9	1
LC_LCDSSLCC	1	1	1	0.7	0.8
LC_SLC	1	0.9	1	1	1
Control+EDTA	1	1	1	1	0.9
CM_MC2+EDTA	1	1	1	1	1
FR_FRCP1+EDTA	0.8	0.9	0.8	0.8	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	9/10	9/10	10/10	10/10
CM_MC1	10/10	10/10	9/10	9/10	10/10
GH_ER2	10/10	10/10	10/10	10/10	9/10
FR_FRCP1	10/10	10/10	10/10	10/10	9/10
GH_FR1	10/10	10/10	7/10	9/10	10/10
CM_MC2	8/10	4/10	6/10	7/10	1/10
CM_MC3	9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC	10/10	10/10	10/10	7/10	8/10
LC_SLC	10/10	9/10	10/10	10/10	10/10
Control+EDTA	10/10	10/10	10/10	10/10	9/10
CM_MC2+EDTA	10/10	10/10	10/10	10/10	10/10
FR_FRCP1+EDTA	8/10	9/10	8/10	8/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 12 of 14)
Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

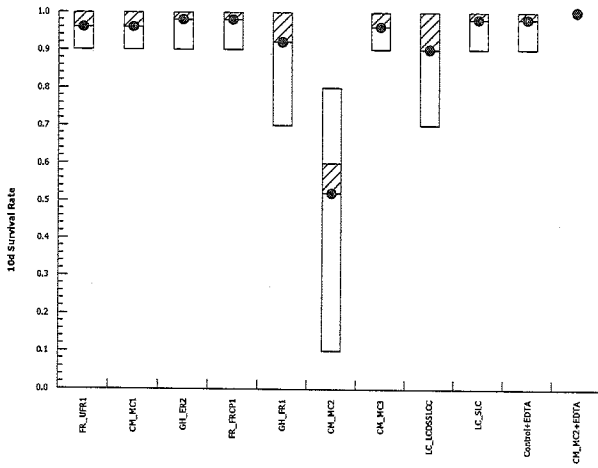
Nautilus Environmental

Analysis ID: 08-3426-8928
Analyzed: 05 Jun-18 15:17

Endpoint: 10d Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 7 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-4098-9678	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:14	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	0.6913	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ER2	1	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	0.3389	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	2.22E-07	<0.0001	Exact	Significant Effect
CM_MC1		CM_MC3	0.6913	1.0000	Exact	Non-Significant Effect
CM_MC1		LC_LCDSSLCC	0.218	1.0000	Exact	Non-Significant Effect
CM_MC1		LC_SLC	1	1.0000	Exact	Non-Significant Effect
CM_MC1		Control+EDTA	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2+EDTA	1	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_FRCP1+EDTA	0.07975	0.7975	Exact	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 8 of 14)

Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-4098-9678

Endpoint: 10d Survival Rate

CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:14

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	48	2	50	0.96	0.04	0.0%
CM_MC1 Site Control	48	2	50	0.96	0.04	0.0%
GH_ER2	49	1	50	0.98	0.02	-2.08%
FR_FRCP1	49	1	50	0.98	0.02	-2.08%
GH_FR1	46	4	50	0.92	0.08	4.17%
CM_MC2	26	24	50	0.52	0.48	45.83%
CM_MC3	48	2	50	0.96	0.04	0.0%
LC_LCDSSLCC	45	5	50	0.9	0.1	6.25%
LC_SLC	49	1	50	0.98	0.02	-2.08%
Control+EDTA	49	1	50	0.98	0.02	-2.08%
CM_MC2+EDTA	50	0	50	1	0	-4.17%
FR_FRCP1+EDTA	43	7	50	0.86	0.14	10.42%

10d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	0.9	0.9	1	1
CM_MC1	1	1	0.9	0.9	1
GH_ER2	1	1	1	1	0.9
FR_FRCP1	1	1	1	1	0.9
GH_FR1	1	1	0.7	0.9	1
CM_MC2	0.8	0.4	0.6	0.7	0.1
CM_MC3	0.9	1	1	0.9	1
LC_LCDSSLCC	1	1	1	0.7	0.8
LC_SLC	1	0.9	1	1	1
Control+EDTA	1	1	1	1	0.9
CM_MC2+EDTA	1	1	1	1	1
FR_FRCP1+EDTA	0.8	0.9	0.8	0.8	1

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	9/10	9/10	10/10	10/10
CM_MC1	10/10	10/10	9/10	9/10	10/10
GH_ER2	10/10	10/10	10/10	10/10	9/10
FR_FRCP1	10/10	10/10	10/10	10/10	9/10
GH_FR1	10/10	10/10	7/10	9/10	10/10
CM_MC2	8/10	4/10	6/10	7/10	1/10
CM_MC3	9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC	10/10	10/10	10/10	7/10	8/10
LC_SLC	10/10	9/10	10/10	10/10	10/10
Control+EDTA	10/10	10/10	10/10	10/10	9/10
CM_MC2+EDTA	10/10	10/10	10/10	10/10	10/10
FR_FRCP1+EDTA	8/10	9/10	8/10	8/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 9 of 14)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-4098-9678

Endpoint: 28d Survival Rate

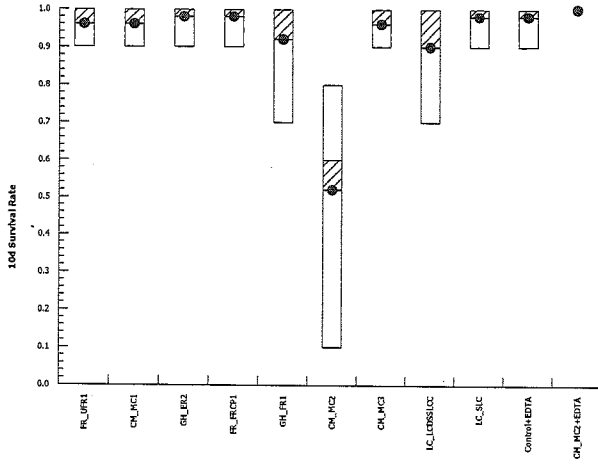
CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:14

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 10 Oct-18 13:19 (p 1 of 2)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 08-1936-9360	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 13:16	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 03-9736-3154	Test Type: Survival-Growth	Analyst: Jill Sones
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) <i>Modified</i>	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-2018043000	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.7525	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.7525	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.1811	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0000	Exact	2.0E-07	Significant Effect
		CM_MC3	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.1022	Exact	0.7154	Non-Significant Effect

① Site control = LC_SLC

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits		Overlap	Decision
		Lower	Upper		
Control Resp	0.96	0.8	>>	Yes	Passes Criteria

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		48	2	50	0.96	0.04	-4.35%
CM_MC1		48	2	50	0.96	0.04	-4.35%
GH_ER2		49	1	50	0.98	0.02	-6.52%
FR_FRCP1		49	1	50	0.98	0.02	-6.52%
GH_FR1		46	4	50	0.92	0.08	0.0%
CM_MC2		26	24	50	0.52	0.48	43.48%
CM_MC3		48	2	50	0.96	0.04	-4.35%
LC_LCDSSLCC		45	5	50	0.9	0.1	2.17%
LC_SLC	XC	49	1	50	0.98	0.02	-6.52%

Jlu
Oct-11/18

CETIS Analytical Report

Report Date: 10 Oct-18 13:19 (p 2 of 2)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 08-1936-9360 Endpoint: Survival Rate
 Analyzed: 10 Oct-18 13:16 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

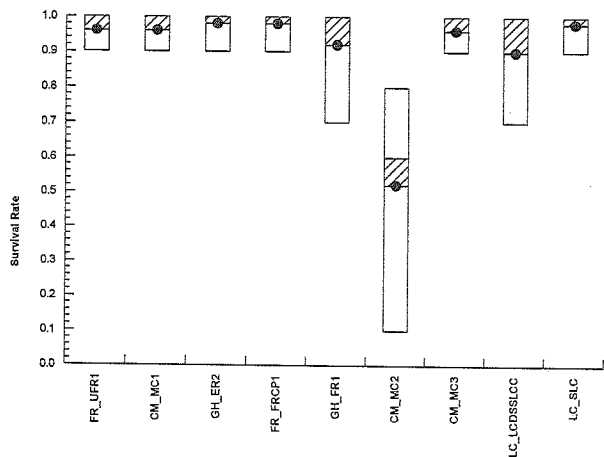
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC1		1.0000	1.0000	0.9000	0.9000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000	0.9000
GH_FR1		1.0000	1.0000	0.7000	0.9000	1.0000
CM_MC2		0.8000	0.4000	0.6000	0.7000	0.1000
CM_MC3		0.9000	1.0000	1.0000	0.9000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	0.7000	0.8000
LC_SLC	XC	1.0000	0.9000	1.0000	1.0000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		10/10	9/10	9/10	10/10	10/10
CM_MC1		10/10	10/10	9/10	9/10	10/10
GH_ER2		10/10	10/10	10/10	10/10	9/10
FR_FRCP1		10/10	10/10	10/10	10/10	9/10
GH_FR1		10/10	10/10	7/10	9/10	10/10
CM_MC2		8/10	4/10	6/10	7/10	1/10
CM_MC3		9/10	10/10	10/10	9/10	10/10
LC_LCDSSLCC		10/10	10/10	10/10	7/10	8/10
LC_SLC	XC	10/10	9/10	10/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:37 (p 1 of 2)
 Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth-Sediment Test			Nautilus Environmental		
Analysis ID: 05-9434-5493	Endpoint: ²⁷ 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 05 Jun-18 15:36	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 15-6299-8066	Test Type: Growth-Survival (²⁷ 10d)	Analyst: Eric Cheung			
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water			
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:			
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA	Teck Coal	
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Control+EDTA		CM_MC2+EDTA	1	1.0000	Exact	Non-Significant Effect
Control+EDTA		FR_FRCP1+EDTA	0.02972	0.0297	Exact	Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control+EDTA Negative Contr	49	1	50	0.98	0.02	0.0%
CM_MC2+EDTA	50	0	50	1	0	-2.04%
FR_FRCP1+EDTA	43	7	50	0.86	0.14	12.24%

²⁸ **10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	1	1	1	1	0.9
CM_MC2+EDTA	1	1	1	1	1
FR_FRCP1+EDTA	0.8	0.9	0.8	0.8	1

²⁸ **10d Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	10/10	10/10	10/10	10/10	9/10
CM_MC2+EDTA	10/10	10/10	10/10	10/10	10/10
FR_FRCP1+EDTA	8/10	9/10	8/10	8/10	10/10

CETIS Analytical Report

Report Date: 05 Jun-18 15:37 (p 2 of 2)
Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth ^{EC}Sediment Test

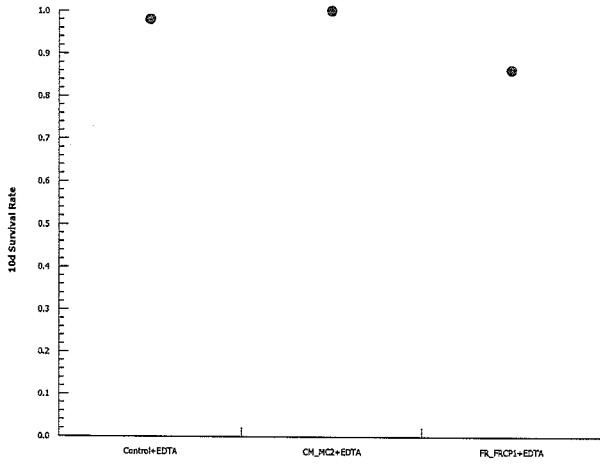
Nautilus Environmental

Analysis ID: 05-9434-5493
Analyzed: 05 Jun-18 15:36

Endpoint: ²²10d Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 19 Jun-18 15:04 (p 1 of 3)
 Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth ^{see} Sediment Test Nautilus Environmental

Analysis ID: 17-9766-7624	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:09	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (100) ^{28d}	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) ^(unadited)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	10-2099-4429	03 May-18	03 May-18	NA	Teck Coal	
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)		
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	26.8%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Control		FR_UFR1	40	15	0	8	1.0000	Asymp	Non-Significant Effect
		CM_MC1	39	15	0	8	1.0000	Asymp	Non-Significant Effect
		GH_ER2	37	15	0	8	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	40	15	0	8	1.0000	Asymp	Non-Significant Effect
		GH_FR1	40	15	0	8	1.0000	Asymp	Non-Significant Effect
		CM_MC2	25	15	0	8	0.7800	Asymp	Non-Significant Effect
		CM_MC3	39	15	0	8	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	34	15	0	8	0.9992	Asymp	Non-Significant Effect
		LC_SLC	40	15	0	8	1.0000	Asymp	Non-Significant Effect
		Control+EDTA	28	15	0	8	0.9403	Asymp	Non-Significant Effect
		CM_MC2+EDTA	37	15	0	8	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1+EDTA	35	15	0	8	0.9997	Asymp	Non-Significant Effect

CETIS Analytical Report

Report Date: 19 Jun-18 15:04 (p 2 of 3)
 Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth ^{JE}Sediment Test

Nautilus Environmental

Analysis ID: 17-9766-7624 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:09 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1364044	0.01136704	12	3.566	0.0007	Significant Effect
Error	0.1657619	0.003187729	52			
Total	0.3021663		64			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	31	26.22	0.0020	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9261	0.9495	0.0008	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	0.3428	0.3017	0.3839	0.34	0.3133	0.394	0.01482	9.67%	0.0%
FR_UFR1	5	0.4094	0.384	0.4347	0.4022	0.3956	0.445	0.009137	4.99%	-19.41%
CM_MC1	5	0.434	0.3959	0.472	0.448	0.391	0.4622	0.01369	7.05%	-26.59%
GH_ER2	5	0.3967	0.36	0.4335	0.39	0.363	0.4367	0.01323	7.46%	-15.73%
FR_FRCP1	5	0.4368	0.4118	0.4617	0.436	0.409	0.461	0.008987	4.6%	-27.41%
GH_FR1	5	0.5014	0.4202	0.5825	0.514	0.4033	0.5814	0.02922	13.03%	-46.25%
CM_MC2	5	0.3255	0.2798	0.3711	0.3225	0.2884	0.37	0.01643	11.29%	5.06%
CM_MC3	5	0.4415	0.3836	0.4995	0.4533	0.363	0.4833	0.02086	10.57%	-28.8%
LC_LCDSSLCC	5	0.3686	0.2214	0.5158	0.401	0.1628	0.465	0.05301	32.16%	-7.52%
LC_SLC	5	0.4345	0.4061	0.4629	0.4333	0.409	0.471	0.01023	5.27%	-26.74%
Control+EDTA	5	0.3644	0.2509	0.4779	0.35	0.275	0.494	0.04088	25.09%	-6.29%
CM_MC2+EDTA	5	0.4028	0.3617	0.4439	0.385	0.375	0.45	0.01479	8.21%	-17.5%
FR_FRCP1+EDTA	5	0.432	0.3367	0.5273	0.465	0.3078	0.4971	0.03432	17.76%	-26.02%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.3144	0.3133	0.34	0.3522	0.394
FR_UFR1	0.397	0.4022	0.3956	0.445	0.407
CM_MC1	0.413	0.391	0.4556	0.4622	0.448
GH_ER2	0.416	0.39	0.363	0.378	0.4367
FR_FRCP1	0.45	0.409	0.461	0.436	0.4278
GH_FR1	0.514	0.525	0.5814	0.4033	0.483
CM_MC2	0.3225	0.355	0.2884	0.2914	0.37
CM_MC3	0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC	0.465	0.401	0.424	0.1628	0.39
LC_SLC	0.435	0.4333	0.409	0.424	0.471
Control+EDTA	0.275	0.494	0.35	0.415	0.2878
CM_MC2+EDTA	0.45	0.385	0.379	0.425	0.375
FR_FRCP1+EDTA	0.48	0.3078	0.4971	0.465	0.41

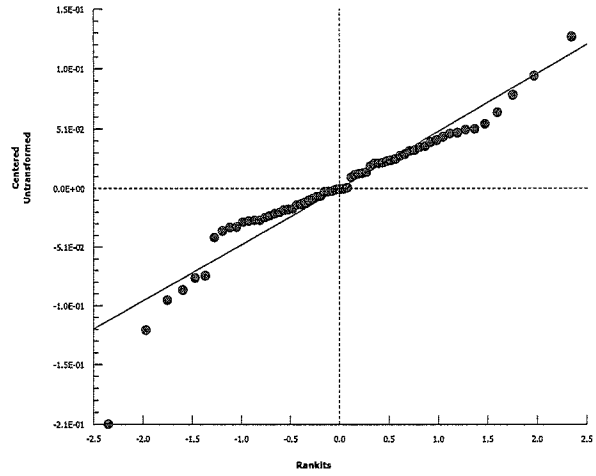
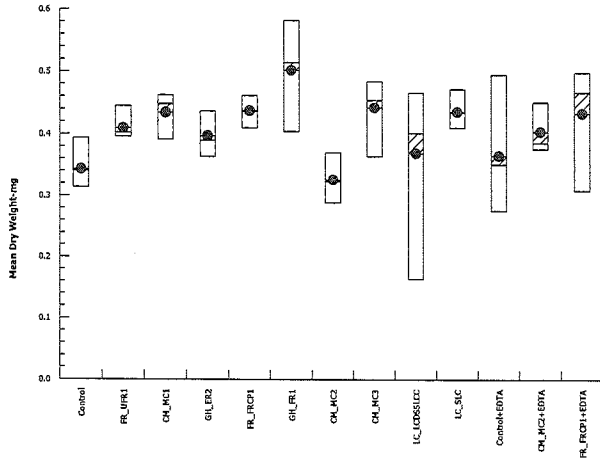
J66
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-9766-7624 Endpoint: Mean Dry Weight-mg
Analyzed: 05 Jun-18 15:09 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 18 of 28)

Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-4779-0655	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:13	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyaella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	22.9%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	34	15	0	8	0.9990	Asymp	Non-Significant Effect
		GH_ER2	23	15	0	8	0.5851	Asymp	Non-Significant Effect
		FR_FRCP1	37	15	0	8	1.0000	Asymp	Non-Significant Effect
		GH_FR1	38	15	0	8	1.0000	Asymp	Non-Significant Effect
		CM_MC2	15	15	0	8	0.0356	Asymp	Significant Effect
		CM_MC3	34	15	0	8	0.9990	Asymp	Non-Significant Effect
		LC_LCDSSLCC	26	15	0	8	0.8393	Asymp	Non-Significant Effect
		LC_SLC	36	15	0	8	0.9999	Asymp	Non-Significant Effect
		Control+EDTA	24	15	0	8	0.6818	Asymp	Non-Significant Effect
		CM_MC2+EDTA	24	15	0	8	0.6818	Asymp	Non-Significant Effect
		FR_FRCP1+EDTA	34	15	0	8	0.9990	Asymp	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 19 of 28)
 Test Code: 180713 | 19-3140-7002

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-4779-0655 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:13 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1141268	0.01037516	11	3.086	0.0033	Significant Effect
Error	0.1613712	0.003361899	48			
Total	0.2754979		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	29.42	24.72	0.0020	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9257	0.9459	0.0013	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.4094	0.384	0.4347	0.4022	0.3956	0.445	0.009137	4.99%	0.0%
CM_MC1	5	0.434	0.3959	0.472	0.448	0.391	0.4622	0.01369	7.05%	-6.01%
GH_ER2	5	0.3967	0.36	0.4335	0.39	0.363	0.4367	0.01323	7.46%	3.08%
FR_FRCP1	5	0.4368	0.4118	0.4617	0.436	0.409	0.461	0.008987	4.6%	-6.69%
GH_FR1	5	0.5014	0.4202	0.5825	0.514	0.4033	0.5814	0.02922	13.03%	-22.47%
CM_MC2	5	0.3255	0.2798	0.3711	0.3225	0.2884	0.37	0.01643	11.29%	20.5%
CM_MC3	5	0.4415	0.3836	0.4995	0.4533	0.363	0.4833	0.02086	10.57%	-7.86%
LC_LCDSSLCC	5	0.3686	0.2214	0.5158	0.401	0.1628	0.465	0.05301	32.16%	9.96%
LC_SLC	5	0.4345	0.4061	0.4629	0.4333	0.409	0.471	0.01023	5.27%	-6.14%
Control+EDTA	5	0.3644	0.2509	0.4779	0.35	0.275	0.494	0.04088	25.09%	10.99%
CM_MC2+EDTA	5	0.4028	0.3617	0.4439	0.385	0.375	0.45	0.01479	8.21%	1.6%
FR_FRCP1+EDTA	5	0.432	0.3367	0.5273	0.465	0.3078	0.4971	0.03432	17.76%	-5.53%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.397	0.4022	0.3956	0.445	0.407
CM_MC1	0.413	0.391	0.4556	0.4622	0.448
GH_ER2	0.416	0.39	0.363	0.378	0.4367
FR_FRCP1	0.45	0.409	0.461	0.436	0.4278
GH_FR1	0.514	0.525	0.5814	0.4033	0.483
CM_MC2	0.3225	0.355	0.2884	0.2914	0.37
CM_MC3	0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC	0.465	0.401	0.424	0.1628	0.39
LC_SLC	0.435	0.4333	0.409	0.424	0.471
Control+EDTA	0.275	0.494	0.35	0.415	0.2878
CM_MC2+EDTA	0.45	0.385	0.379	0.425	0.375
FR_FRCP1+EDTA	0.48	0.3078	0.4971	0.465	0.41

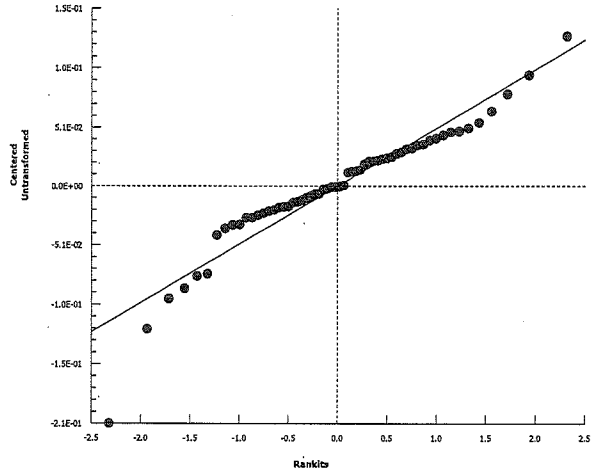
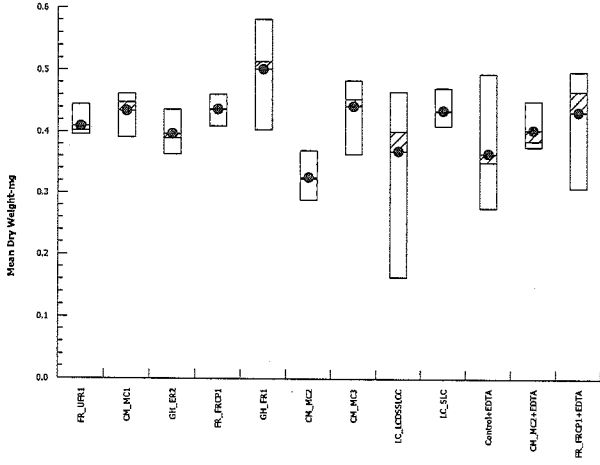
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-4779-0655 Endpoint: Mean Dry Weight-mg
Analyzed: 05 Jun-18 15:13 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 24 of 28)
 Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-8739-6997	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:17	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	23.6%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	32	15	0	8	0.9949	Asymp	Non-Significant Effect
		CM_MC1	36	15	0	8	0.9999	Asymp	Non-Significant Effect
		FR_FRCP1	36	15	0	8	0.9999	Asymp	Non-Significant Effect
		GH_FR1	38	15	0	8	1.0000	Asymp	Non-Significant Effect
		CM_MC2	16	15	0	8	0.0598	Asymp	Non-Significant Effect
		CM_MC3	35.5	15	1	8	0.9998	Asymp	Non-Significant Effect
		LC_LCDSSLCC	29	15	0	8	0.9622	Asymp	Non-Significant Effect
		LC_SLC	35	15	0	8	0.9996	Asymp	Non-Significant Effect
		Control+EDTA	23	15	0	8	0.5851	Asymp	Non-Significant Effect
		CM_MC2+EDTA	29	15	0	8	0.9622	Asymp	Non-Significant Effect
		FR_FRCP1+EDTA	33	15	0	8	0.9977	Asymp	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 25 of 28)
 Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-8739-6997 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:17 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1141268	0.01037516	11	3.086	0.0033	Significant Effect
Error	0.1613712	0.003361899	48			
Total	0.2754979		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	29.42	24.72	0.0020	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9257	0.9459	0.0013	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.4094	0.384	0.4347	0.4022	0.3956	0.445	0.009137	4.99%	0.0%
CM_MC1	5	0.434	0.3959	0.472	0.448	0.391	0.4622	0.01369	7.05%	-6.01%
GH_ER2	5	0.3967	0.36	0.4335	0.39	0.363	0.4367	0.01323	7.46%	3.08%
FR_FRCP1	5	0.4368	0.4118	0.4617	0.436	0.409	0.461	0.008987	4.6%	-6.69%
GH_FR1	5	0.5014	0.4202	0.5825	0.514	0.4033	0.5814	0.02922	13.03%	-22.47%
CM_MC2	5	0.3255	0.2798	0.3711	0.3225	0.2884	0.37	0.01643	11.29%	20.5%
CM_MC3	5	0.4415	0.3836	0.4995	0.4533	0.363	0.4833	0.02086	10.57%	-7.86%
LC_LCDSSLCC	5	0.3686	0.2214	0.5158	0.401	0.1628	0.465	0.05301	32.16%	9.96%
LC_SLC	5	0.4345	0.4061	0.4629	0.4333	0.409	0.471	0.01023	5.27%	-6.14%
Control+EDTA	5	0.3644	0.2509	0.4779	0.35	0.275	0.494	0.04088	25.09%	10.99%
CM_MC2+EDTA	5	0.4028	0.3617	0.4439	0.385	0.375	0.45	0.01479	8.21%	1.6%
FR_FRCP1+EDTA	5	0.432	0.3367	0.5273	0.465	0.3078	0.4971	0.03432	17.76%	-5.53%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.397	0.4022	0.3956	0.445	0.407
CM_MC1	0.413	0.391	0.4556	0.4622	0.448
GH_ER2	0.416	0.39	0.363	0.378	0.4367
FR_FRCP1	0.45	0.409	0.461	0.436	0.4278
GH_FR1	0.514	0.525	0.5814	0.4033	0.483
CM_MC2	0.3225	0.355	0.2884	0.2914	0.37
CM_MC3	0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC	0.465	0.401	0.424	0.1628	0.39
LC_SLC	0.435	0.4333	0.409	0.424	0.471
Control+EDTA	0.275	0.494	0.35	0.415	0.2878
CM_MC2+EDTA	0.45	0.385	0.379	0.425	0.375
FR_FRCP1+EDTA	0.48	0.3078	0.4971	0.465	0.41

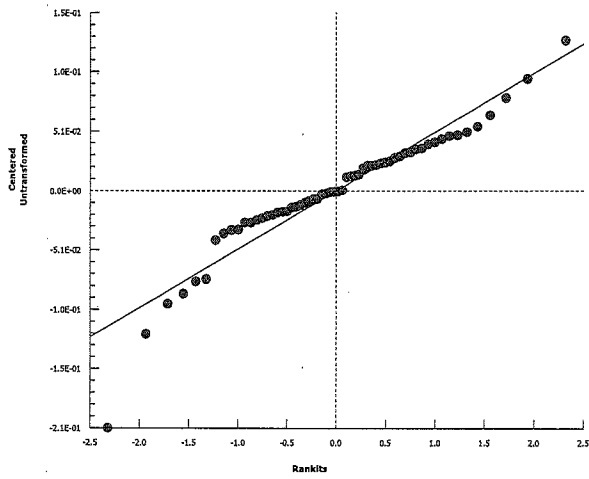
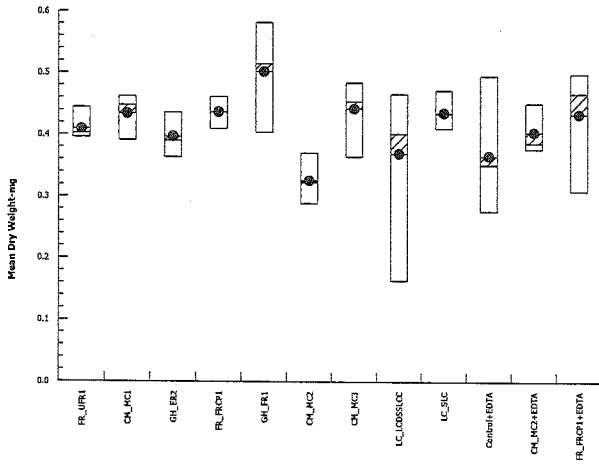
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-8739-6997 Endpoint: Mean Dry Weight-mg
Analyzed: 05 Jun-18 15:17 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 21 of 28)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 04-1055-9957	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:15	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (30d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA		
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-201804301224		
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_20180430_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300956		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_20180430_N		
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_20180430_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-04-24		
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_N		
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.6%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_UFR1	21	15	0	8	0.3830	Asymp	Non-Significant Effect
		GH_ER2	19	15	0	8	0.2103	Asymp	Non-Significant Effect
		FR_FRCP1	27	15	0	8	0.8948	Asymp	Non-Significant Effect
		GH_FR1	36	15	0	8	0.9999	Asymp	Non-Significant Effect
		CM_MC2	15	15	0	8	0.0356	Asymp	Significant Effect
		CM_MC3	30	15	0	8	0.9793	Asymp	Non-Significant Effect
		LC_LCDSSLCC	23	15	0	8	0.5851	Asymp	Non-Significant Effect
		LC_SLC	27	15	0	8	0.8948	Asymp	Non-Significant Effect
		Control+EDTA	22	15	0	8	0.4833	Asymp	Non-Significant Effect
		CM_MC2+EDTA	20	15	0	8	0.2904	Asymp	Non-Significant Effect
		FR_FRCP1+EDTA	31	15	0	8	0.9894	Asymp	Non-Significant Effect

CETIS Analytical Report

Report Date: 05 Jun-18 15:23 (p 22 of 28)

Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 04-1055-9957 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 05 Jun-18 15:15 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1141268	0.01037516	11	3.086	0.0033	Significant Effect
Error	0.1613712	0.003361899	48			
Total	0.2754979		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	29.42	24.72	0.0020	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9257	0.9459	0.0013	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.4094	0.384	0.4347	0.4022	0.3956	0.445	0.009137	4.99%	0.0%
CM_MC1	5	0.434	0.3959	0.472	0.448	0.391	0.4622	0.01369	7.05%	-6.01%
GH_ER2	5	0.3967	0.36	0.4335	0.39	0.363	0.4367	0.01323	7.46%	3.08%
FR_FRCP1	5	0.4368	0.4118	0.4617	0.436	0.409	0.461	0.008987	4.6%	-6.69%
GH_FR1	5	0.5014	0.4202	0.5825	0.514	0.4033	0.5814	0.02922	13.03%	-22.47%
CM_MC2	5	0.3255	0.2798	0.3711	0.3225	0.2884	0.37	0.01643	11.29%	20.5%
CM_MC3	5	0.4415	0.3836	0.4995	0.4533	0.363	0.4833	0.02086	10.57%	-7.86%
LC_LCDSSLCC	5	0.3686	0.2214	0.5158	0.401	0.1628	0.465	0.05301	32.16%	9.96%
LC_SLC	5	0.4345	0.4061	0.4629	0.4333	0.409	0.471	0.01023	5.27%	-6.14%
Control+EDTA	5	0.3644	0.2509	0.4779	0.35	0.275	0.494	0.04088	25.09%	10.99%
CM_MC2+EDTA	5	0.4028	0.3617	0.4439	0.385	0.375	0.45	0.01479	8.21%	1.6%
FR_FRCP1+EDTA	5	0.432	0.3367	0.5273	0.465	0.3078	0.4971	0.03432	17.76%	-5.53%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.397	0.4022	0.3956	0.445	0.407
CM_MC1	0.413	0.391	0.4556	0.4622	0.448
GH_ER2	0.416	0.39	0.363	0.378	0.4367
FR_FRCP1	0.45	0.409	0.461	0.436	0.4278
GH_FR1	0.514	0.525	0.5814	0.4033	0.483
CM_MC2	0.3225	0.355	0.2884	0.2914	0.37
CM_MC3	0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC	0.465	0.401	0.424	0.1628	0.39
LC_SLC	0.435	0.4333	0.409	0.424	0.471
Control+EDTA	0.275	0.494	0.35	0.415	0.2878
CM_MC2+EDTA	0.45	0.385	0.379	0.425	0.375
FR_FRCP1+EDTA	0.48	0.3078	0.4971	0.465	0.41

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 04-1055-9957

Endpoint: Mean Dry Weight-mg

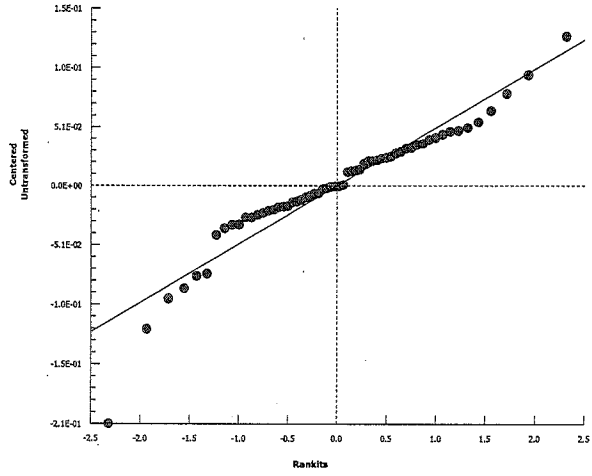
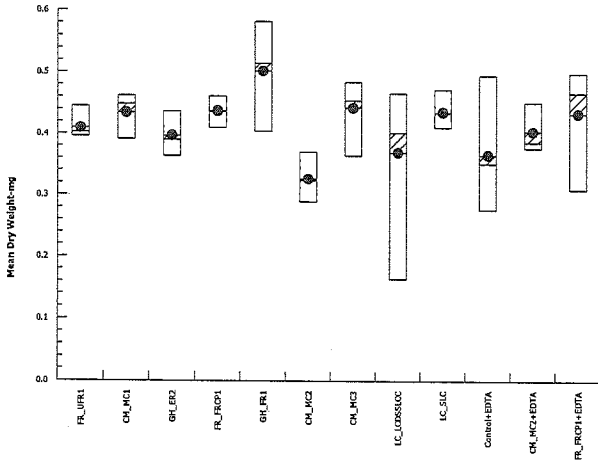
CETIS Version: CETISv1.8.7

Analyzed: 05 Jun-18 15:15

Analysis: Nonparametric-Control vs Treatments

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 10 Oct-18 13:18 (p 1 of 2)
 Test Code/ID: 180713b / 16-9507-4060

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 03-5625-7763	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 13:17	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 03-9736-3154	Test Type: Survival-Growth	Analyst: Jill Sones
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-4755-1822	30 Apr-18 12:24	01 May-18 11:05	60h (7.1 °C)	Teck Coal	
CM_MC1	18-5928-6740	30 Apr-18 12:00	01 May-18 11:05	60h (5 °C)		
GH_ER2	13-2040-6503	30 Apr-18 13:16	01 May-18 11:05	59h (7.5 °C)		
FR_FRCP1	16-0986-1318	30 Apr-18 09:56	01 May-18 11:05	62h (7.1 °C)		
GH_FR1	01-3136-1974	30 Apr-18 09:40	01 May-18 11:05	62h (8.5 °C)		
CM_MC2	15-9825-8392	30 Apr-18 11:16	01 May-18 11:05	61h (5 °C)		
CM_MC3	04-7475-3061	30 Apr-18 12:17	01 May-18 11:05	60h (4.4 °C)		
LC_LCDSSLCC	02-3480-2787	30 Apr-18 12:43	01 May-18 11:05	59h (6.5 °C)		
LC_SLC	04-8253-9667	30 Apr-18 11:44	01 May-18 11:05	60h (4.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1-WS-2018043012	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q2_WS_201804	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-04-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1-WS-201804300	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-04-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q2_WS_201804	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q2_WS_201804	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2017-04-25_	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	19.01%
		CM_MC1 passed mean dry weight-mg	19.01%
		GH_ER2 passed mean dry weight-mg	19.01%
		FR_FRCP1 passed mean dry weight-mg	19.01%
		GH_FR1 passed mean dry weight-mg	19.01%
		CM_MC2 failed mean dry weight-mg	19.01%
		CM_MC3 passed mean dry weight-mg	19.01%
		LC_LCDSSLCC passed mean dry weight-mg	19.01%

① site control = LC_SLC

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	19	16	0	8	CDF	0.1760	Non-Significant Effect
		CM_MC1	28	16	0	8	CDF	0.9114	Non-Significant Effect
		GH_ER2	20	16	0	8	CDF	0.2476	Non-Significant Effect
		FR_FRCP1	29	16	0	8	CDF	0.9460	Non-Significant Effect
		GH_FR1	35	16	0	8	CDF	0.9992	Non-Significant Effect
		CM_MC2*	15	16	0	8	CDF	0.0279	Significant Effect
		CM_MC3	32	16	0	8	CDF	0.9915	Non-Significant Effect
		LC_LCDSSLCC	21	16	0	8	CDF	0.3329	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0994667	0.0124333	8	4.475	7.8E-04	Significant Effect
Error	0.100015	0.0027782	36			
Total	0.199482		44			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	24.35	20.09	0.0020	Unequal Variances

CETIS Analytical Report

Report Date: 10 Oct-18 13:18 (p 2 of 2)
 Test Code/ID: 180713b / 16-9507-4060

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 03-5625-7763 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 13:17 Analysis: Nonparametric-Control vs Treatments Status Level: 1
 Distribution: Shapiro-Wilk W Normality Test 0.8593 0.9308 6.4E-05 Non-Normal Distribution

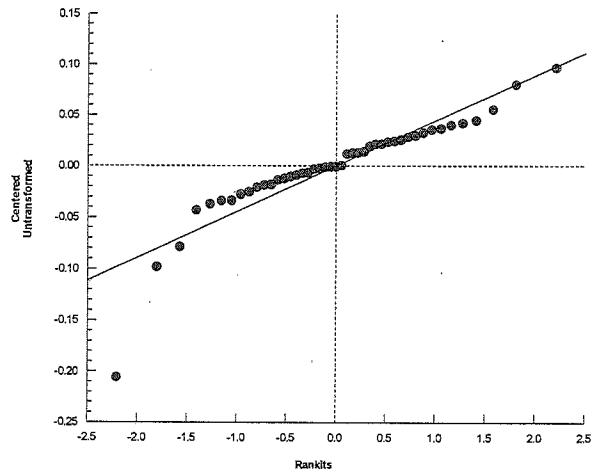
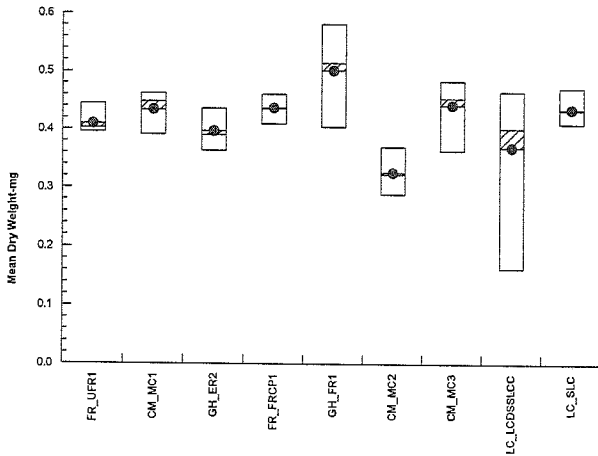
Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		5	0.4094	0.384	0.4347	0.4022	0.3956	0.445	0.009137	4.99%	0.00%
CM_MC1		5	0.434	0.3959	0.472	0.448	0.391	0.4622	0.01369	7.05%	-6.01%
GH_ER2		5	0.3967	0.36	0.4335	0.39	0.363	0.4367	0.01323	7.46%	3.08%
FR_FRCP1		5	0.4368	0.4118	0.4617	0.436	0.409	0.461	0.008987	4.60%	-6.69%
GH_FR1		5	0.5014	0.4202	0.5825	0.514	0.4033	0.5814	0.02922	13.03%	-22.47%
CM_MC2		5	0.3255	0.2798	0.3711	0.3225	0.2884	0.37	0.01643	11.29%	20.50%
CM_MC3		5	0.4415	0.3836	0.4995	0.4533	0.363	0.4833	0.02086	10.57%	-7.86%
LC_LCDSSLCC		5	0.3686	0.2214	0.5158	0.401	0.1628	0.465	0.05301	32.16%	9.96%
LC_SLC	XC	5	0.4345	0.4061	0.4629	0.4333	0.409	0.471	0.01023	5.27%	-6.13%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.397	0.4022	0.3956	0.445	0.407
CM_MC1		0.413	0.391	0.4556	0.4622	0.448
GH_ER2		0.416	0.39	0.363	0.378	0.4367
FR_FRCP1		0.45	0.409	0.461	0.436	0.4278
GH_FR1		0.514	0.525	0.5814	0.4033	0.483
CM_MC2		0.3225	0.355	0.2884	0.2914	0.37
CM_MC3		0.4533	0.467	0.363	0.4833	0.441
LC_LCDSSLCC		0.465	0.401	0.424	0.1628	0.39
LC_SLC	XC	0.435	0.4333	0.409	0.424	0.471

Graphics



Oct - 11/18

CETIS Analytical Report

Report Date: 05 Jun-18 15:37 (p 3 of 4)
 Test Code: 180713 | 19-3140-7002

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 21-0125-9748	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 05 Jun-18 15:37	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 15-6299-8066	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 03 May-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 31 May-18	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 days

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control+EDTA	08-1990-4671	03 May-18	03 May-18	NA	Teck Coal	
CM_MC2+EDTA	02-5071-2385	03 May-18	03 May-18	NA		
FR_FRCP1+EDTA	04-9337-1074	03 May-18	03 May-18	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control+EDTA	Water Sample	Teck Coal	Control+EDTA		
CM_MC2+EDTA	Water Sample	Teck Coal	CM_MC2+EDTA		
FR_FRCP1+EDTA	Water Sample	Teck Coal	FR_FRCP1+EDTA		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	26.2%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control+EDTA		CM_MC2+EDTA	-0.85	2.108	0.095	8	0.9074	CDF	Non-Significant Effect
		FR_FRCP1+EDTA	-1.495	2.108	0.095	8	0.9742	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01150382	0.005751911	2	1.125	0.3566	Non-Significant Effect
Error	0.06135603	0.005113002	12			
Total	0.07285985		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.274	9.21	0.1946	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9702	0.8328	0.8610	Normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control+EDTA	5	0.3644	0.2509	0.4779	0.35	0.275	0.494	0.04088	25.09%	0.0%
CM_MC2+EDTA	5	0.4028	0.3617	0.4439	0.385	0.375	0.45	0.01479	8.21%	-10.55%
FR_FRCP1+EDTA	5	0.432	0.3367	0.5273	0.465	0.3078	0.4971	0.03432	17.76%	-18.56%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control+EDTA	0.275	0.494	0.35	0.415	0.2878
CM_MC2+EDTA	0.45	0.385	0.379	0.425	0.375
FR_FRCP1+EDTA	0.48	0.3078	0.4971	0.465	0.41

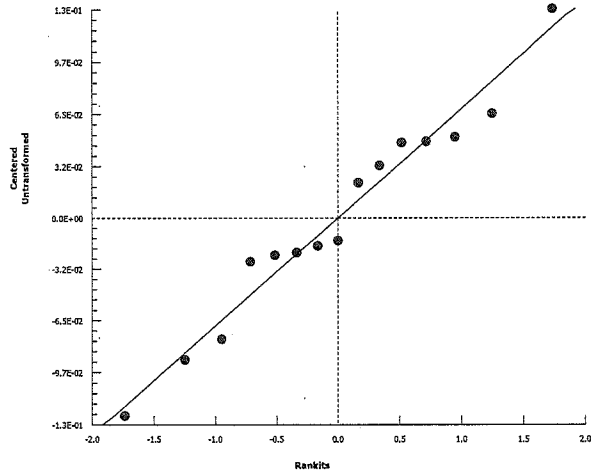
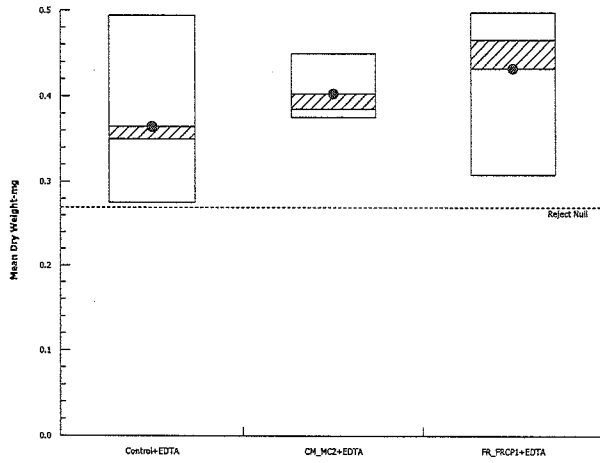
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 21-0125-9748 Endpoint: Mean Dry Weight-mg
Analyzed: 05 Jun-18 15:37 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



APPENDIX D – *Pimephales promelas* Toxicity Test Data

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	CTL		CTL 10ug/L		CTL 20ug/L		1718-1019 20 ug/L		1718-1022 20 ug/L		1718-1023 20 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	15	0	15	0	12	3	15	0	15	0	12	3
b	13	2	15	0	13	2	15	0	15	0	13	2
c	14	1	14	1	12	3	14	1	15	0	15	0
d	14	1	14	1	14	1	15	0	15	0	15	0
e	30	0	29	1	28	2	28	2	29	1	28	2
f	29	1	27	3	28	2	29	1	30	0	28	2

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL			CTL 10ug/L			CTL 20ug/L			1718-1019 20 ug/L		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	0	✓ 15	15	0	✓ 15	11	1	✓ 15	15	0	✓ 15
b	13	2	✓ 15	15	0	✓ 15	13	0	✓ 15	15	0	✓ 15
c	14	1	✓ 15	14	1	✓ 15	12	0	✓ 15	14	0	✓ 15
d	14	1	✓ 15	14	1	✓ 15	14	1	✓ 15	15	0	✓ 15
e	27	3		29	0		28	0		28	0	
f	28	1		27	0		27	1		28	1	

replicate	1718-1022 20 ug/L			1718-1023 20 ug/L		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	1	✓ 15	12	0	✓ 15
b	15	0	✓ 15	12	1	✓ 15
c	15	0	✓ 15	15	0	✓ 15
d	15	0	✓ 15	15	0	✓ 15
e	27	2		28	0	
f	30	0		26	2	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:

Reviewed By: LS

Date Reviewed: 2018/07/04

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)

1718-1022 20 ug/L (GH_FR1)

1718-1023 20 ug/L (FR_FRCP1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	10	1	4	0
b	10	0	5	0
c	12	1	2	0
d	8	0	7	0

CTL 10ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	8	0	7	0
b	11	0	4	0
c	10	0	5	0
d	8	0	7(1)	0

CTL 20ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	2	2
b	8	0	7	0
c	11	0	4	0
d	9	0	6	0

1718-1019 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	12	0	3	0
b	11	0	4	0
c	4	0	11	0
d	8	0	7	0

1718-1022 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	1	1	0
b	13	0	2	0
c	8	0	7	0
d	14	0	1	0

1718-1023 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	15	0	0	0
b	11	0	34	0
c	10	1	4	0
d	6	1	8	0

CTL
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	13	0
b	0	0	14	1
c	3	0	11	0
d	0	0	15	0

CTL 10ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	14	0
b	4	0	11	0
c	1	0	14	0
d	1	0	14(1)	0

CTL 20ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	12	0
b	1	0	14	6
c	1	0	14	0
d	1	0	14	0

1718-1019 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	14	0
b	0	0	15	0
c	0	0	15	0
d	0	0	14	1

1718-1022 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	12	0
b	6	0	9(1)	0
c	3	0	12	0
d	0	0	15	0

1718-1023 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	35	0	10	0
b	4	0	11	0
c	0	0	14	0
d	1	1	12	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/02/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL		CTL 10ug/L		CTL 20ug/L	
Day 5		Day 5		Day 5	
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched	Alive Embryos	Dead Embryos
0	0	14	0	0	0
0	0	14	0	0	0
0	0	14	0	0	0
0	0	15	0	0	0
0	0	14	0	0	1
0	0	15(1)	0	0	0
0	0	15	0	0	0

1718-1019 20 ug/L		1718-1022 20 ug/L		1718-1023 20 ug/L	
Day 5		Day 5		Day 5	
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched	Alive Embryos	Dead Embryos
0	0	15	0	0	1
0	0	15	0	0	0
0	0	15(1)	0	0	0
0	0	13	1	0	0
0	0	14	0	0	1
0	1	14(1)	0	0	0
0	0	15	0	0	0
0	0	15	0	0	0

CTL		CTL 10ug/L	
Day 6		Day 6	
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	14	0
0	0	14	0
0	0	15	0
0	0	14	0
0	0	15(1)	0
0	0	15	0

CTL 20ug/L		1718-1019 20 ug/L		1718-1022 20 ug/L	
Day 6		Day 6		Day 6	
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched	Alive Embryos	Dead Embryos
0	0	13	0	0	0
0	0	15	0	0	0
0	0	15	0	0	0
0	0	15	0	0	0
0	0	15	0	0	0
0	0	15	0	0	0
0	0	14	0	0	0
0	0	14(1)	0	0	0
0	0	15	1	0	0
0	0	13	0	0	0

1718-1023 20 ug/L	
Day 6	
Alive Embryos	Dead Embryos
0	0
0	0
0	0
0	0

Comments/Observations

Reviewed By: JP Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7
a	14	15	13	15	14	14
b	14	14	15	15	13	15
c	14	15	15	14	15	14
d	15	15	15	12*	15	13

Comments/Observations: *killed by tech (1)

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8
a	14	15	13	15	11	14(1)
b	14	14	15	15	13	15
c	14	14	15	14	15	14
d	13	15(1)	15	11	15	13

Comments/Observations:

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9
a	13	15	13	15	9*	14(1)
b	14	14	15	15	13	15
c	13	14	15	14	15	14
d	13	12	15	11	14, 15*	13

Comments/Observations: #Day 9 - 1022 a + d - microbial growth

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10
a	13	15	13	15	8	14(2)
b	14	14	15	15	13	15
c	13	14	15	14	15	14
d	13	12	15	11	13	13

Comments/Observations: * Day 9 1022 a - Microbial growth on

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 11	Day 11	Day 11	Day 11	Day 11	Day 11
a	13	15	13	15	7*	14(2) ** very small
b	14	14	15	15	13	15
c	13	14	14(1)	12(1)	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations: CTL 10ug/L - 2 w bent spines Microbial

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 12	Day 12	Day 12	Day 12	Day 12	Day 12
a	13	15	13	15	4*	14(2)
b	14	14	15	15	13	15
c	13	14	14(1)	13	15	14(1)
d	13	12(3)	15	11	13	13

Comments/Observations: 1718-1022 a - day 12 - dead organisms covered in microbial growth

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 13	Day 13	Day 13	Day 13	Day 13	Day 13
a	13	15	13	15	4	14(2)
b	14	14	14	15	13	15
c	13	14	13	13	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations:

replicate	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
	Day 14	Day 14	Day 14	Day 14	Day 14	Day 14
a	13	15	12	15	4	13(1)
b	14	14	14	15	13	15
c	13	14	12	13	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations: * 1718-1022 a - Day 12 - all 3 covered in microbial growth

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 15	CTL 10ug/L Day 15	CTL 20ug/L Day 15	1718-1019 20 ug/L Day 15	1718-1022 20 ug/L Day 15	1718-1023 20 ug/L Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	13(1)
b	14	14	14	15	13	15
c	13	13	12	13	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations:

	CTL Day 16	CTL 10ug/L Day 16	CTL 20ug/L Day 16	1718-1019 20 ug/L Day 16	1718-1022 20 ug/L Day 16	1718-1023 20 ug/L Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	13(1)
b	14	14	14	15	13	15
c	13	13	12	13	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations:

	CTL Day 17	CTL 10ug/L Day 17	CTL 20ug/L Day 17	1718-1019 20 ug/L Day 17	1718-1022 20 ug/L Day 17	1718-1023 20 ug/L Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13	12	13	15	14(1)
d	13	12(2)	15	11	13	13

Comments/Observations:

	CTL Day 18	CTL 10ug/L Day 18	CTL 20ug/L Day 18	1718-1019 20 ug/L Day 18	1718-1022 20 ug/L Day 18	1718-1023 20 ug/L Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13	12	13	15	13
d	13	12(2)	15	11	13	13

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 19	CTL 10ug/L Day 19	CTL 20ug/L Day 19	1718-1019 20 ug/L Day 19	1718-1022 20 ug/L Day 19	1718-1023 20 ug/L Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13	11(1)	13	15	13(1)
d	13	12(2)	15	11	13	13

Comments/Observations:

	CTL Day 20	CTL 10ug/L Day 20	CTL 20ug/L Day 20	1718-1019 20 ug/L Day 20	1718-1022 20 ug/L Day 20	1718-1023 20 ug/L Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13 ^{ML}	11	13	15	13
d	13	11(1)	15	11	13	13

Comments/Observations: *no microbical, just very small, last small one barely swimming*

	CTL Day 21	CTL 10ug/L Day 21	CTL 20ug/L Day 21	1718-1019 20 ug/L Day 21	1718-1022 20 ug/L Day 21	1718-1023 20 ug/L Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13	11	13	15	13
d	13	10	15	11	13	13

Comments/Observations: *no microbical*

	CTL Day 22	CTL 10ug/L Day 22	CTL 20ug/L Day 22	1718-1019 20 ug/L Day 22	1718-1022 20 ug/L Day 22	1718-1023 20 ug/L Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	15
c	13	13	11(1)	13	15	13(1)
d	13	10	15(1)	11	13	13

Comments/Observations:

Reviewed By: CP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 23	CTL 10ug/L Day 23	CTL 20ug/L Day 23	1718-1019 20 ug/L Day 23	1718-1022 20 ug/L Day 23	1718-1023 20 ug/L Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12(1)	15	4	12
b	14	14	14	15	13	15
c	13	13	11	13	15	13
d	13	10	15(1)	11	13	13

Comments/Observations:

	CTL Day 24	CTL 10ug/L Day 24	CTL 20ug/L Day 24	1718-1019 20 ug/L Day 24	1718-1022 20 ug/L Day 24	1718-1023 20 ug/L Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12(1)	15	4	12
b	14	14	14	15	13	15
c	13	13	11	13	15	13
d	13	10	14	11	13	13

Comments/Observations: *no microbial growth*

	CTL Day 25	CTL 10ug/L Day 25	CTL 20ug/L Day 25	1718-1019 20 ug/L Day 25	1718-1022 20 ug/L Day 25	1718-1023 20 ug/L Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12(1)	15	4	12
b	14	14	14	15	13	15
c	13	13	11	13	15	13
d	13	10	13	11	13	13

Comments/Observations: *no microbial growth*

	CTL Day 26	CTL 10ug/L Day 26	CTL 20ug/L Day 26	1718-1019 20 ug/L Day 26	1718-1022 20 ug/L Day 26	1718-1023 20 ug/L Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12(1)	15	4	12
b	14	14	14	15	13	15
c	13	13	11	13	15	13
d	13	10	13	11	13	13

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104 Sample: CTL CTL 10 ug/L CTL 20 ug/L
 1718-1019 20 ug/L (CM_MC2)
 1718-1022 20 ug/L (GH_FR1)
 1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 27	CTL 10ug/L Day 27	CTL 20ug/L Day 27	1718-1019 20 ug/L Day 27	1718-1022 20 ug/L Day 27	1718-1023 20 ug/L Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	14	14	15	13	14
c	13	13	11	13	15	13
d	13	10	13	11	13	13

No microbial

Comments/Observations:

	CTL Day 28	CTL 10ug/L Day 28	CTL 20ug/L Day 28	1718-1019 20 ug/L Day 28	1718-1022 20 ug/L Day 28	1718-1023 20 ug/L Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	11*	14	15	13	14
c	13	13	11	13	15	13
d	13	10	13	11	13	13

Comments/Observations:
 Ctl10: * 3 killed by Tech → not included in mortality

	CTL Day 29	CTL 10ug/L Day 29	CTL 20ug/L Day 29	1718-1019 20 ug/L Day 29	1718-1022 20 ug/L Day 29	1718-1023 20 ug/L Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	10	13	15	13	14
c	13	13	11	13	15	13
d	13	10	13	11	13	13

Comments/Observations:
 no microbial

	CTL Day 30	CTL 10ug/L Day 30	CTL 20ug/L Day 30	1718-1019 20 ug/L Day 30	1718-1022 20 ug/L Day 30	1718-1023 20 ug/L Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	10	13	15	13	14
c	13	13	11	13	15	13
d	13	10	13	11	13	13

Comments/Observations:

Reviewed By: JP Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L

1718-1019 20 ug/L (CM_MC2)
1718-1022 20 ug/L (GH_FR1)
1718-1023 20 ug/L (FR_FRCP1)

Number of Alive Embryos and Hatched Organisms

	CTL Day 31	CTL 10ug/L Day 31	CTL 20ug/L Day 31	1718-1019 20 ug/L Day 31	1718-1022 20 ug/L Day 31	1718-1023 20 ug/L Day 31	0%
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	
a	13	15	12	15	4	12	
b	14	10	13	15	13	13*	
c	13	13	11	13	15	13	
d	13	10	13	11	13	13	

Comments/Observations: * 13 days found, no macroalgae growth

	CTL Day 32	CTL 10ug/L Day 32	CTL 20ug/L Day 32	1718-1019 20 ug/L Day 32	1718-1022 20 ug/L Day 32	1718-1023 20 ug/L Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	15	12	15	4	12
b	14	10 ⁹	13	15	13	13
c	13	13	10	13	15	13
d	13	10	13	11	13	12

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L 1718-1022 20 ug/L 1718-1023 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
pH (units)						
0	8.2	8.3	8.3	8.3	8.4	8.3
1	8.3	8.3	8.4	8.3	8.4	8.3
2	8.1	8.3	8.3	8.3	8.3	8.4
3	8.2	8.3	8.3	8.4	8.3	8.3
4	8.3	8.4	8.4	8.4	8.4	8.4
5	8.2	8.4	8.4	8.4	8.4	8.4
6	8.3	8.3	8.3	8.0	8.3	8.3
7	8.4	8.4	8.4	8.3	8.3	8.1
8	8.4	8.4	8.5	8.4	8.5	8.5
Conductance (µS/cm)						
0	443	486	469	524	549	549
1	441	484	476	529	530	561
2	437	485	542	542	550	585
3	457	474	489	544	548	591
4	451	481	475	542	546	585
5	481	440	435	616	623	563
6	451	436	437	494	471	489
7	423	438	434	496	481	501
8	405	436	440	495	489	497
Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.2	7.3	7.2	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.2	7.3	7.3	7.3	7.3
5	7.2	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.2	7.3	7.3	7.3
Temperature (°C)						
0	24	24	24	24	24	24
1	24	24	24	24	24	24
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	25
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

Old Solutions						
CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L	
pH (units)						
0						
1	8.3	8.3	8.4	8.4	8.4	8.4
2	8.3	8.3	8.3	8.3	8.3	8.3
3	8.2	8.3	8.3	8.3	8.3	8.3
4	8.3	8.4	8.4	8.4	8.3	8.4
5	8.2	8.2	8.2	8.3	8.3	8.3
6	8.1	8.1	8.1	8.2	8.2	8.2
7	8.2	8.2	8.2	8.2	8.3	8.3
8	8.0	8.1	8.1	8.2	8.2	8.2
Conductance (µS/cm)						
0						
1	477	509	482	532	563	604
2	442	489	483	520	523	562
3	455	493	490	544	560	574
4	465	510	501	544	548	569
5	437	484	477	520	538	569
6	439	453	454	521	536	573
7	451	473	449	544	508	520
8	424	446	451	497	502	515
Dissolved Oxygen (mg/L) (40-100% saturation)						
0						
1	7.2	7.3	7.2	7.2	7.2	7.2
2	7.2	7.2	7.2	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3
4	6.9	7.0	7.0	7.3	7.3	7.3
5	7.1	7.1	7.1	7.1	7.1	7.1
6	6.9	6.9	7.0	7.0	6.9	7.0
7	6.9	6.9	6.9	6.9	6.9	6.9
8	6.5	6.5	6.6	6.6	6.6	6.6
Temperature (°C)						
0						
1	24	24	24	24	24	24
2	24	25	24	24	24	24
3	24	24	24	24	24	24
4	25	25	25	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed by: JP

Date reviewed: 2018/02/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample CTL CTL 10 ug/L CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

New Solutions

Conc. (%)	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
Day						
pH (units)						
9	8.2	8.3	8.3	8.4	8.4	8.2
* 10	8.1	8.2	8.1	8.2	8.2	8.2
11	8.3	8.3	8.3	8.3	8.3	8.2
12	8.3	8.3	8.3	8.0	8.1	8.0
13	8.1	8.3	8.4	8.0	8.3	8.2
14	8.2	8.3	8.3	8.2	8.3	8.3
15	8.3	8.4	8.4	8.2	8.4	8.3
16	8.3	8.3	8.3	7.9	8.2	8.1
17	8.3	8.3	8.3	8.2	8.3	8.3

* Day 10
new and old
chems
swapped

Old Solutions

Conc. (%)	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
Day						
pH (units)						
9	8.0	8.1	8.1	8.2	8.1	8.2
* 10	8.1	8.1	8.1	8.3	8.3	8.3
11	7.6	7.7	7.9	8.1	8.0	8.0
12	7.9	7.9	8.0	8.0	8.1	8.0
13	8.0	8.1	8.1	8.0	8.1	8.1
14	8.0	8.1	8.0	8.0	8.2	8.1
15	7.9	7.9	7.9	8.0	8.1	8.1
16	7.9	7.9	7.9	7.8	8.0	8.0
17	8.0	8.0	7.9	7.9	7.9	7.9

Conductance (µS/cm)

9	410	431	442	403	487	502
* 10	432	453	456	501	520	516
11	392	458	433	492	497	492
12	379	418	442	463	458	472
13	391	444	436	506	511	527
14	379	429	506	512	511	531
15	412	430	445	508	514	534
16	501	437	458	501	515	535
17	372	434	445	508	514	531

Conductance (µS/cm)

9	426	452	457	480	491	489
* 10	442	456	458	495	496	499
11	442	453	459	495	496	509
12	375	437	442	473	479	490
13	390	444	448	472	476	487
14	399	452	451	502	519	539
15	412	451	460	512	528	552
16	389	443	458	515	528	551
17	419	463	468	521	525	546

new CB = 437 506 512

Dissolved Oxygen (mg/L) (40-100% saturation)

9	7.3	7.3	7.3	7.3	7.3	7.3
* 10	7.1	6.9	6.8	6.9	6.7	6.7
11	7.3	7.2	7.2	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3
13	7.2	7.2	7.2	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3

Dissolved Oxygen (mg/L) (40-100% saturation)

9	6.3	6.5	6.7	6.8	6.9	6.9
* 10	7.3	7.3	7.3	7.3	7.3	7.3
11	6.1	6.1	6.2	6.3	6.3	6.3
12	6.4	6.4	6.4	6.2	6.1	6.1
13	6.5	6.4	6.4	6.2	6.2	6.2
14	6.0	6.2	6.2	6.0	6.0	6.0
15	6.1	6.1	6.1	6.1	6.1	6.3
16	6.0	5.7	6.1	6.1	6.0	6.0
17	6.9	6.7	6.5	6.4	5.8	5.9

Temperature (°C)

9	24	24	24	24	24	24
* 10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

Temperature (°C)

9	24	24	24	24	24	24
* 10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	25	25	25	25	25
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed by: JP

Date reviewed: 2018/06/20

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample CTL CTL 10 ug/L CTL 20 ug/L

1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
Day						
pH (units)						
18	8.2	8.3	8.3	8.1	8.2	8.2
19	8.2	8.3	8.3	8.1	8.2	8.2
20	8.2	8.3	8.3	8.1	8.3	8.3
21	8.2	8.3	8.3	8.1	8.2	8.1
22	8.3	8.4	8.4	8.1	8.3	8.3
23	8.1	8.3	8.3	8.1	8.2	8.2
24	8.5	8.4	8.5	8.3	8.4	8.4
25	8.4	8.3	8.4	8.2	8.4	8.3
26	8.4	8.4	8.5	8.2	8.3	8.4
Conductance (µS/cm)						
18	379	463	403	512	508	531
19	365	396	409	515	524	513
20	388	410	399	514	520	509
21	388	421	400	450	519	515
22	397	403	428	463	518	518
23	386	413	434	451	520	526
24	355	404	402	453	518	524
25	359	401	403	452	519	515
26	349	399	406	453	520	524
Dissolved Oxygen (mg/L) (40-100% saturation)						
18	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.3
24	7.0	7.2	7.3	7.3	7.3	7.3
25	7.2	7.3	7.3	7.3	7.3	7.3
26	7.2	7.3	7.3	7.3	7.3	7.3
Temperature (°C)						
18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

Old Solutions						
CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L	
pH (units)						
18	7.9	7.9	7.9	7.9	8.0	8.1
19	7.9	8.0	8.1	8.0	8.1	8.0
20	7.8	8.0	8.0	8.0	8.0	8.0
21	7.8	7.9	7.8	7.8	8.0	8.0
22	7.7	7.9	7.8	7.7	7.9	7.9
23	7.8	7.8	7.8	7.6	7.8	8.0
24	8.0	8.0	8.0	7.9	8.0	8.2
25	7.9	7.9	8.0	7.9	7.9	8.0
26	7.7	7.9	7.9	7.8	8.1	8.0
Conductance (µS/cm)						
18	398	465	478	516	532	546
19	395	490	488	527	541	556
20	401	428	424	476	533	522
21	388	431	415	488	534	561
22	393	415	431	464	515	526
23	399	428	439	452	527	538
24	413	429	448	459	533	545
25	378	422	428	460	530	534
26	398	421	415	458	536	540
Dissolved Oxygen (mg/L) (40-100% saturation)						
18	6.7	6.7	6.4	6.4	6.4	6.5
19	6.4	6.4	6.2	6.2	6.6	6.3
20	6.1	6.1	6.1	6.5	6.8	6.1
21	5.8	5.9	6.0	5.9	5.9	6.0
22	6.1	6.1	6.0	5.8	6.6	5.8
23	6.9	6.3	6.0	6.0	5.6	5.5
24	6.3	6.3	6.0	5.9	6.3	6.3
25	6.1	6.3	6.0	5.9	5.7	5.8
26	5.1	6.3	5.9	5.4	5.5	5.8
Temperature (°C)						
18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

~ 7.9

~ 5.19

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: VP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client 164/NAU104

Sample CTL CTL 10 ug/L CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L
Day						
	pH (units)					
27	8.4	8.3	8.4	8.1	8.2	8.2
28	8.3	8.3	8.4	8.2	8.3	8.2
29	8.1	8.3	8.3	8.1	8.3	8.2
30	8.3	8.3	8.3	8.1	8.2	8.2
31	8.3	8.3	8.3	8.2	8.3	8.5
32						

Old Solutions						
CTL	CTL 10ug/L	CTL 20ug/L	1718-1019 20 ug/L	1718-1022 20 ug/L	1718-1023 20 ug/L	
	pH (units)					
27	7.6	7.8	7.9	7.7	8.1	7.9
28	7.5	7.8	7.8	7.7	8.0	7.9
29	7.8	7.9	7.9	7.6	8.1	8.0
30	7.7	7.8	7.9	7.7	7.7	8.0
31	7.7	7.7	7.8	7.9	7.9	8.0
32	7.6	7.8	7.9	7.8	8.1	8.1

Conductance (µS/cm)						
27	362	403	408	530	584	608
28	356	394	400	530	581	606
29	373	394	408	530	581	603
30	375	402	408	531	581	604
31	369	395	389	528	579	604
32						

Conductance (µS/cm)						
27	404	422	419	461	535	552
28	409	421	421	517	582	602
29	388	412	421	527	590	617
30	390	419	422	524	593	628
31	393	417	429	534	590	623
32	394	416	426	534	593	634

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3
29	7.3	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3
32						

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	6.0	6.0	6.0	5.5	5.7	5.8
28	5.6	5.8	6.0	5.9	6.1	6.0
29	6.5	6.2	6.1	5.9	5.7	5.9
30	6.0	6.2	6.3	5.9	6.0	5.8
31	6.4	6.3	6.2	6.0	6.0	5.7
32	6.0	6.0	5.4	6.0	6.0	6.1

Temperature (°C)						
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32						

Temperature (°C)						
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
	1	12	N	1	12	N	1	11	N	1	11	N
	2	12		2	13		2	12		2	11	
	3	10		3	12		3	14		3	13	
	4	10		4	11		4	13		4	13	
	5	10		5	13		5	12		5	10	
	6	11	A*	6	11		6	12		6	13	
	7	14	N	7	7		7	13		7	9	
	8	13		8	10		8	10		8	10	EA*
	9	10		9	10		9	9		9	11	N
	10	10		10	10		10	10		10	12	
	11	10		11	10		11	10		11	11	
	12	10		12	10		12	10		12	11	
	13	11		13	11		13	11		13	11	
	14			14	10		14			14		
	15			15			15			15		

Comments A twisted tail

CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
10 ug/L	1	11	A*	1	12	A*	1	14	N	1	10	A*
	2	12	N	2	12	N	2	13		2	10	N
	3	11		3	11		3	12		3	12	
	4	12		4	11		4	11		4	12	
	5	11		5	10		5	11		5	11	
	6	9		6	11		6	12		6	11	
	7	9		7	11		7	12		7	12	
	8	9		8	10		8	9		8	12	
	9	10		9	11		9	9		9	12	
	10			10			10	10		10	11	
	11			11			11	11		11		
	12			12			12	12		12		
	13			13			13	11		13		
	14			14			14			14		
	15			15			15			15		

Comments A twisted tail

Reviewed By: JP Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL, CTL 10 ug/L, CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
20 ug/L	1	13	N	1	13	N	1	13	N	1	12	N
	2	12	N	2	11	N	2	12	N	2	13	N
	3	12	N	3	9	N	3	10	N	3	13	N
	4	12	N	4	13	N	4	12	N	4	12	N
	5	12	N	5	10	N	5	14	N	5	12	N
	6	12	N	6	13	N	6	10	N	6	9	N
	7	12	N	7	9	N	7	10	N	7	9	N
	8	12	N	8	13	N	8	10	N	8	9	N
	9	14	N	9	13	N	9	10	N	9	12	N
	10	13	N	10	11	N	10	10	N	10	9	N
	11	8	N	11	7	N	11	10	N	11	9	N
	12	6	N	12	10	N	12	10	N	12	13	N
	13		N	13	13	N	13		N	13	8	N
	14		N	14		N	14		N	14		N
	15		N	15		N	15		N	15		N

Comments: *twisted tail

Conc. CTL	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1718-1019 20 ug/L	1	11	N	1	12	N	1	12	N	1	14	N
	2	10	N	2	10	N	2	12	N	2	12	N
	3	10	N	3	12	N	3	12	N	3	12	N
	4	13	N	4	12	N	4	14	N	4	11	N
	5	10	N	5	10	N	5	10	N	5	12	N
	6	10	N	6	10	N	6	10	N	6	12	N
	7	10	N	7	10	N	7	10	N	7	12	N
	8	10	N	8	10	N	8	10	N	8	12	N
	9	10	N	9	10	N	9	12	N	9	12	N
	10	10	N	10	9	N	10	9	N	10	13	N
	11	10	N	11	10	N	11	12	N	11	12	N
	12	10	N	12	10	N	12	13	N	12		N
	13	10	N	13	10	N	13	9	N	13		N
	14	10	N	14	10	N	14	10	N	14		N
	15	10	N	15	10	N	15	10	N	15		N

Comments:

Reviewed By: JP Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 1718-1022 20 ug/L				Conc. 1718-1023 20 ug/L							
Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	15	N	1	13	N	1	11	N	1	11	N
2	14	N	2	13	N	2	10	N	2	11	N
3	13	N	3	12	N	3	12	N	3	13	N
4	11	N	4	10	N	4	11	N	4	11	N
5			5	9	N	5	9	N	5	11	N
6			6	10	N	6	11	N	6	9	N
7			7	10	N	7	13	N	7	13	N
8			8	10	N	8	9	N	8	11	N
9			9	13	N	9	11	N	9	11	N
10			10	13	N	10	9	N	10	13	N
11			11	13	N	11	11	N	11	13	N
12			12	13	N	12	12	N	12	10	N
13			13	13	N	13	13	N	13	11	N
14			14	13	N	14	13	N	14		
15			15	10	N	15	10	N	15		
Comments											
Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	10	N	1	15	N	1	11	N	1	11	N
2	12	N	2	13	N	2	12	N	2	11	N
3	12	N	3	10	N	3	8	N	3	11	N
4	12	N	4	9	N	4	11	N	4	12	N
5	11	N	5	11	N	5	13	N	5	13	N
6	11	N	6	10	N	6	8	N	6	13	N
7	13	N	7	11	N	7	9	N	7	10	N
8	14	N	8	10	N	8	10	N	8	10	N
9	9	N	9	10	N	9	8	N	9	10	N
10	12	N	10	8	N	10	11	N	10	10	N
11	13	N	11	11	N	11	11	N	11	12	N
12	13	N	12	11	N	12	8	N	12	12	N
13			13	8	N	13	10	AX	13		
14			14			14			14		
15			15			15			15		
Comments											
*twisted tail											

Reviewed By: CP Date Reviewed: 2018/06/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL CTL 10 ug/L CTL 20 ug/L
1718-1019 20 ug/L, 1718-1022 20 ug/L, 1718-1023 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=head, O=oral, E=eyes, G=gills, F=fins, S=spine**

Conc.

Replicate #			Replicate #			Replicate #			Replicate #		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
5			5			5			5		
6			6			6			6		
7			7			7			7		
8			8			8			8		
9			9			9			9		
10			10			10			10		
11			11			11			11		
12			12			12			12		
13			13			13			13		
14			14			14			14		
15			15			15			15		
Comments											

Reviewed By: _____ Date Reviewed: _____

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	1718-1019 10 ug/L		1718-1020 10 ug/L		1718-1021 10 ug/L		1718-1022 10 ug/L		1718-1023 10 ug/L		1718-1024 10 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	15	0	13	2	15	0	15	0	15	0	15	0
b	15	0	13	2	15	0	15	0	15	0	15	0
c	15	0	15	0	15	0	15	0	15	0	14	1*
d	15	0	15	0	15	0	14	1	14	1	15	0
e	28	2*	28	2	30	1	30	0	30	0	30	0
f	30	0	25	5	30	0	30	0	30	0	30	0

* hatched

Comments/Observations:
* attached to other egg

Number of Alive Embryos and Hatched Organisms

replicate	1718-1019 10 ug/L CTL OP			1718-1020 10 ug/L			1718-1021 10 ug/L			1718-1022 10 ug/L		
	Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15 ¹⁰	3	✓ 15 ¹⁰	15 ¹⁰	1	✓ 15 ¹⁰	15 ¹⁰	4*	✓ 15 ¹⁰	15 ¹⁰	1	✓ 15 ¹⁰
b	15 ¹⁰	1	✓ 15 ¹⁰	15 ¹⁰	0	✓ 15 ¹⁰	15 ¹⁰	3	✓ 15 ¹⁰	15 ¹⁰	2	✓ 15 ¹⁰
c	15 ¹⁰	4	✓ 15 ¹⁰	15	0	✓ 15 ¹⁰	15 ¹⁰	2	✓ 15 ¹⁰	15 ¹⁰	2	✓ 15 ¹⁰
d	11 ¹⁰	4**	✓ 15 ¹⁰	15 ¹⁰	1	✓ 15 ¹⁰	15 ¹⁰	4*	✓ 15 ¹⁰	15 ¹⁰	0	✓ 15 ¹⁰
e	24	3	5**	24	2		24	5	#1 hatched	28	2	**
f	27	3		30	0		28	2		24	1	

replicate	1718-1023 10 ug/L			1718-1024 10 ug/L		
	Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	0	✓ 15 ¹⁰	15 ¹⁰	1	✓ 15 ¹⁰
b	15	0	✓ 15 ¹⁰	15 ¹⁰	2	✓ 15 ¹⁰
c	15 ¹⁰	1	✓ 15 ¹⁰	15 ¹⁰	1	✓ 15 ¹⁰
d	15 ¹⁰	1	✓ 15 ¹⁰	15	0	✓ 15 ¹⁰
e	29	1		24	5	6
f	30	0		28	2	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:
* 1019 (01) - about 7 hatched (Day 2)
* ensure microbial growth

Reviewed By: JP

Date Reviewed: 2018/06/27

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

1718-1019 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
10	1*	4	0
5	0	10	0
13	0	2	0
7	0	8	0

1718-1020 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
11	1	3	0
12	0	3	0
112*	0	24*	0
118*	0	47*	0

1718-1021 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
8	0	5	2*
10	0	5	0
8	0	5	2*
2	0	12	1*

1718-1022 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
3	0	12	0
7	0	8	0
10	0	5	0
3	0	12	0

1718-1023 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
13	0	2	0
15	0	0	0
10	0	5	0
14	0	1	0

1718-1024 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
7	0	8	0
11	0	4	0
11	0	4	0
12	0	3	0

1718-1019 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	12	2*
0	0	15	0
0	0	15	0
0	0	145*	0

1718-1020 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
3	0	11	0
5	0	10	0
5	0	10	0
4	0	11	0

1718-1021 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
24*	0	9	0
6	0	9	0
5	0	8	0
0	10	14	0

1718-1022 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	1
4	0	9	2*
8	0	7	0
0	1	14	0

1718-1023 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
5	0	10	0
8	0	7	0
3	0	12	0
1	0	14	0

1718-1024 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
1	0	14	0
1	0	14	0
2	0	13	0
0	0	15	0

Comments/Observations
* Day 3 - microbial growth
* Day 4 - microbial growth

Reviewed By: W

Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

1718-1019 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	12(1)	0
0	0	15	0
0	0	15(2)	0
0	0	14(5)	0

1718-1020 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14(1)	0
0	0	15	0
2	0	13	0
0	0	15(1)	0

1718-1021 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	13	0
1	1*	13	0
0	0	12(1)	1
0	0	13(1)	0

1718-1022 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	13	0
0	0	15(1)	0
0	0	14	0

1718-1023 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	14	1
0	0	15	0

1718-1024 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15(1)	0
0	0	15	0
0	0	15	0

1718-1019 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
-	-	8	4
-	-	15	0
-	-	14	1
-	-	15	0

1718-1020 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
-	-	13(1)	0
-	-	14(1)	0
-	-	15(1)	0
-	-	15	0

1718-1021 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	13	0
0	0	14	0
0	0	11	2
0	0	12	1

1718-1022 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	12	1
0	0	15(2)	0
0	0	14	0

1718-1023 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	14	0
0	0	15	0

1718-1024 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	1
0	0	15(2)	0
0	0	15	0

* Day 6 -
microbial
growth ML

Comments/Observations
* Day 5 - Microbial growth

Reviewed By: W

Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L(CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L Day 7	1718-1020 10 ug/L Day 7	1718-1021 10 ug/L Day 7	1718-1022 10 ug/L Day 7	1718-1023 10 ug/L Day 7	1718-1024 10 ug/L Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	5	14	10	14	15	13
b	13	15	10	8	15	13
c	14	14	9	13	14	12(1)
d	15	15	7	14	15	15

Comments/Observations:

	1718-1019 10 ug/L Day 8	1718-1020 10 ug/L Day 8	1718-1021 10 ug/L Day 8	1718-1022 10 ug/L Day 8	1718-1023 10 ug/L Day 8	1718-1024 10 ug/L Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	5	14	7	14	15	4*
b	13	15	7	5	15	8(1)
c	14	14	7	13	14	8
d	15	15	7	13	15	7

Comments/Observations:

	1718-1019 10 ug/L Day 9	1718-1020 10 ug/L Day 9	1718-1021 10 ug/L Day 9	1718-1022 10 ug/L Day 9	1718-1023 10 ug/L Day 9	1718-1024 10 ug/L Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	5	14	4*	14	15	2*
b	12*	15	5*	0*	15	1*
c	14	14	5*	9*	14	5*
d	15	15	7	12*	15	4*

Comments/Observations:

	1718-1019 10 ug/L Day 10	1718-1020 10 ug/L Day 10	1718-1021 10 ug/L Day 10	1718-1022 10 ug/L Day 10	1718-1023 10 ug/L Day 10	1718-1024 10 ug/L Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	5	14	4*	13	15	2
b	12	15	5*	0	15	0
c	14	14	5*	9*	14	4
d	15	15	7	11*	15	2*

Comments/Observations: * Day 7 1024 - significant microbial growth (likely from sample quality) - CB
* Significant microbial growth in some samples on day 9. -SS
* Microbial growth in samples on day 10 - LC

Reviewed By: _____ Date Reviewed: _____

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2), 1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 11	Day 11	Day 11	Day 11	Day 11	Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	3	14	4	13	15	1*
b	12	15	5	0	15	0
c	13	14	5	8*	14	3*
d	15	15	7	11	15	2

Comments/Observations: * microbial growth mortality

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 12	Day 12	Day 12	Day 12	Day 12	Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13(1)	15	1
b	0	15	5	0	15	0
c	13	14	5	7*	14	2*
d	15	15	6	11(1)	15	0*

Comments/Observations: * microbial growth

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 13	Day 13	Day 13	Day 13	Day 13	Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	15	0
c	13	14	5	9	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 14	Day 14	Day 14	Day 14	Day 14	Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	15	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

Reviewed By: 10 Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 15	Day 15	Day 15	Day 15	Day 15	Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	15	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	15	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

Reviewed By: W

Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L(CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	3	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	3	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	13	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	15	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	13	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

Reviewed By: W

Date Reviewed: 2018/01/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2), 1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	13	15	1
b	12	15	5	0	14	0
c	13	4 15 14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	13	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12*	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations: * No microbials

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

Reviewed By: 100 Date Reviewed: 2/28/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12	15	1
b	12	15	5	0	14	0
c	13	14	5	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 28	Day 28	Day 28	Day 28	Day 28	Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12	15	1
b	12	15	5	0	14	0
c	13	14	4	7	14	2
d	15	15	6	10	14	0

Comments/Observations: *nonmicrobial*

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 29	Day 29	Day 29	Day 29	Day 29	Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12	15	1
b	12	15	5	0	14	0
c	13	14	4	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 30	Day 30	Day 30	Day 30	Day 30	Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4	14	4	12	15	1
b	12	15	5	0	14	0
c	12	14	4	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

Reviewed By: 10 Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: 1718-1019 10 ug/L (CM_MC2), 1718-1020 10 ug/L (CM_MC1), 1718-1021 10 ug/L (GH_ER2),
1718-1022 10 ug/L (GH_FR1), 1718-1023 10 ug/L (FR_FRCP1), 1718-1024 10 ug/L (FR_UFR1)

Number of Alive Embryos and Hatched Organisms

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	12	15	1
b	12	14*	5	10	14	0
c	12	14	4	7	14	2
d	15	15	6	10	14	0

Comments/Observations: *Body band, no microbial growth

	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	4(1)	14	4	12	15	1
b	12	14	5	0	14	0
c	12	14	7	7	14	2
d	15	15	6	10	14	0

Comments/Observations:

Reviewed By: LO Date Reviewed: 2018/06/18

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

New Solutions						
Conc. (%)	1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
pH (units)						
0	8.3	8.2	8.3	8.3	8.3	8.2
1	8.3	8.3	8.3	8.4	8.1	8.3
2	8.3	8.3	8.4	8.4	8.3	8.3
3	8.3	8.2	8.3	8.3	8.3	8.4
4	8.4	8.2	8.4	8.4	8.4	8.3
5	8.4	8.3	8.4	8.4	8.4	8.3
6	8.2	8.3	8.3	8.3	8.3	8.1
7	8.1	8.1	8.0	8.1	8.1	8.1
8	8.4	8.3	8.4	8.5	8.3	8.3
Conductance (µS/cm)						
0	530	231	300	541	578	248
1	522	231	240	573	570	223
2	530	228	301	532	583	231
3	540	232	307	532	588	259
4	530	229	301	519	564	285
5	602	216	288	496	561	257
6	481	190	279	432	483	212
7	482	195	276	442	483	204
8	485	194	264	473	489	216
Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.2	7.3	7.3	7.2	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.2	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3
Temperature (°C)						
0	24	24	24	24	24	24
1	24	24	24	24	24	24
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

Old Solutions						
Conc. (%)	1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
pH (units)						
0						
1	8.3	8.3	8.3	8.4	8.4	8.4
2	8.2	8.1	8.2	8.2	8.2	8.2
3	8.4	8.2	8.3	8.4	8.3	8.3
4	8.3	8.2	8.3	8.3	8.4	8.3
5	8.3	8.2	8.3	8.3	8.4	8.3
6	8.2	8.1	8.2	8.2	8.3	8.2
7	8.3	8.2	8.3	8.3	8.3	8.3
8	8.2	8.1	8.1	8.3	8.1	8.1
Conductance (µS/cm)						
0						
1	531	265	324	539	586	287
2	498	257	298	543	567	239
3	578	244	312	543	587	249
4	540	232	304	522	559	240
5	523	249	303	511	560	265
6	498	246	302	514	561	260
7	492	234	295	486	520	252
8	505	234	293	475	509	255
Dissolved Oxygen (mg/L) (40-100% saturation)						
0						
1	7.3	7.3	7.3	7.2	7.3	7.3
2	7.1	7.2	7.3	7.3	7.3	7.2
3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.2	7.3	7.3	7.3
5	6.8	7.0	7.1	7.1	7.1	7.0
6	6.9	7.0	6.9	6.9	6.9	6.9
7	6.9	6.9	6.9	6.9	6.9	6.9
8	6.9	6.9	6.9	6.9	6.8	6.6
Temperature (°C)						
0						
1	24	24	24	24	24	24
2	24	24	24	24	24	25
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

20180815 W

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L, 1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

New Solutions

Conc. (%)	1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
-----------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

Day 8.2 pH (units)

9	8.4	8.1	8.3	8.1	8.3	8.3
10	8.2	8.1	8.3	8.3	8.4	8.2
11	8.3	8.0	8.1	8.2	8.1	8.2
12	8.1	7.9	8.0	8.1	8.0	8.0
13	8.1	8.1	8.3	8.3	8.3	8.2
14	8.3	8.2	8.3	8.3	8.3	8.2
15	8.2	8.2	8.4	8.4	8.3	8.3
16	8.1	8.1	8.2	8.2	8.2	8.2
17	8.2	8.0	8.3	8.3	8.3	8.2

Conductance (µS/cm)

9	462	443	215	472	490	225
10	503	210	291	470	444	230
11	479	193	281	484	481	208
12	465	184	267	468	474	206
13	488	178	254	486	508	209
14	488	181	268	495	515	210
15	495	177	260	508	522	211
16	497	196	263	497	518	224
17	492	186	264	499	523	228

Dissolved Oxygen (mg/L) (40-100% saturation)

9	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)

9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

DO Levels (60-100% saturation) -

4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions

1718-1019 10 ug/L	1718-1020 10 ug/L	1718-1021 10 ug/L	1718-1022 10 ug/L	1718-1023 10 ug/L	1718-1024 10 ug/L
----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

Day 8.2 pH (units)

9	8.2	8.0	8.0	8.2	8.1	8.0
10	8.2	8.1	8.1	8.2	8.1	8.1
11	8.1	7.8	8.2	8.1	8.1	8.0
12	8.0	8.0	8.2	8.0	8.0	8.0
13	8.0	8.0	8.0	8.1	7.9	7.8
14	8.1	8.1	8.1	8.1	8.1	8.1
15	8.1	8.0	8.0	8.1	8.1	8.0
16	7.9	7.7	7.9	7.9	7.9	7.9
17	7.8	7.8	7.8	7.9	7.9	7.9

Conductance (µS/cm)

9	490	495	270	458	479	206
10	503	211	290	492	497	239
11	503	213	288	492	508	243
12	461	206	274	460	479	241
13	465	213	277	469	479	237
14	490	211	278	478	520	244
15	518	218	282	501	536	247
16	517	211	276	503	540	240
17	498	215	274	499	538	252

Dissolved Oxygen (mg/L) (40-100% saturation)

9	6.9	6.9	6.9	6.8	7.0	6.9
10	6.8	6.8	6.8	6.8	6.7	6.7
11	6.5	6.5	6.4	6.4	6.4	6.2
12	6.4	6.2	6.2	6.2	6.1	6.1
13	6.3	6.3	6.4	6.3	6.3	5.9
14	6.3	6.3	6.4	6.3	6.3	5.9
15	6.1	6.1	6.1	6.0	6.1	6.1
16	6.0	5.9	5.9	5.9	5.8	5.7
17	6.7	6.4	5.8	5.8	5.7	5.6

Temperature (°C)

9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

2018/06/11 8:40

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

New Solutions						
Conc. (%)	1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
pH (units)						
18	8.2	7.9	7.9	8.1	8.2	8.2
19	8.1	8.0	8.2	8.2	8.1	8.2
20	8.2	8.2	8.2	8.2	8.3	8.3
21	8.2	8.1	8.2	8.2	8.1	8.2
22	8.3	8.1	8.3	8.3	8.3	8.2
23	8.1	8.1	8.1	8.2	8.1	8.1
24	8.4	8.4	8.4	8.4	8.4	8.4
25	8.3	8.3	8.3	8.3	8.3	8.2
26	8.4	8.4	8.3	8.3	8.3	8.4
Conductance (µS/cm)						
18	200	210	503	521	227	
19	182	189	256	512	524	216
20	196	261	194	517	224	
21	226	214	249	507	522	223
22	450	180	258	502	522	236
23	450	173	251	513	510	221
24	449	189	264	516	522	232
25	450	189	267	514	526	237
26	449	188	267	515	518	237
Dissolved Oxygen (mg/L) (40-100% saturation)						
18	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.3
24	7.3	7.3	7.3	7.3	7.3	7.3
25	7.3	7.3	7.3	7.3	7.3	7.3
26	7.2	7.3	7.3	7.3	7.3	7.3
Temperature (°C)						
18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

Old Solutions						
1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024	
10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	
pH (units)						
18	8.0	7.9	7.9	7.9	7.9	8.0
19	8.0	8.0	8.0	8.0	8.0	8.0
20	8.0	8.0	8.0	8.0	8.0	8.0
21	8.0	8.0	8.0	8.0	8.0	8.0
22	7.8	7.6	8.0	8.0	7.9	8.1
23	7.8	7.6	7.9	8.0	7.9	8.0
24	7.8	7.7	8.2	8.1	8.0	8.2
25	8.1	7.8	8.1	7.9	7.9	8.0
26	8.1	7.5	8.0	8.1	8.0	8.1
Conductance (µS/cm)						
18	521	206	271	498	528	235
19	512	214	282	518	554	244
20	512	184	284	512	520	241
21	506	185	297	516	541	256
22	459	180	261	453	508	221
23	450	199	266	508	513	252
24	443	171	258	507	528	248
25	467	197	266	510	532	255
26	466	205	266	493	526	275
Dissolved Oxygen (mg/L) (40-100% saturation)						
18	6.2	6.9	6.9	6.3	6.4	6.4
19	6.8	6.1	6.2	6.1	6.1	6.3
20	6.4	6.3	6.4	6.4	6.2	6.2
21	6.6	6.3	6.7	6.6	6.9	6.9
22	5.6	6.0	6.6	6.4	6.8	6.4
23	6.1	5.9	5.9	5.9	5.9	5.4
24	6.0	6.0	5.9	5.9	5.8	5.8
25	6.0	5.8	5.8	5.9	5.8	5.8
26	6.0	5.3	5.6	5.7	5.7	5.7
Temperature (°C)						
18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: W

Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client :164/NAU104

Sample 1718-1019 10 ug/L 1718-1020 10 ug/L 1718-1021 10 ug/L
1718-1022 10 ug/L 1718-1023 10 ug/L 1718-1024 10 ug/L

New Solutions						
Conc. (%)	1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)					
27	8.2	8.2	8.1	8.2	8.2	8.2
28	8.3	8.2	8.3	8.3	8.3	8.3
29	8.3	8.2	8.2	8.3	8.2	8.3
30	8.3	8.1	8.1	8.2	8.1	8.1
31	8.3	8.1	8.2	8.3	8.2	8.3
32						

Old Solutions						
1718-1019	1718-1020	1718-1021	1718-1022	1718-1023	1718-1024	
10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	
pH (units)						
27	8.0	7.6	7.9	7.9	7.8	8.1
28	8.0	7.5	8.0	7.9	7.8	8.1
29	8.0	7.6	8.1	8.0	8.0	8.1
30	7.8	7.8	8.0	8.0	8.0	8.0
31	7.6	7.7	7.8	7.8	7.9	8.0
32	8.0	7.8	8.2	7.9	7.8	8.0

Conductance (µS/cm)						
27	525	530	266	599	602	254
28	635	195	278	589	870	265
29	519	215	272	584	516	282
30	525	702	264	578	605	267
31	512	207	265	578	593	259
32						

Conductance (µS/cm)						
27	467	201	268	511	524	250
28	534	186	277	516	581	279
29	524	218	280	585	610	291
30	573	226	287	601	623	272
31	510	209	300	603	619	278
32	524	234	292	576	588	276

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3
29	7.3	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3
32						

Dissolved Oxygen (mg/L) (40-100% saturation)						
27	6.3	6.3	6.2	5.9	5.8	6.2
28	6.1	6.0	5.9	5.9	5.3	6.8
29	6.8	6.1	5.9	6.1	6.0	6.0
30	5.9	5.9	5.8	6.0	6.0	5.9
31	6.9	6.9	6.9	6.2	6.1	6.9
32	5.9	6.6	6.5	6.2	6.0	6.0

Temperature (°C)						
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32						

Temperature (°C)					
27	24	24	24	24	24
28	24	24	24	24	24
29	24	24	24	24	24
30	24	24	24	24	24
31	24	24	24	24	24
32	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: W

Date Reviewed: 2018/10/18

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 1718-1019 10 ug/L

Replicate #	Fish	Length (mm)	Normal/Abnormal
Replicate # <u>A</u>			
1	16	N	
2	15	N	
3	15	N	
4	11	A ^g	
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
Replicate # <u>B</u>			
1	14	N	
2	10	N	
3	13	N	
4	13	N	
5	10	N	
6	9	N	
7	10	N	
8	13	N	
9	11	N	
10	11	N	
11	10	N	
12	9	N	
13			
14			
15			
Replicate # <u>C</u>			
1	12	N	
2	10	N	
3	14	N	
4	14	N	
5	13	N	
6	10	N	
7	11	N	
8	12	N	
9	11	N	
10	10	N	
11	10	N	
12	10	N	
13			
14			
15			
Replicate # <u>D</u>			
1	13	N	
2	13	N	
3	10	N	
4	11	N	
5	11	N	
6	11	N	
7	11	N	
8	10	N	
9	10	N	
10	10	N	
11	12	N	
12	10	N	
13	11	N	
14	11	N	
15	11	N	

Comments: tail squiggly

Conc. 1718-1020 10 ug/L

Replicate #	Fish	Length (mm)	Normal/Abnormal
Replicate # <u>A</u>			
1	13	N	
2	12	N	
3	12	N	
4	9	N	
5	14	N	
6	13	N	
7	12	N	
8	12	N	
9	10	N	
10	12	N	
11	11	N	
12	11	N	
13	11	N	
14	10	N	
15			
Replicate # <u>B</u>			
1	13	N	
2	12	N	
3	12	N	
4	10	N	
5	9	N	
6	9	N	
7	10	N	
8	11	N	
9	10	N	
10	11	N	
11	10	N	
12	10	N	
13	10	N	
14	11	N	
15			
Replicate # <u>C</u>			
1	10	N	
2	10	N	
3	11	N	
4	12	N	
5	12	N	
6	10	N	
7	14	N	
8	11	N	
9	11	N	
10	11	N	
11	10	N	
12	11	N	
13	11	N	
14	10	N	
15			
Replicate # <u>D</u>			
1	9	N	
2	11	N	
3	12	N	
4	12	N	
5	8	N	
6	11	N	
7	10	N	
8	14	N	
9	11	N	
10	12	N	
11	9	N	
12	10	N	
13	10	N	
14	11	N	
15	10	N	

Comments:

Reviewed By: LO Date Reviewed: 20181006/18

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.	Replicate #	A			B			C			D		
		Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1718-1021 10 ug/L	1	14	N	14	N	15	N	7	N				
	2	15	↓	14	↓	15	↓	15	↓				
	3	15	↓	14	↓	14	↓	13	↓				
	4	12	↓	15	↓	13	A*	13	↓				
	5		↓	11	↓			12	A*				
	6		↓					12	↓				
	7		↓						↓				
	8		↓						↓				
	9		↓						↓				
	10		↓						↓				
	11		↓						↓				
	12		↓						↓				
	13		↓						↓				
	14		↓						↓				
	15		↓						↓				
Comments													
* twisted tail													
1718-1022 10 ug/L	1	12	N			14	N	14	N				
	2	12	↓			12	↓	13	↓				
	3	13	↓			15	↓	12	↓				
	4	14	↓			12	↓	10	↓				
	5	13	↓			12	↓	12	↓				
	6	14	↓			12	↓	9	↓				
	7	12	↓			12	↓	12	↓				
	8	12	↓					9	↓				
	9	11	↓					11	↓				
	10	12	↓					12	↓				
	11	11	↓						↓				
	12	11	↓						↓				
	13		↓						↓				
	14		↓						↓				
	15		↓						↓				
Comments													

Reviewed By: LO Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 10 ug/L

Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1	14	N	B	1	13	N	C	1	13	N	D	1	8	N
A	2	10		B	2	12		C	2	11		D	2	8	
A	3	11		B	3	11		C	3	11		D	3	9	
A	4	11		B	4	11		C	4	11		D	4	11	
A	5	10		B	5	11		C	5	10		D	5	14	
A	6	10		B	6	10		C	6	14		D	6	10	
A	7	11		B	7	10		C	7	11		D	7	10	
A	8	10		B	8	11		C	8	10		D	8	11	
A	9	12		B	9	10		C	9	11		D	9	10	
A	10	11		B	10	11		C	10	11		D	10	9	
A	11	9		B	11	11		C	11	10		D	11	10	
A	12	10		B	12	12		C	12	9		D	12	10	
A	13	11		B	13	11		C	13	10		D	13	10	
A	14	11		B	14	10		C	14	10		D	14	10	
A	15			B	15			C	15			D	15		

Comments

Conc. 10 ug/L

Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1	18	N	B	1			C	1	15	N	D	1		
A	2			B	2			C	2	15		D	2		
A	3			B	3			C	3			D	3		
A	4			B	4			C	4			D	4		
A	5			B	5			C	5			D	5		
A	6			B	6			C	6			D	6		
A	7			B	7			C	7			D	7		
A	8			B	8			C	8			D	8		
A	9			B	9			C	9			D	9		
A	10			B	10			C	10			D	10		
A	11			B	11			C	11			D	11		
A	12			B	12			C	12			D	12		
A	13			B	13			C	13			D	13		
A	14			B	14			C	14			D	14		
A	15			B	15			C	15			D	15		

Comments

Reviewed By: LO Date Reviewed: 2018/06/18

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1718-1019 10 ug/L, 1718-1020 10 ug/L, 1718-1021 10 ug/L,
1718-1022 10 ug/L, 1718-1023 10 ug/L, 1718-1024 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

Replicate #			Replicate #			Replicate #			Replicate #		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
5			5			5			5		
6			6			6			6		
7			7			7			7		
8			8			8			8		
9			9			9			9		
10			10			10			10		
11			11			11			11		
12			12			12			12		
13			13			13			13		
14			14			14			14		
15			15			15			15		
Comments											

Reviewed By: _____ Date Reviewed: _____

Client T&C 164/ Sample 32 Day EIS Organism FM Batch 20180511 ELS
 NAV 104

Initial weights due: 2018/06/12
 Final weights due: 2018/06/17

Item Weighed	Date	Initials	Balance*
dried pan	<u>2018/05/11</u>	<u>JC</u>	<u>Mettler</u>
dried pan + organisms	<u>2018/06/14</u>	<u>AP</u>	<u>Mettler 1</u>

* same balance must be used for initial and final weights
 * for FM/HA/CT, must use scale with 0.01 mg accuracy

Concentration

Replicate	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1032.30	1059.88	1015.72	1054.19	1021.40	1058.91	1015.94	1039.80
b	1024.56	1059.88	1018.16	1057.20	1024.26	1060.73	1023.10	1046.86
c	1021.63	1063.26	1016.43	1053.04	1015.08	1053.21	1020.05	1061.56
d	1011.84	1054.19	1008.23	1044.66	1016.82	1061.53	1018.75	1055.67
e								

Concentration

Replicate	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1027.65	1051.84	1020.74	1044.13	1029.63	1072.06	1024.99	1066.35
b	1022.46	1061.31	1017.39	1034.21	1030.66	1030.66	1017.13	1053.92
c	1024.25	1061.91	1022.42	1064.13	1027.20	1060.89	1005.63	1041.76
d	1022.78	1058.12	1024.62	1047.89	1019.50	1050.84	1010.80	1047.37
e								

Balance Calibration Check: Yes / No

first pan weighed: Initial 1014 Final 1024
 weight of first pan: Initial 1022.78 Final 1032.63
 first pan after all other pans weighed: 1032.64

% difference <5%: Yes / No

% difference = $\frac{\text{initial weight} - \text{reweight}}{\text{initial weight} + \text{reweight}} \times 100\%$

Test Validity Met: Yes / No

Results are Logical**: Yes / No

** no negative numbers, consistent values across replicates

**If "no" is circled for any parameter, notify Lab Supervisor/
 QA Group to determine appropriate action**

Reviewed By: OP Date Reviewed: 2018/06/27

Test Method: 7 days Fathead minnow Survival and Growth Test (7 treatments plus a control)
HydroQual Test Method: WTR-ME-046

Reference: Biological Test Method: Test of Larval Growth and Survival Using Fathead minnows. Environment Canada, EPS 1/RM/22, Second Edition, February 2011.

Test Organism:

test species: *Pimephales promelas*
culture source: Aquatox
(Arkansas, USA)
temp of breeding aquaria: 23 - 26 °C
food type: newly-hatched brine
shrimp nauplii
frequency of feeding: daily
breeding colony mortality: <1% (last 7 days)
age of test organisms: <24 hours
condition prior to test initiation: normal
batch number: 20180511FMELS

Test Design:

test type: static renewal
toxicant: sodium chloride
test vessel: polypropylene
cups, 11 x 9 cm
volume of test vessel (ml): 500
test volume (ml): 250
depth of test solution: >3 cm
replicates per treatment: 4 replicates
organisms per replicate: 10
feeding: twice daily
temperature (°C): 24-26
photoperiod: 16 hours light: 8 hours dark
light level (surface): 100-500 lux (full spectrum)

Control/Dilution Water:

source: dechlorinated City of Calgary tap water
spiked with 4 mg/L KCl
pH (units): 8.4
conductance (µS/cm): 454
dissolved oxygen (mg/L): 7.6
NH₄⁺ (mg/L): -
hardness (mg CaCO₃/L): 164
alkalinity (mg CaCO₃/L): 114
total residual chlorine (mg/L): <0.01

Comments: None

The test data and results are authorized and verified correct.



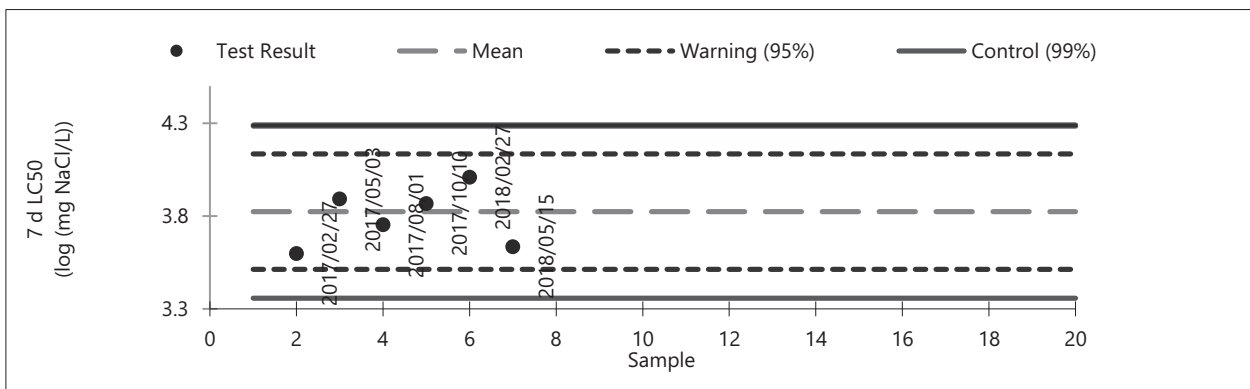
Senior Verifier

Mortality Current Test

toxicant Sodium Chloride (NaCl)				
started on		2018/05/15	ended on 2018/05/22	
Result (7 d LC50):		3.64	log (mg NaCl/L); geometric mean	
Confidence Limits (95%)		lower	3.57	upper 3.70

Historical Values

mean	3.82	sd	0.16	cv(%):	23.9
	lower	upper			
warning limits (± 2 sd)	3.51	4.13	(95% confidence limits)		
control limits (± 3 sd)	3.36	4.29	(99% confidence limits)		

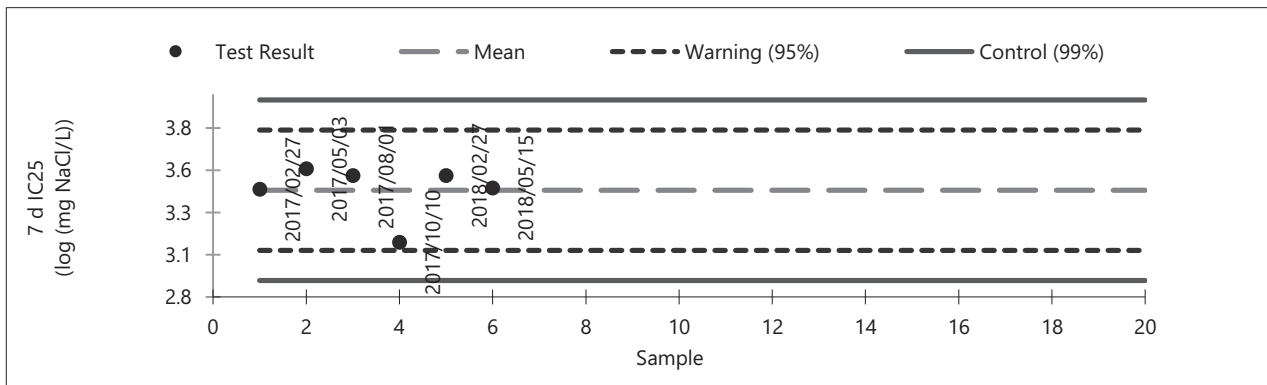


Biomass

started on		2018/05/15	ended on 2018/05/22	
Result (7 d IC25):		3.45	log (mg NaCl/L); geometric mean	
Confidence Limits (95%)		lower	3.37	upper 3.50

Historical Values

mean	3.43	sd	0.18	cv(%):	27.5
	lower	upper			
warning limits (± 2 sd)	3.08	3.79	(95% confidence limits)		
control limits (± 3 sd)	2.90	3.97	(99% confidence limits)		



notes: sd, standard deviation; cv, coefficient of variance; N/A, could not be calculated

Our liability is limited to the cost of the test requested on the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results in part or in whole.

CETIS Summary Report

hatch

Report Date: 29 Aug-18 15:39 (p 1 of 1)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed hatched rate	1
04-6374-9447	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed hatched rate	1

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	L	4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%
Cu Ctrl 10µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
Cu Ctrl 20µg/L	N	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
FR_UFR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_ER2		4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%
CM_MC1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
FR_FRCP1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_FR1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
CM_MC2		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
FR_FRCP1 20µg		4	0.9333	0.8467	1.0000	0.8667	1.0000	0.0272	0.0544	5.83%	3.45%
CM_MC2 20µg		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_FR1 20µg		4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	0.9333	1.0000	0.9333	1.0000
Cu Ctrl 10µg/L		1.0000	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	0.9333	1.0000	0.9333
CM_MC1		0.9333	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	0.9333
CM_MC2		0.9333	1.0000	1.0000	1.0000
FR_FRCP1 20µg		0.9333	1.0000	0.9333	0.8667
CM_MC2 20µg		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg		0.9333	0.9333	1.0000	1.0000

CETIS Summary Report

normal

Report Date: 05 Sep-18 08:56 (p 5 of 5)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Proportion Normal Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control		4	0.9615	0.8909	1.0000	0.9231	1.0000	0.0222	0.0444	4.62%	0.00%
Cu Ctrl 10µg/L		4	0.9306	0.8510	1.0000	0.8889	1.0000	0.0250	0.0500	5.37%	3.22%
Cu Ctrl 20µg/L		4	0.9750	0.8954	1.0000	0.9000	1.0000	0.0250	0.0500	5.13%	-1.40%
FR_UFR1		2	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%
GH_ER2		4	0.8958	0.6969	1.0000	0.7500	1.0000	0.0625	0.1250	13.95%	6.83%
CM_MC1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%
FR_FRCP1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%
GH_FR1		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%
CM_MC2	N	4	0.9375	0.7386	1.0000	0.7500	1.0000	0.0625	0.1250	13.33%	2.50%
FR_FRCP1 20µg		4	0.9808	0.9196	1.0000	0.9231	1.0000	0.0192	0.0385	3.92%	-2.00%
CM_MC2 20µg		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%
GH_FR1 20µg		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.00%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control		0.9231	1.0000	1.0000	0.9231
Cu Ctrl 10µg/L		0.9333	0.8889	1.0000	0.9000
Cu Ctrl 20µg/L		1.0000	1.0000	0.9000	1.0000
FR_UFR1		1.0000		1.0000	
GH_ER2		1.0000	1.0000	0.7500	0.8333
CM_MC1		1.0000	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000		1.0000	1.0000
CM_MC2	N	0.7500	1.0000	1.0000	1.0000
FR_FRCP1 20µg		1.0000	1.0000	0.9231	1.0000
CM_MC2 20µg		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg		1.0000	1.0000	1.0000	1.0000

CETIS Summary Report

length, biomass + survival

Report Date: 21 Aug-18 15:29 (p 22 of 24)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	L	4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%
Cu Ctr1 10µg/L		4	1.0620	0.8636	1.0000	1.0000	1.2500	0.0625	0.1250	11.76%	-9.91%
Cu Ctr1 20µg/L	N	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
FR_UFR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_ER2		4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%
CM_MC1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
FR_FRCP1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_FR1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
CM_MC2		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-1.72%
FR_FRCP1 20µg		4	0.9333	0.8467	1.0000	0.8667	1.0000	0.0272	0.0544	5.83%	3.45%
CM_MC2 20µg		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.45%
GH_FR1 20µg		4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	0.00%

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	L	4	11.18	10.68	11.68	10.71	11.38	0.1567	0.3134	2.80%	0.00%
Cu Ctr1 10µg/L		4	11.03	10.33	11.73	10.53	11.6	0.2192	0.4384	3.97%	1.30%
Cu Ctr1 20µg/L	N	4	11.03	10.45	11.61	10.54	11.4	0.182	0.364	3.30%	1.34%
FR_UFR1		2	16.5	-2.559	35.56	15	18	1.5	2.121	12.86%	-47.62%
GH_ER2		4	13.19	11.57	14.81	11.67	13.75	0.5087	1.017	7.71%	-18.03%
CM_MC1		4	11.02	10.33	11.71	10.57	11.57	0.2175	0.435	3.95%	1.41%
FR_FRCP1		4	10.73	9.954	11.51	10	11	0.2447	0.4894	4.56%	3.98%
GH_FR1		3	12.12	10.47	13.77	11.4	12.71	0.3837	0.6646	5.48%	-8.43%
CM_MC2		4	11.8	9.696	13.89	10.93	13.75	0.6597	1.319	11.19%	-5.52%
FR_FRCP1 20µg		4	10.72	9.664	11.78	10	11.5	0.3318	0.6635	6.19%	4.09%
CM_MC2 20µg		4	11.05	10.04	12.06	10.47	11.82	0.3161	0.6323	5.72%	1.14%
GH_FR1 20µg		4	11.63	9.804	13.45	10.77	13.25	0.5731	1.146	9.86%	-4.03%

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	L	4	2.538	2.139	2.937	2.29	2.775	0.1254	0.2507	9.88%	0.00%
Cu Ctr1 10µg/L		4	2.584	2.341	2.827	2.439	2.791	0.07631	0.1526	5.91%	-1.81%
Cu Ctr1 20µg/L	N	4	2.493	2.32	2.665	2.374	2.603	0.05436	0.1087	4.36%	1.78%
FR_UFR1		4	0.4778	-0.4026	1.358	0	1.006	0.2766	0.5533	115.79%	81.17%
GH_ER2		4	1.514	1.433	1.595	1.451	1.559	0.02555	0.0511	3.38%	40.34%
CM_MC1		4	2.502	2.008	2.996	2.075	2.781	0.1551	0.3103	12.40%	1.40%
FR_FRCP1		4	2.514	2.254	2.774	2.409	2.758	0.08174	0.1635	6.50%	0.92%
GH_FR1		4	1.791	-0.1752	3.757	0	2.829	0.6178	1.236	68.99%	29.42%
CM_MC2		4	2.267	1.556	2.979	1.613	2.59	0.2236	0.4471	19.72%	10.65%
FR_FRCP1 20µg		4	2.313	2.007	2.62	2.147	2.577	0.09615	0.1923	8.31%	8.83%
CM_MC2 20µg		4	2.612	2.215	3.01	2.431	2.981	0.1249	0.2498	9.56%	-2.94%
GH_FR1 20µg		4	2.434	1.49	3.379	1.591	2.917	0.2967	0.5935	24.38%	4.08%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	L	4	0.8833	0.8303	0.9364	0.8667	0.9333	0.0167	0.0333	3.77%	0.00%
Cu Ctr1 10µg/L		4	0.8208	0.5903	1.0000	0.6667	1.0000	0.0725	0.1449	17.65%	7.08%
Cu Ctr1 20µg/L	N	4	0.8000	0.6500	0.9500	0.6667	0.8667	0.0471	0.0943	11.79%	9.43%
FR_UFR1		4	0.0500	0.0000	0.1516	0.0000	0.1333	0.0319	0.0638	127.66%	94.34%
GH_ER2		4	0.3167	0.2151	0.4182	0.2667	0.4000	0.0319	0.0638	20.16%	64.15%
CM_MC1		4	0.9500	0.8970	1.0000	0.9333	1.0000	0.0167	0.0333	3.51%	-7.55%
FR_FRCP1		4	0.9500	0.8970	1.0000	0.9333	1.0000	0.0167	0.0333	3.51%	-7.55%
GH_FR1		4	0.4833	0.0000	1.0000	0.0000	0.8000	0.1751	0.3501	72.44%	45.28%
CM_MC2		4	0.7167	0.2163	1.0000	0.2667	1.0000	0.1572	0.3145	43.88%	18.87%
FR_FRCP1 20µg		4	0.8333	0.7721	0.8946	0.8000	0.8667	0.0193	0.0385	4.62%	5.66%
CM_MC2 20µg		4	0.9000	0.6969	1.0000	0.7333	1.0000	0.0638	0.1277	14.18%	-1.89%
GH_FR1 20µg		4	0.7500	0.2276	1.0000	0.2667	1.0000	0.1641	0.3283	43.77%	15.09%

CETIS Summary Report

Report Date: 21 Aug-18 15:29 (p 23 of 24)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	0.9333	1.0000	0.9333	1.0000
Cu Ctrl 10µg/L		1.0000	1.2500	1.0000	1.0000
Cu Ctrl 20µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	0.9333	1.0000	0.9333
CM_MC1		0.9333	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	0.9333
CM_MC2		0.9333	1.0000	1.0000	1.0000
FR_FRCP1 20µg		0.9333	1.0000	0.9333	0.8667
CM_MC2 20µg		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg		0.9333	0.9333	1.0000	1.0000

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	11.31	10.71	11.31	11.38
Cu Ctrl 10µg/L		10.53	11	11	11.6
Cu Ctrl 20µg/L	N	11.17	11	11.4	10.54
FR_UFR1		18		15	
GH_ER2		13.75	13.6	13.75	11.67
CM_MC1		11.57	10.57	11.14	10.8
FR_FRCP1		10.93	11	11	10
GH_FR1		12.25		12.71	11.4
CM_MC2		13.75	11.08	11.42	10.93
FR_FRCP1 20µg		11.5	10.38	10	11
CM_MC2 20µg		10.6	10.47	11.31	11.82
GH_FR1 20µg		13.25	11.62	10.87	10.77

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	2.731	2.355	2.775	2.29
Cu Ctrl 10µg/L		2.439	2.507	2.791	2.598
Cu Ctrl 20µg/L	N	2.565	2.603	2.374	2.429
FR_UFR1		0.9053	0	1.006	0
GH_ER2		1.559	1.495	1.551	1.451
CM_MC1		2.483	2.075	2.781	2.67
FR_FRCP1		2.758	2.453	2.409	2.438
GH_FR1		2.829	0	2.246	2.089
CM_MC2		1.613	2.59	2.511	2.356
FR_FRCP1 20µg		2.577	2.199	2.147	2.331
CM_MC2 20µg		2.495	2.431	2.542	2.981
GH_FR1 20µg		1.591	2.917	2.767	2.461

CETIS Summary Report

Report Date: 21 Aug-18 15:29 (p 24 of 24)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	0.8667	0.9333	0.8667	0.8667
Cu Ctrl 10µg/L		1.0000	0.7500	0.8667	0.6667
Cu Ctrl 20µg/L	N	0.8000	0.8667	0.6667	0.8667
FR_UFR1		0.0667	0.0000	0.1333	0.0000
GH_ER2		0.2667	0.3333	0.2667	0.4000
CM_MC1		0.9333	0.9333	0.9333	1.0000
FR_FRCP1		1.0000	0.9333	0.9333	0.9333
GH_FR1		0.8000	0.0000	0.4667	0.6667
CM_MC2		0.2667	0.8000	0.8000	1.0000
FR_FRCP1 20µg		0.8000	0.8667	0.8667	0.8000
CM_MC2 20µg		1.0000	1.0000	0.8667	0.7333
GH_FR1 20µg		0.2667	0.8667	1.0000	0.8667

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	14/15	15/15	14/15	15/15
Cu Ctrl 10µg/L		15/15	15/12	15/15	15/15
Cu Ctrl 20µg/L	N	15/15	15/15	15/15	15/15
FR_UFR1		15/15	15/15	15/15	15/15
GH_ER2		15/15	14/15	15/15	14/15
CM_MC1		14/15	15/15	15/15	15/15
FR_FRCP1		15/15	15/15	15/15	15/15
GH_FR1		15/15	15/15	15/15	14/15
CM_MC2		14/15	15/15	15/15	15/15
FR_FRCP1 20µg		14/15	15/15	14/15	13/15
CM_MC2 20µg		15/15	15/15	15/15	15/15
GH_FR1 20µg		14/15	14/15	15/15	15/15

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	13/15	14/15	13/15	13/15
Cu Ctrl 10µg/L		15/15	9/12	13/15	10/15
Cu Ctrl 20µg/L	N	12/15	13/15	10/15	13/15
FR_UFR1		1/15	0/15	2/15	0/15
GH_ER2		4/15	5/15	4/15	6/15
CM_MC1		14/15	14/15	14/15	15/15
FR_FRCP1		15/15	14/15	14/15	14/15
GH_FR1		12/15	0/15	7/15	10/15
CM_MC2		4/15	12/15	12/15	15/15
FR_FRCP1 20µg		12/15	13/15	13/15	12/15
CM_MC2 20µg		15/15	15/15	13/15	11/15
GH_FR1 20µg		4/15	13/15	15/15	13/15

CETIS Summary Report

Report Date: 04 Sep-18 12:31 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	GH_FR1 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	CM_MC2 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	Cu Ctrl 10µg/L passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	FR_FRCP1 20µg passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	FR_FRCP1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	Cu Ctrl 20µg/L passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	GH_ER2 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	GH_FR1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	FR_UFR1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	Lab Control passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	CM_MC1 passed proportion normal	1
05-0254-1379	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3836	CM_MC2 passed proportion normal	1

EM
 SEPT-5/18

CETIS Summary Report

Report Date: 04 Sep-18 12:31 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	12/13	14/14	13/13	12/13
Cu Ctrl 10µg/L		14/15	8/9	13/13	9/10
Cu Ctrl 20µg/L		12/12	13/13	9/10	13/13
FR_UFR1		1/1	0/0	2/2	0/0
GH_ER2		4/4	5/5	3/4	5/6
CM_MC1	N	14/14	14/14	14/14	15/15
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	0/0	7/7	10/10
CM_MC2		3/4	12/12	12/12	15/15
FR_FRCP1 20µg		12/12	13/13	12/13	12/12
CM_MC2 20µg		15/15	15/15	13/13	11/11
GH_FR1 20µg		4/4	13/13	15/15	13/13

CETIS Summary Report

Report Date: 04 Sep-18 13:06 (p 1 of 2)
 Test Code/ID: 180714-715b / 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 21-4175-3443 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 11 May-18 12:30 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 12 Jun-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 32d 2h Taxon: Actinopterygii Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg passed proportion normal	1
17-8446-3197	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1

CETIS Summary Report

Report Date: 04 Sep-18 13:06 (p 2 of 2)
Test Code/ID: 180714-715b / 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		1/1	0/0	2/2	0/0
GH_ER2	N	4/4	5/5	3/4	5/6
CM_MC1		14/14	14/14	14/14	15/15
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	0/0	7/7	10/10
CM_MC2		3/4	12/12	12/12	15/15
FR_FRCP1 20µg		12/12	13/13	12/13	12/12
CM_MC2 20µg		15/15	15/15	13/13	11/11
GH_FR1 20µg		4/4	13/13	15/15	13/13

CETIS Analytical Report

Report Date: 09 Jul-18 11:56 (p 1 of 2)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-2905-0592	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:56	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	0.2615	0.5231	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20µg/L	0.1587	0.1587	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	53	7	60	0.8833	0.1167	0.0%
Cu Ctrl 10µg/L	47	10	57	0.8246	0.1754	6.65%
Cu Ctrl 20µg/L	48	12	60	0.8	0.2	9.43%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8667	0.9333	0.8667	0.8667
Cu Ctrl 10µg/L	1	0.75	0.8667	0.6667
Cu Ctrl 20µg/L	0.8	0.8667	0.6667	0.8667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	13/15	14/15	13/15	13/15
Cu Ctrl 10µg/L	15/15	9/12	13/15	10/15
Cu Ctrl 20µg/L	12/15	13/15	10/15	13/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:56 (p 2 of 2)
Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

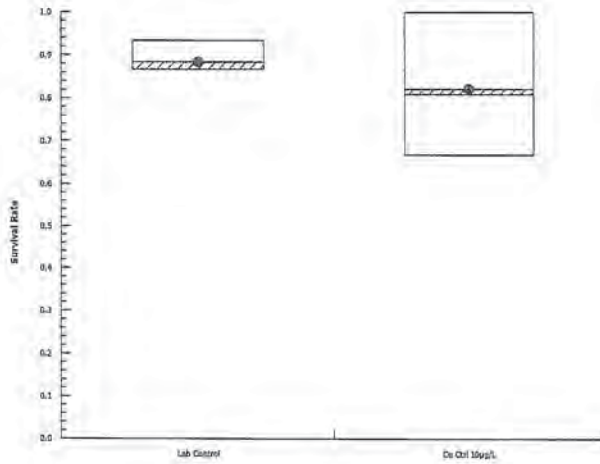
Nautilus Environmental

Analysis ID: 19-2905-0592
Analyzed: 09 Jul-18 11:56

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 06 Sep-18 11:34 (p 1 of 1)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 06-9763-0052	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 06 Sep-18 11:33	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		Cu Ctrl 10µg/L	0.6636	Exact	1.0000	Non-Significant Effect
		Cu Ctrl 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	N	51	2	53	0.9623	0.03774	0.0%
Cu Ctrl 10µg/L		44	3	47	0.9362	0.06383	2.71%
Cu Ctrl 20µg/L		47	1	48	0.9792	0.02083	-1.76%

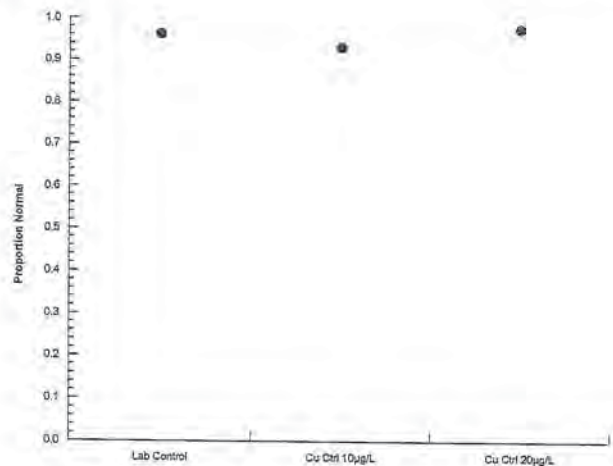
Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	0.9231	1.0000	1.0000	0.9231
Cu Ctrl 10µg/L		0.9333	0.8889	1.0000	0.9000
Cu Ctrl 20µg/L		1.0000	1.0000	0.9000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	12/13	14/14	13/13	12/13
Cu Ctrl 10µg/L		14/15	8/9	13/13	9/10
Cu Ctrl 20µg/L		12/12	13/13	9/10	13/13

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:21 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-4846-7874	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:20	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed length-mm	4.18%
		Cu Ctrl 20µg/L passed length-mm	4.18%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		Cu Ctrl 10µg/L	0.5381	1.943	0.524	6	CDF	0.3049	Non-Significant Effect
		Cu Ctrl 20µg/L	0.6246	1.943	0.467	6	CDF	0.2776	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0580669	0.0290334	2	0.2059	0.8176	Non-Significant Effect
Error	1.26883	0.140981	9			
Total	1.32689		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	0.2964	9.21	0.8623	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9139	0.8025	0.2391	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	L	4	11.18	10.68	11.68	11.31	10.71	11.38	0.1567	2.80%	0.00%
Cu Ctrl 10µg/L		4	11.03	10.33	11.73	11	10.53	11.6	0.2192	3.97%	1.30%
Cu Ctrl 20µg/L		4	11.03	10.45	11.61	11.09	10.54	11.4	0.182	3.30%	1.34%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	11.31	10.71	11.31	11.38
Cu Ctrl 10µg/L		10.53	11	11	11.6
Cu Ctrl 20µg/L		11.17	11	11.4	10.54

CETIS Analytical Report

Report Date: 07 Aug-18 09:21 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

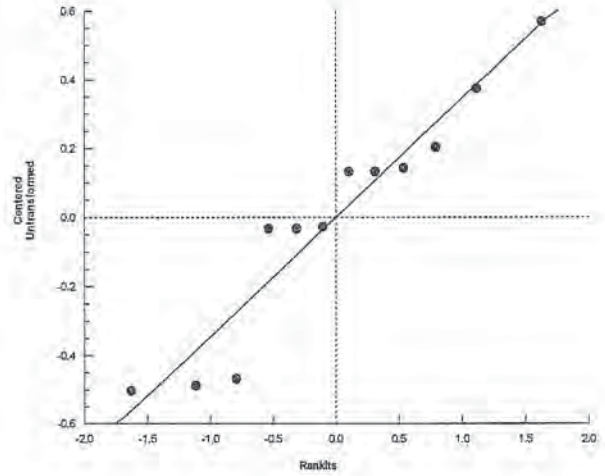
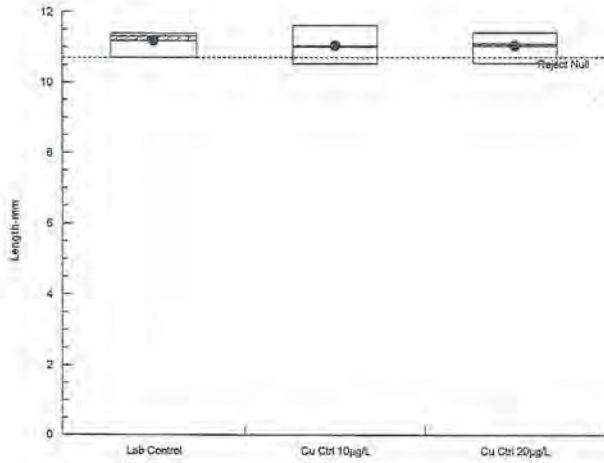
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-4846-7874 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:20 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:23 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test			Nautilus Environmental		
Analysis ID: 09-3384-6810	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4			
Analyzed: 07 Aug-18 9:23	Analysis: Parametric-Two Sample	Status Level: 1			
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus			
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water			
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:			
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed mean dry biomass-mg	10.46%
		Cu Ctrl 20µg/L passed mean dry biomass-mg	10.46%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		Cu Ctrl 10µg/L	-0.3137	1.943	0.285	6	CDF	0.6178	Non-Significant Effect
		Cu Ctrl 20µg/L	0.3305	1.943	0.266	6	CDF	0.3761	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0166373	0.0083187	2	0.2547	0.7805	Non-Significant Effect
Error	0.293907	0.0326563	9			
Total	0.310544		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.827	9.21	0.4011	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9452	0.8025	0.5687	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	L	4	2.538	2.139	2.937	2.543	2.29	2.775	0.1254	9.88%	0.00%
Cu Ctrl 10µg/L		4	2.584	2.341	2.827	2.553	2.439	2.791	0.07631	5.91%	-1.81%
Cu Ctrl 20µg/L		4	2.493	2.32	2.665	2.497	2.374	2.603	0.05436	4.36%	1.78%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	L	2.731	2.355	2.775	2.29
Cu Ctrl 10µg/L		2.439	2.507	2.791	2.598
Cu Ctrl 20µg/L		2.565	2.603	2.374	2.429

CETIS Analytical Report

Report Date: 07 Aug-18 09:23 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

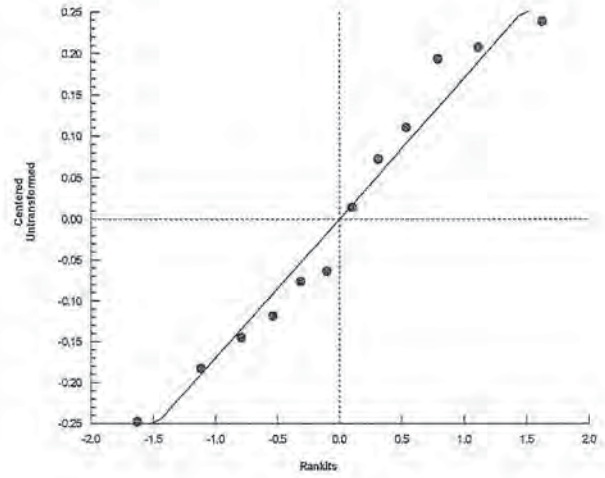
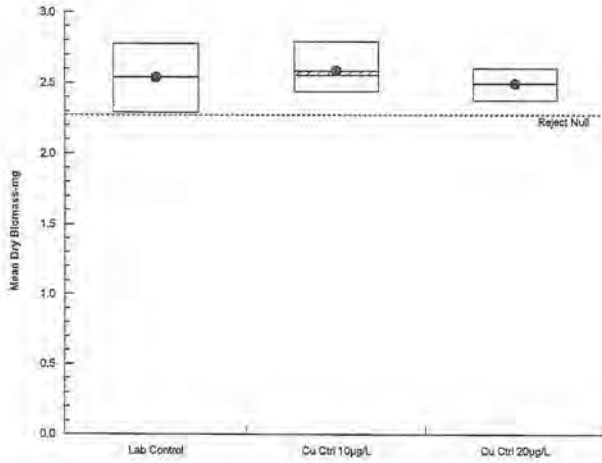
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-3384-6810 Endpoint: Mean Dry Biomass-mg
Analyzed: 07 Aug-18 9:23 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:53 (p 1 of 4)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 04-6374-9447	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:53	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	06-0105-7634	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h		
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L		
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10µg/L	1	1.0000	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20µg/L	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	58	2	60	0.9667	0.03333	0.0%
Cu Ctrl 10µg/L	60	0	60	1	0	-3.45%
Cu Ctrl 20µg/L	60	0	60	1	0	-3.45%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.9333	1	0.9333	1
Cu Ctrl 10µg/L	1	1	1	1
Cu Ctrl 20µg/L	1	1	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	14/15	15/15	14/15	15/15
Cu Ctrl 10µg/L	15/15	15/15	15/15	15/15
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:53 (p 2 of 4)
Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

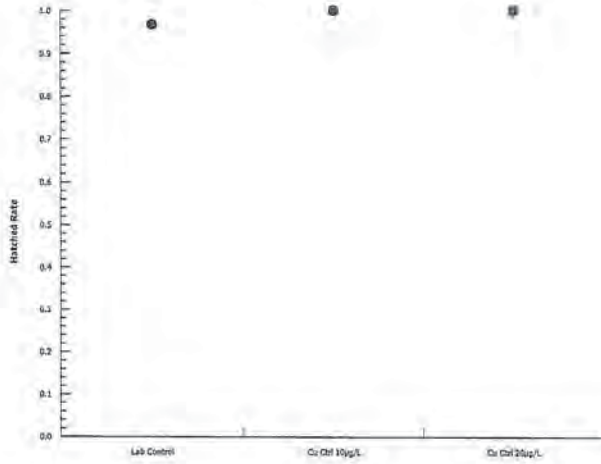
Nautilus Environmental

Analysis ID: 04-6374-9447
Analyzed: 09 Jul-18 11:53

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 09:58 (p 1 of 2)
 Test Code: 180714-715a | 10-7024-0286

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5762-2975	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 9:56	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 15-0903-9952	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h		
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h		
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h		
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	0	<0.0001	Exact	Significant Effect
Cu Ctrl 10µg/L		GH_ER2	0	<0.0001	Exact	Significant Effect
Cu Ctrl 10µg/L		CM_MC1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_FR1	9.599E-05	0.0004	Exact	Significant Effect
Cu Ctrl 10µg/L		CM_MC2	0.1218	0.3654	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L Negative Contr	47	10	57	0.8246	0.1754	0.0%
FR_UFR1	3	57	60	0.05	0.95	93.94%
GH_ER2	19	41	60	0.3167	0.6833	61.6%
CM_MC1	57	3	60	0.95	0.05	-15.21%
FR_FRCP1	57	3	60	0.95	0.05	-15.21%
GH_FR1	29	31	60	0.4833	0.5167	41.38%
CM_MC2	43	17	60	0.7167	0.2833	13.09%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	1	0.75	0.8667	0.6667
FR_UFR1	0.06667	0	0.1333	0
GH_ER2	0.2667	0.3333	0.2667	0.4
CM_MC1	0.9333	0.9333	0.9333	1
FR_FRCP1	1	0.9333	0.9333	0.9333
GH_FR1	0.8	0	0.4667	0.6667
CM_MC2	0.2667	0.8	0.8	1

CETIS Analytical Report

Report Date: 09 Jul-18 09:58 (p 2 of 2)
 Test Code: 180714-715a | 10-7024-0286

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5762-2975
 Analyzed: 09 Jul-18 9:56

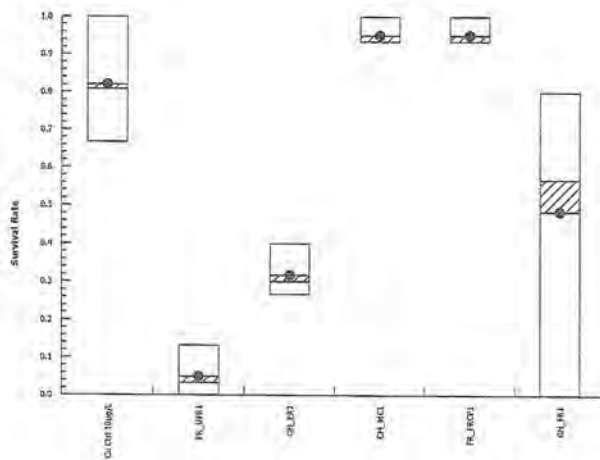
Endpoint: Survival Rate
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
 Official Results: Yes

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	15/15	9/12	13/15	10/15
FR_UFR1	1/15	0/15	2/15	0/15
GH_ER2	4/15	5/15	4/15	6/15
CM_MC1	14/15	14/15	14/15	15/15
FR_FRCP1	15/15	14/15	14/15	14/15
GH_FR1	12/15	0/15	7/15	10/15
CM_MC2	4/15	12/15	12/15	15/15

Graphics



CETIS Analytical Report

Report Date: 04 Sep-18 13:18 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 19-2313-4290	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 04 Sep-18 13:17	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h		
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h		
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h		
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
<i>204</i>		GH_ER2	0.6208	Exact	1.0000	Non-Significant Effect
<i>Cu Ctrl</i>		CM_MC1	0.0890	Exact	0.5343	Non-Significant Effect
<i>10µg/L</i>		FR_FRCP1	0.0890	Exact	0.5343	Non-Significant Effect
		GH_FR1	0.2826	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.6180	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	44	3	47	0.9362	0.06383	-4.63%
FR_UFR1		3	0	3	1	0	-11.76%
GH_ER2		17	2	19	0.8947	0.1053	0.0%
CM_MC1		57	0	57	1	0	-11.76%
FR_FRCP1		57	0	57	1	0	-11.76%
GH_FR1		29	0	29	1	0	-11.76%
CM_MC2		42	1	43	0.9767	0.02326	-9.17%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	0.9333	0.8889	1.0000	0.9000
FR_UFR1		1.0000	1.0000		
GH_ER2		1.0000	1.0000	0.7500	0.8333
CM_MC1		1.0000	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	
CM_MC2		0.7500	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 04 Sep-18 13:18 (p 2 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-2313-4290
 Analyzed: 04 Sep-18 13:17

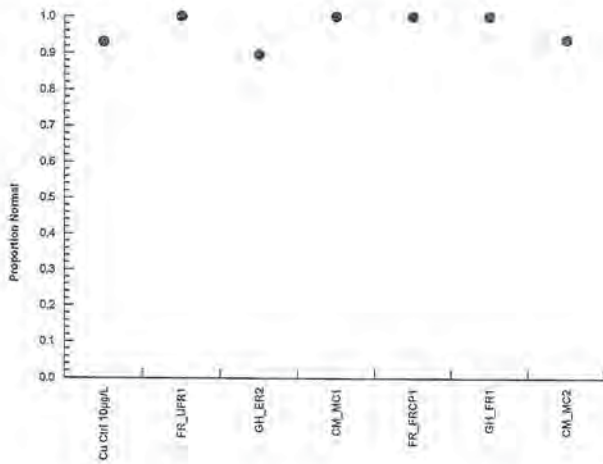
Endpoint: Proportion Normal
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	14/15	8/9	13/13	9/10
FR_UFR1		1/1	2/2		
GH_ER2		4/4	5/5	3/4	5/6
CM_MC1		14/14	14/14	14/14	15/15
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	7/7	10/10	
CM_MC2		3/4	12/12	12/12	15/15

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:28 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 12-8342-7457	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:28	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h		
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h		
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h		
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	12.24%
		GH_ER2 passed length-mm	12.24%
		CM_MC1 passed length-mm	12.24%
		FR_FRCP1 passed length-mm	12.24%
		GH_FR1 passed length-mm	12.24%
		CM_MC2 passed length-mm	12.24%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	-5.604	2.132	2.08	4	CDF	0.9975	Non-Significant Effect
		GH_ER2	-3.899	1.943	1.076	6	CDF	0.9960	Non-Significant Effect
		CM_MC1	0.04048	1.943	0.600	6	CDF	0.4845	Non-Significant Effect
		FR_FRCP1	0.9131	1.943	0.638	6	CDF	0.1982	Non-Significant Effect
		GH_FR1	-2.635	2.015	0.832	5	CDF	0.9769	Non-Significant Effect
		CM_MC2	-1.097	1.943	1.351	6	CDF	0.8426	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	60.4035	10.0672	6	11.64	2.3E-05	Significant Effect
Error	15.5743	0.86524	18			
Total	75.9778		24			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	8.514	16.81	0.2028	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.961	0.8877	0.4340	Normal Distribution

Analyst: *EMM* QA: *Aug 7/18*

CETIS Analytical Report

Report Date: 07 Aug-18 09:28 (p 2 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-8342-7457 Endpoint: Length-mm
 Analyzed: 07 Aug-18 9:28 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

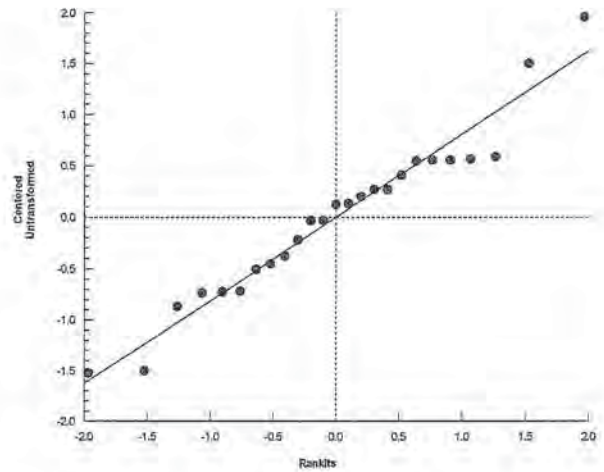
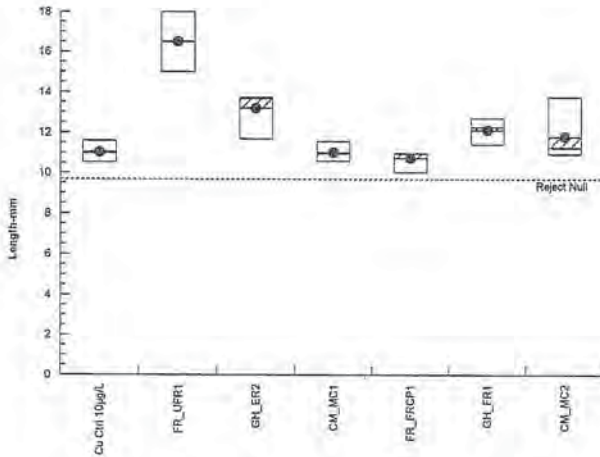
Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	N	4	11.03	10.33	11.73	11	10.53	11.6	0.2192	3.97%	0.00%
FR_UFR1		2	16.5	-2.559	35.56	16.5	15	18	1.5	12.86%	-49.56%
GH_ER2		4	13.19	11.57	14.81	13.68	11.67	13.75	0.5087	7.71%	-19.58%
CM_MC1		4	11.02	10.33	11.71	10.97	10.57	11.57	0.2175	3.95%	0.11%
FR_FRCP1		4	10.73	9.954	11.51	10.97	10	11	0.2447	4.56%	2.72%
GH_FR1		3	12.12	10.47	13.77	12.25	11.4	12.71	0.3837	5.48%	-9.86%
CM_MC2		4	11.8	9.696	13.89	11.25	10.93	13.75	0.6597	11.19%	-6.91%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	10.53	11	11	11.6
FR_UFR1		18	15		
GH_ER2		13.75	13.6	13.75	11.67
CM_MC1		11.57	10.57	11.14	10.8
FR_FRCP1		10.93	11	11	10
GH_FR1		12.25	12.71	11.4	
CM_MC2		13.75	11.08	11.42	10.93

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:31 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-9349-7576	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:30	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h		
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h		
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h		
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 failed mean dry biomass-mg	37.40%
		GH_ER2 failed mean dry biomass-mg	37.40%
		CM_MC1 passed mean dry biomass-mg	37.40%
		FR_FRCP1 passed mean dry biomass-mg	37.40%
		GH_FR1 passed mean dry biomass-mg	37.40%
		CM_MC2 passed mean dry biomass-mg	37.40%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1*	10	10	0	6	CDF	0.0480	Significant Effect
		GH_ER2*	10	10	0	6	CDF	0.0480	Significant Effect
		CM_MC1	17	10	0	6	CDF	0.7639	Non-Significant Effect
		FR_FRCP1	14	10	0	6	CDF	0.3760	Non-Significant Effect
		GH_FR1	14	10	0	6	CDF	0.3760	Non-Significant Effect
		CM_MC2	14	10	0	6	CDF	0.3760	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	14.0332	2.33886	6	7.504	2.2E-04	Significant Effect
Error	6.54535	0.311684	21			
Total	20.5785		27			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	26.3	16.81	2.0E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8589	0.8975	0.0014	Non-Normal Distribution

CETIS Analytical Report

Report Date: 07 Aug-18 09:31 (p 2 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-9349-7576 Endpoint: Mean Dry Biomass-mg CETIS Version: CETISv1.9.4
 Analyzed: 07 Aug-18 9:30 Analysis: Nonparametric-Control vs Treatments Status Level: 1

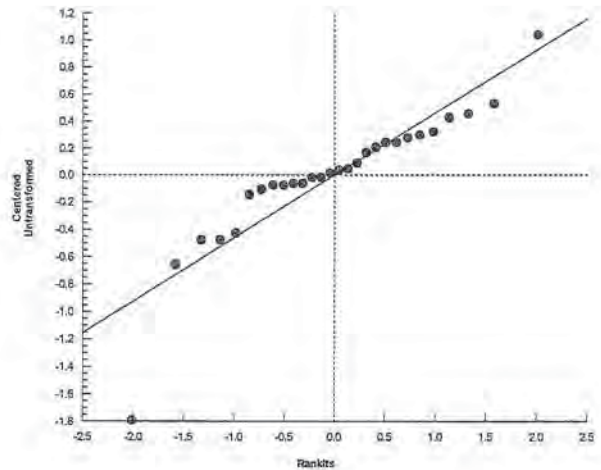
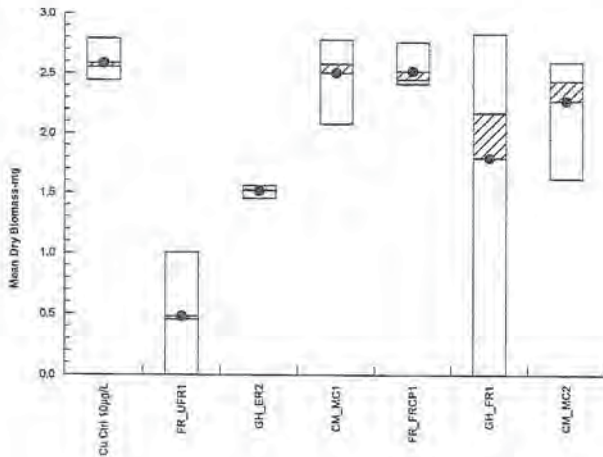
Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	N	4	2.584	2.341	2.827	2.553	2.439	2.791	0.07631	5.91%	0.00%
FR_UFR1		4	0.4778	-0.4026	1.358	0.4527	0	1.006	0.2766	115.79%	81.51%
GH_ER2		4	1.514	1.433	1.595	1.523	1.451	1.559	0.02555	3.38%	41.40%
CM_MC1		4	2.502	2.008	2.996	2.577	2.075	2.781	0.1551	12.40%	3.16%
FR_FRCP1		4	2.514	2.254	2.774	2.445	2.409	2.758	0.08174	6.50%	2.68%
GH_FR1		4	1.791	-0.1752	3.757	2.168	0	2.829	0.6178	68.99%	30.68%
CM_MC2		4	2.267	1.556	2.979	2.433	1.613	2.59	0.2236	19.72%	12.24%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	2.439	2.507	2.791	2.598
FR_UFR1		0.9053	0	1.006	0
GH_ER2		1.559	1.495	1.551	1.451
CM_MC1		2.483	2.075	2.781	2.67
FR_FRCP1		2.758	2.453	2.409	2.438
GH_FR1		2.829	0	2.246	2.089
CM_MC2		1.613	2.59	2.511	2.356

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 09:58 (p 1 of 2)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-1973-9602	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 9:57	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	13-9321-7005	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h		
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h		
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h		
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10µg/L		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_ER2	0.2479	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC1	0.5	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_FR1	0.5	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L Negative Contr	60	0	60	1	0	0.0%
FR_UFR1	60	0	60	1	0	0.0%
GH_ER2	58	2	60	0.9667	0.03333	3.33%
CM_MC1	59	1	60	0.9833	0.01667	1.67%
FR_FRCP1	60	0	60	1	0	0.0%
GH_FR1	59	1	60	0.9833	0.01667	1.67%
CM_MC2	59	1	60	0.9833	0.01667	1.67%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	1	0.9333	1	0.9333
CM_MC1	0.9333	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	0.9333
CM_MC2	0.9333	1	1	1

CETIS Analytical Report

Report Date: 09 Jul-18 09:58 (p 2 of 2)
Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

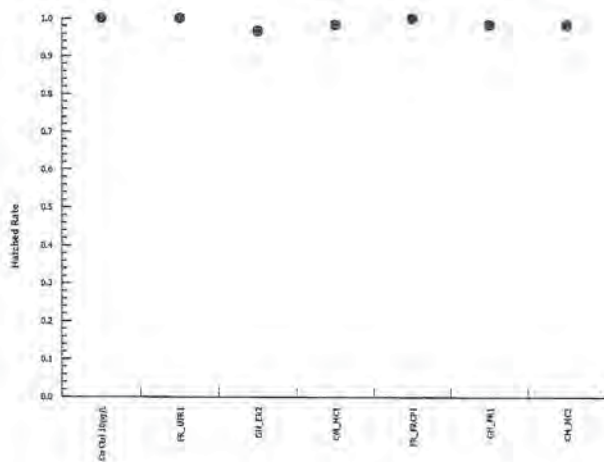
Analysis ID: 12-1973-9602 Endpoint: Hatched Rate
Analyzed: 09 Jul-18 9:57 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	15/15	15/15	15/15	15/15
FR_UFR1	15/15	15/15	15/15	15/15
GH_ER2	15/15	14/15	15/15	14/15
CM_MC1	14/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	14/15
CM_MC2	14/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:19 (p 3 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-1102-0427	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:18	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Negative Contr	3	57	60	0.05	0.95	0.0%
FR_FRCP1	57	3	60	0.95	0.05	-1800.0%
GH_FR1	29	31	60	0.4833	0.5167	-866.7%
CM_MC2	43	17	60	0.7167	0.2833	-1333.0%

Survival Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.06667	0	0.1333	0
FR_FRCP1	1	0.9333	0.9333	0.9333
GH_FR1	0.8	0	0.4667	0.6667
CM_MC2	0.2667	0.8	0.8	1

Survival Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1/15	0/15	2/15	0/15
FR_FRCP1	15/15	14/15	14/15	14/15
GH_FR1	12/15	0/15	7/15	10/15
CM_MC2	4/15	12/15	12/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:19 (p 4 of 4)
Test Code: 180714-715b | 01-1249-3306

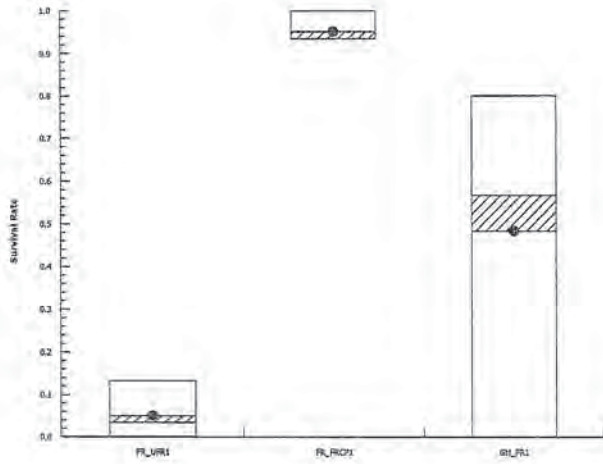
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-1102-0427 Endpoint: Survival Rate
Analyzed: 09 Jul-18 11:18 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 06 Sep-18 13:30 (p 1 of 2)
 Test Code/ID: 180714-715b / 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-8062-2385	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 06 Sep-18 13:30	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	1.0000	Exact	1.0000	Non-Significant Effect
FR_UFR1		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	XC	3	0	3	1	0	0.0%
FR_FRCP1		57	0	57	1	0	0.0%
GH_FR1		29	0	29	1	0	0.0%
CM_MC2		42	1	43	0.9767	0.02326	2.33%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	1.0000	1.0000		
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	
CM_MC2		0.7500	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	1/1	2/2		
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	7/7	10/10	
CM_MC2		3/4	12/12	12/12	15/15

CETIS Analytical Report

Report Date: 07 Sep-18 10:37 (p 1 of 2)
 Test Code/ID: 180714-715b / 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 21-4279-7478	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 07 Sep-18 10:35	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	1.0000	Exact	1.0000	Non-Significant Effect
<i>FR_UFR1</i>		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
<i>emma</i>		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	N	3	0	3	1	0	0.0%
FR_FRCP1		57	0	57	1	0	0.0%
GH_FR1		29	0	29	1	0	0.0%
CM_MC2		42	1	43	0.9767	0.02326	2.33%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	1.0000	1.0000		
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	
CM_MC2		0.7500	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	1/1	2/2		
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	7/7	10/10	
CM_MC2		3/4	12/12	12/12	15/15

Handwritten signature and date: JPT 7/18

CETIS Analytical Report

Report Date: 07 Sep-18 10:37 (p 2 of 2)
Test Code/ID: 180714-715b / 01-1249-3306

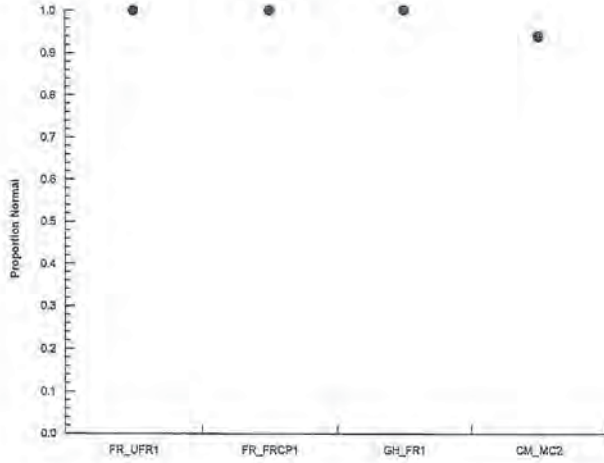
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 21-4279-7478 Endpoint: Proportion Normal
Analyzed: 07 Sep-18 10:35 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 06 Sep-18 13:30 (p 2 of 2)
Test Code/ID: 180714-715b / 01-1249-3306

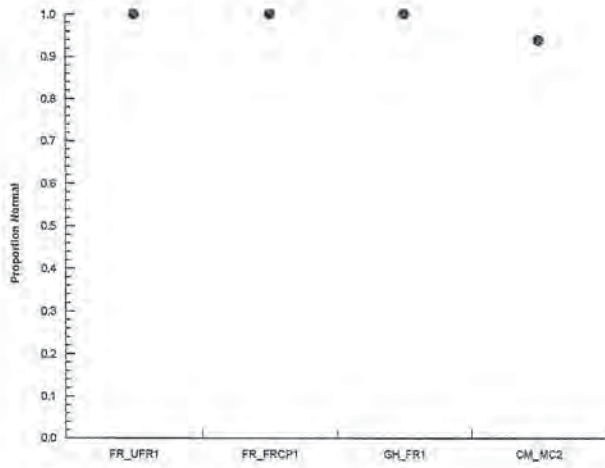
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-8062-2385 Endpoint: Proportion Normal
Analyzed: 06 Sep-18 13:30 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:37 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-6105-9053	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:36	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed length-mm	17.44%
		GH_FR1 failed length-mm	17.44%
		CM_MC2 failed length-mm	17.44%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1*	5.831	2.132	2.109	4	CDF	0.0022	Significant Effect
		GH_FR1*	3.582	2.353	2.878	3	CDF	0.0186	Significant Effect
		CM_MC2*	3.485	2.132	2.878	4	CDF	0.0126	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	46.2113	15.4038	3	12.24	0.0016	Significant Effect
Error	11.3242	1.25824	9			
Total	57.5355		12			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.925	11.34	0.2697	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.941	0.8138	0.4697	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	N	2	16.5	-2.559	35.56	16.5	15	18	1.5	12.86%	0.00%
FR_FRCP1		4	10.73	9.954	11.51	10.97	10	11	0.2447	4.56%	34.95%
GH_FR1		3	12.12	10.47	13.77	12.25	11.4	12.71	0.3837	5.48%	26.55%
CM_MC2		4	11.8	9.696	13.89	11.25	10.93	13.75	0.6597	11.19%	28.52%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	18	15		
FR_FRCP1		10.93	11	10	
GH_FR1		12.25	12.71	11.4	
CM_MC2		13.75	11.08	11.42	10.93

CETIS Analytical Report

Report Date: 07 Aug-18 09:37 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

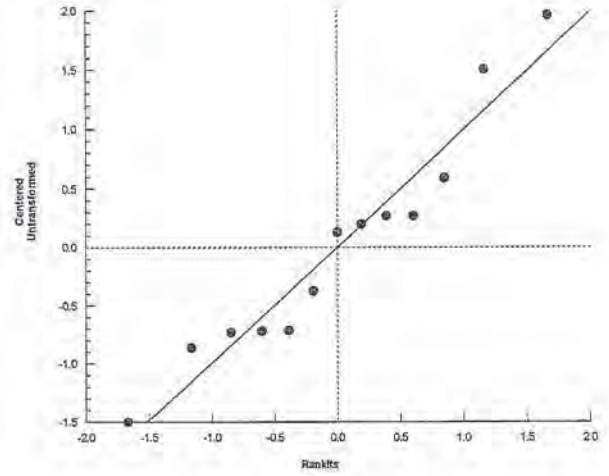
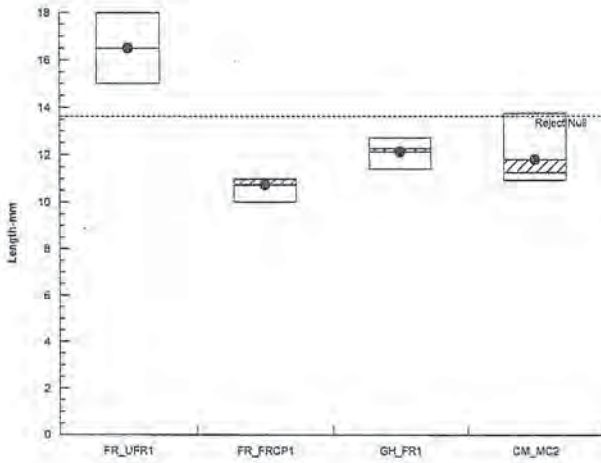
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-6105-9053 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:36 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:37 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2855-1293	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:37	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed mean dry biomass-mg	144.64%
		GH_FR1 passed mean dry biomass-mg	144.64%
		CM_MC2 passed mean dry biomass-mg	144.64%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	-7.06	1.943	0.561	6	CDF	0.9998	Non-Significant Effect
		GH_FR1	-1.94	1.943	1.315	6	CDF	0.9498	Non-Significant Effect
		CM_MC2	-5.031	1.943	0.691	6	CDF	0.9988	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9.88515	3.29505	3	6.399	0.0078	Significant Effect
Error	6.17879	0.514899	12			
Total	16.0639		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	8.791	11.34	0.0322	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8944	0.8408	0.0655	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	N	4	0.4778	-0.4026	1.358	0.4527	0	1.006	0.2766	115.79%	0.00%
FR_FRCP1		4	2.514	2.254	2.774	2.445	2.409	2.758	0.08174	6.50%	-426.19%
GH_FR1		4	1.791	-0.1752	3.757	2.168	0	2.829	0.6178	68.99%	-274.82%
CM_MC2		4	2.267	1.556	2.979	2.433	1.613	2.59	0.2236	19.72%	-374.50%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	0.9053	0	1.006	0
FR_FRCP1		2.758	2.453	2.409	2.438
GH_FR1		2.829	0	2.246	2.089
CM_MC2		1.613	2.59	2.511	2.356

CETIS Analytical Report

Report Date: 07 Aug-18 09:37 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

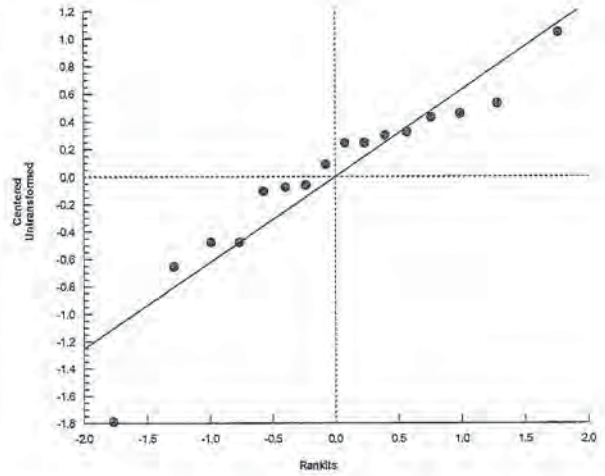
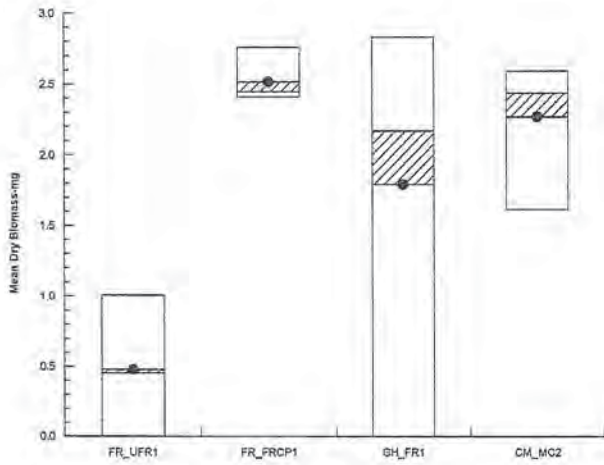
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2855-1293 Endpoint: Mean Dry Biomass-mg
Analyzed: 07 Aug-18 9:37 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:19 (p 1 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-9814-0632	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:19	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	11-9918-7010	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.5	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect

Data Summary


C-%		NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	Negative Contr	60	0	60	1	0	0.0%
FR_FRCP1		60	0	60	1	0	0.0%
GH_FR1		59	1	60	0.9833	0.01667	1.67%
CM_MC2		59	1	60	0.9833	0.01667	1.67%

Hatched Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	0.9333
CM_MC2	0.9333	1	1	1

Hatched Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	15/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	14/15
CM_MC2	14/15	15/15	15/15	15/15

Analyst: EMM 
 QA: Aug 7/18

CETIS Analytical Report

Report Date: 09 Jul-18 11:19 (p 2 of 4)
Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

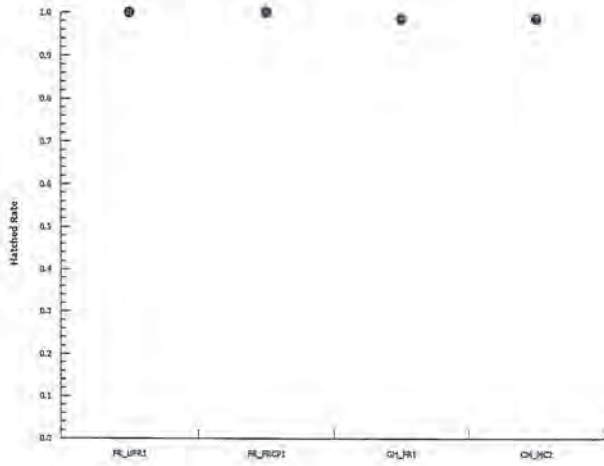
Nautilus Environmental

Analysis ID: 06-9814-0632
Analyzed: 09 Jul-18 11:19

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 3 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5983-9154	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:21	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%		NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	Upstream Contr	19	41	60	0.3167	0.6833	0.0%
FR_FRCP1		57	3	60	0.95	0.05	-200.0%
GH_FR1		29	31	60	0.4833	0.5167	-52.63%
CM_MC2		43	17	60	0.7167	0.2833	-126.3%

Survival Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.2667	0.3333	0.2667	0.4
FR_FRCP1	1	0.9333	0.9333	0.9333
GH_FR1	0.8	0	0.4667	0.6667
CM_MC2	0.2667	0.8	0.8	1

Survival Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	4/15	5/15	4/15	6/15
FR_FRCP1	15/15	14/15	14/15	14/15
GH_FR1	12/15	0/15	7/15	10/15
CM_MC2	4/15	12/15	12/15	15/15

Analyst: EMM QA: Aug 7/18

CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 4 of 4)
Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

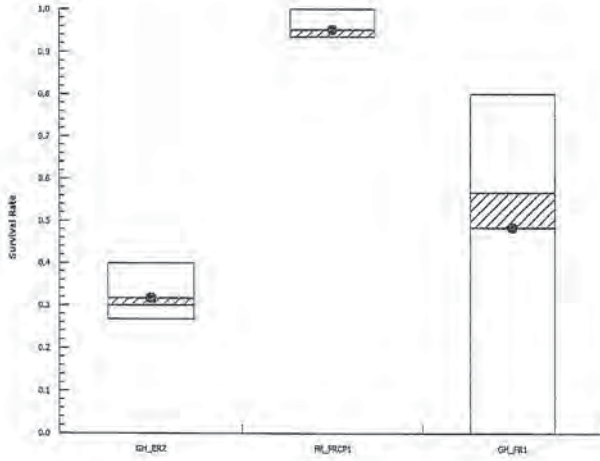
Nautilus Environmental

Analysis ID: 11-5983-9154
Analyzed: 09 Jul-18 11:21

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 04 Sep-18 13:13 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-6986-8545	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 04 Sep-18 13:12	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	0.0600	Exact	0.1800	Non-Significant Effect
<i>GH_ER2</i>		GH_FR1	0.1516	Exact	0.3032	Non-Significant Effect
		CM_MC2	0.2200	Exact	0.2200	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	N	17	2	19	0.8947	0.1053	0.0%
FR_FRCP1		57	0	57	1	0	-11.76%
GH_FR1		29	0	29	1	0	-11.76%
CM_MC2		42	1	43	0.9767	0.02326	-9.17%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	1.0000	1.0000	0.7500	0.8333
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	
CM_MC2		0.7500	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	4/4	5/5	3/4	5/6
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	7/7	10/10	
CM_MC2		3/4	12/12	12/12	15/15

CETIS Analytical Report

Report Date: 04 Sep-18 13:13 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

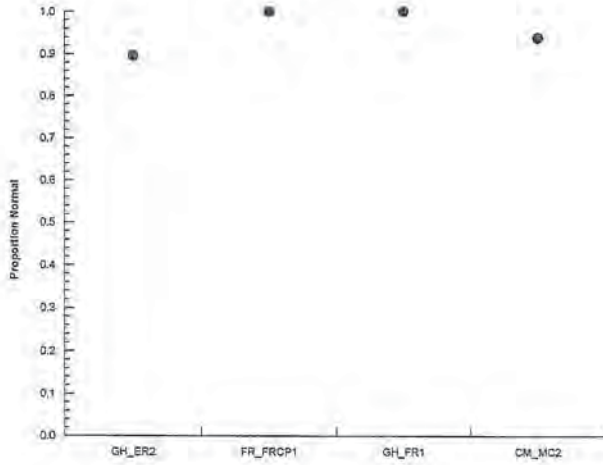
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-6986-8545 Endpoint: Proportion Normal
Analyzed: 04 Sep-18 13:12 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:42 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-0300-5052	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:41	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed length-mm	12.27%
		GH_FR1 passed length-mm	12.27%
		CM_MC2 passed length-mm	12.27%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1*	4.358	1.943	1.097	6	CDF	0.0024	Significant Effect
		GH_FR1	1.572	2.015	1.375	5	CDF	0.0884	Non-Significant Effect
		CM_MC2	1.678	1.943	1.619	6	CDF	0.0722	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	12.2872	4.09575	3	4.537	0.0265	Significant Effect
Error	9.92985	0.902714	11			
Total	22.2171		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.619	11.34	0.4542	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9357	0.8328	0.3315	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	N	4	13.19	11.57	14.81	13.68	11.67	13.75	0.5087	7.71%	0.00%
FR_FRCP1		4	10.73	9.954	11.51	10.97	10	11	0.2447	4.56%	18.65%
GH_FR1		3	12.12	10.47	13.77	12.25	11.4	12.71	0.3837	5.48%	8.13%
CM_MC2		4	11.8	9.696	13.89	11.25	10.93	13.75	0.6597	11.19%	10.59%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	13.75	13.6	13.75	11.67
FR_FRCP1		10.93	11	11	10
GH_FR1		12.25	12.71	11.4	
CM_MC2		13.75	11.08	11.42	10.93

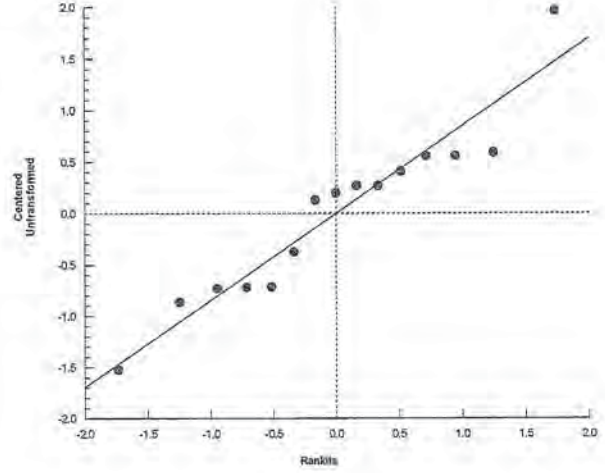
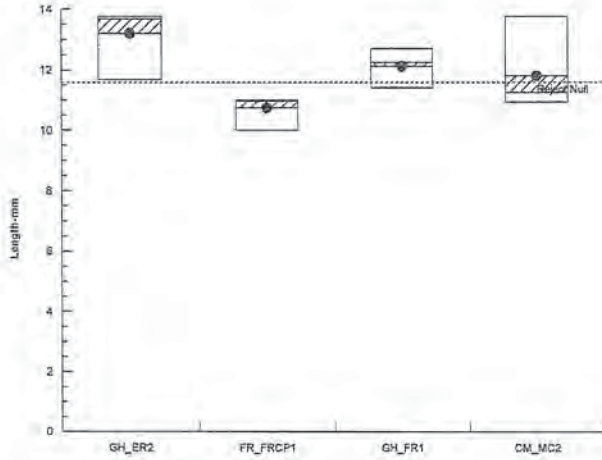
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-0300-5052 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:41 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 3 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-2897-5034	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:21	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	70.8%	

Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	26	10	0	6	0.9996	Asymp	Non-Significant Effect
		GH_FR1	22	10	0	6	0.9776	Asymp	Non-Significant Effect
		CM_MC2	26	10	0	6	0.9996	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.456019	0.8186729	3	1.865	0.1894	Non-Significant Effect
Error	5.268256	0.4390213	12			
Total	7.724275		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	19.66	11.34	0.0002	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8038	0.8408	0.0031	Non-normal Distribution

Mean Dry Biomass-mg Summary

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	4	1.514	1.433	1.595	1.523	1.451	1.559	0.02555	3.38%	0.0%
FR_FRCP1	4	2.514	2.254	2.774	2.445	2.409	2.758	0.08174	6.5%	-66.07%
GH_FR1	4	1.791	-0.1752	3.757	2.168	0	2.829	0.6178	68.99%	-18.3%
CM_MC2	4	2.267	1.556	2.979	2.433	1.613	2.59	0.2236	19.72%	-49.76%

Mean Dry Biomass-mg Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1.559	1.495	1.551	1.451
FR_FRCP1	2.758	2.453	2.409	2.438
GH_FR1	2.829	0	2.246	2.089
CM_MC2	1.613	2.59	2.511	2.356

CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 4 of 4)
Test Code: 180714-715b | 01-1249-3306

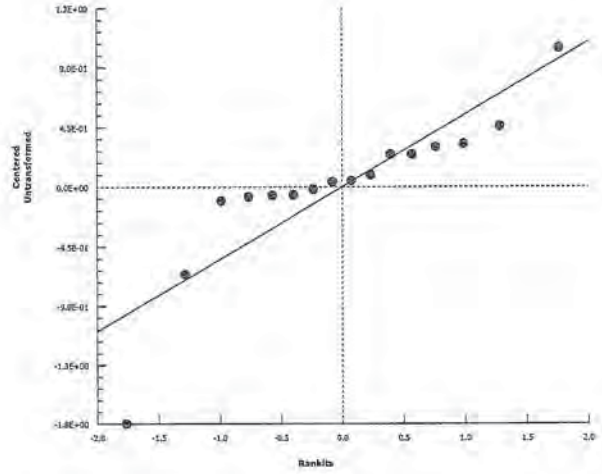
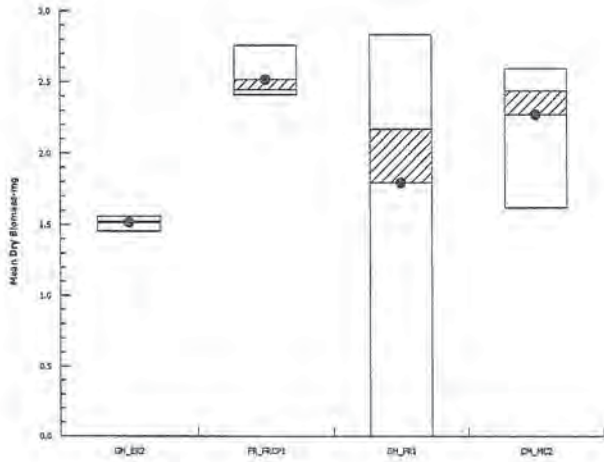
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-2897-5034 Endpoint: Mean Dry Biomass-mg
Analyzed: 09 Jul-18 11:21 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 1 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-9394-5364	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:21	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	03-2099-5262	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Upstream Contr	58	2	60	0.9667	0.03333	0.0%
FR_FRCP1	60	0	60	1	0	-3.45%
GH_FR1	59	1	60	0.9833	0.01667	-1.72%
CM_MC2	59	1	60	0.9833	0.01667	-1.72%

Hatched Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1	0.9333	1	0.9333
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	0.9333
CM_MC2	0.9333	1	1	1

Hatched Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	15/15	14/15	15/15	14/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	14/15
CM_MC2	14/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:22 (p 2 of 4)
Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

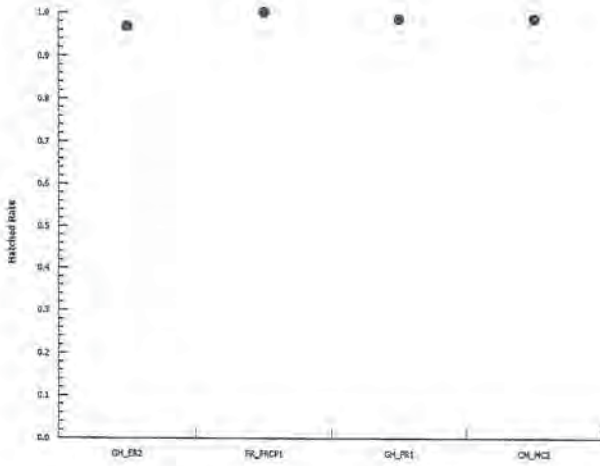
Nautilus Environmental

Analysis ID: 10-9394-5364
Analyzed: 09 Jul-18 11:21

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:24 (p 3 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-7554-9287	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:24	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	0.6603	0.6603	Exact	Non-Significant Effect
CM_MC1		GH_FR1	0	<0.0001	Exact	Significant Effect
CM_MC1		CM_MC2	0.0005096	0.0010	Exact	Significant Effect

Data Summary

C-%		NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	Dilution Water	57	3	60	0.95	0.05	0.0%
FR_FRCP1		57	3	60	0.95	0.05	0.0%
GH_FR1		29	31	60	0.4833	0.5167	49.12%
CM_MC2		43	17	60	0.7167	0.2833	24.56%

Survival Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.9333	0.9333	0.9333	1
FR_FRCP1	1	0.9333	0.9333	0.9333
GH_FR1	0.8	0	0.4667	0.6667
CM_MC2	0.2667	0.8	0.8	1

Survival Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	14/15	14/15	14/15	15/15
FR_FRCP1	15/15	14/15	14/15	14/15
GH_FR1	12/15	0/15	7/15	10/15
CM_MC2	4/15	12/15	12/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:24 (p 4 of 4)
Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

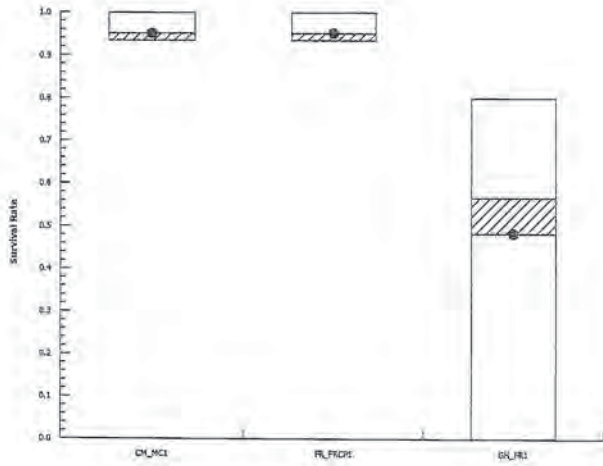
Nautilus Environmental

Analysis ID: 06-7554-9287
Analyzed: 09 Jul-18 11:24

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 04 Sep-18 13:23 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test			Nautilus Environmental		
Analysis ID: 05-2534-0057	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4			
Analyzed: 04 Sep-18 13:22	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus			
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water			
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:			
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	1.0000	Exact	1.0000	Non-Significant Effect
<i>CM MC1</i>		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.4300	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	N	57	0	57	1	0	0.0%
FR_FRCP1		57	0	57	1	0	0.0%
GH_FR1		29	0	29	1	0	0.0%
CM_MC2		42	1	43	0.9767	0.02326	2.33%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	N	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	
CM_MC2		0.7500	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	N	14/14	14/14	14/14	15/15
FR_FRCP1		15/15	14/14	14/14	14/14
GH_FR1		12/12	7/7	10/10	
CM_MC2		3/4	12/12	12/12	15/15

CETIS Analytical Report

Report Date: 04 Sep-18 13:23 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

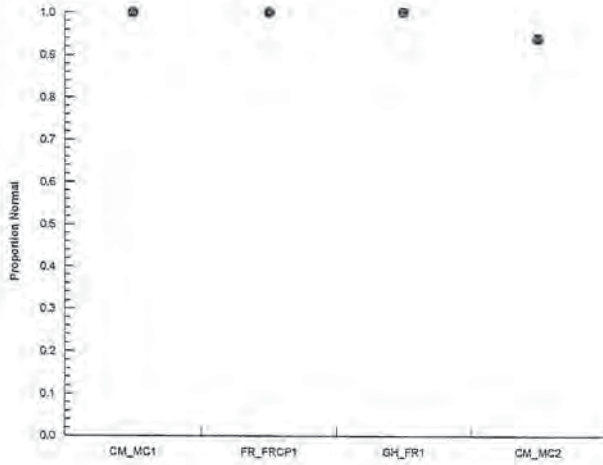
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-2534-0057 Endpoint: Proportion Normal
Analyzed: 04 Sep-18 13:22 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:45 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-5252-2921	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:45	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed length-mm	12.25%
		GH_FR1 passed length-mm	12.25%
		CM_MC2 passed length-mm	12.25%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	0.8781	1.943	0.636	6	CDF	0.2068	Non-Significant Effect
		GH_FR1	-2.673	2.015	0.829	5	CDF	0.9779	Non-Significant Effect
		CM_MC2	-1.116	1.943	1.35	6	CDF	0.8464	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.52562	1.50854	3	2.245	0.1402	Non-Significant Effect
Error	7.39198	0.671998	11			
Total	11.9176		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.219	11.34	0.2388	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8821	0.8328	0.0510	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	N	4	11.02	10.33	11.71	10.97	10.57	11.57	0.2175	3.95%	0.00%
FR_FRCP1		4	10.73	9.954	11.51	10.97	10	11	0.2447	4.56%	2.61%
GH_FR1		3	12.12	10.47	13.77	12.25	11.4	12.71	0.3837	5.48%	-9.98%
CM_MC2		4	11.8	9.696	13.89	11.25	10.93	13.75	0.6597	11.19%	-7.03%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	N	11.57	10.57	11.14	10.8
FR_FRCP1		10.93	11	11	10
GH_FR1		12.25	12.71	11.4	
CM_MC2		13.75	11.08	11.42	10.93

Analyst: *EMM* QA: *Aug 7/18*

CETIS Analytical Report

Report Date: 07 Aug-18 09:45 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

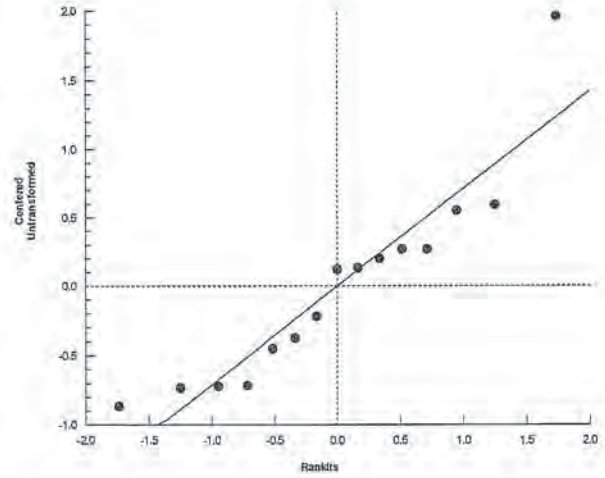
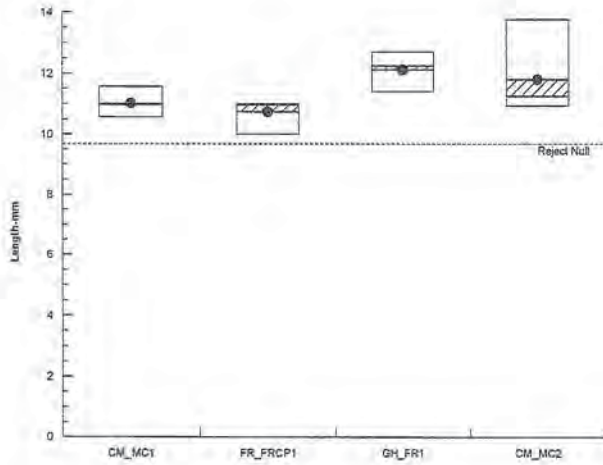
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-5252-2921 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:45 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:46 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-5367-9799	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:45	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed mean dry biomass-mg	21.13%
		GH_FR1 passed mean dry biomass-mg	21.13%
		CM_MC2 passed mean dry biomass-mg	21.13%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	-0.06938	1.943	0.341	6	CDF	0.5265	Non-Significant Effect
		GH_FR1	1.116	1.943	1.238	6	CDF	0.1535	Non-Significant Effect
		CM_MC2	0.863	1.943	0.529	6	CDF	0.2107	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.37216	0.457388	3	0.9891	0.4308	Non-Significant Effect
Error	5.54926	0.462439	12			
Total	6.92143		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	10.71	11.34	0.0134	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8423	0.8408	0.0105	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	N	4	2.502	2.008	2.996	2.577	2.075	2.781	0.1551	12.40%	0.00%
FR_FRCP1		4	2.514	2.254	2.774	2.445	2.409	2.758	0.08174	6.50%	-0.49%
GH_FR1		4	1.791	-0.1752	3.757	2.168	0	2.829	0.6178	68.99%	28.42%
CM_MC2		4	2.267	1.556	2.979	2.433	1.613	2.59	0.2236	19.72%	9.39%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	N	2.483	2.075	2.781	2.67
FR_FRCP1		2.758	2.453	2.409	2.438
GH_FR1		2.829	0	2.246	2.089
CM_MC2		1.613	2.59	2.511	2.356

Handwritten: Aug 7/18

CETIS Analytical Report

Report Date: 07 Aug-18 09:46 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

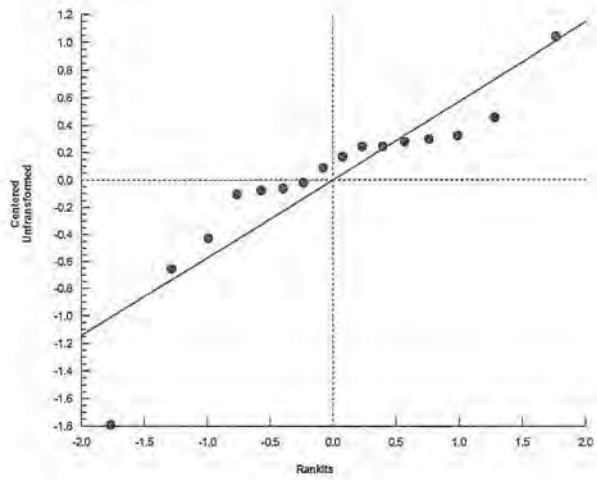
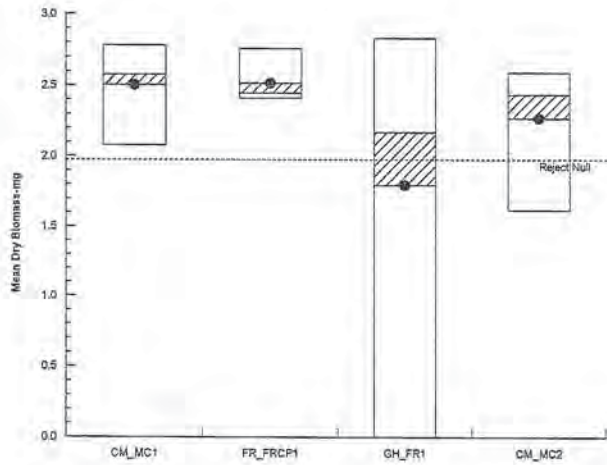
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-5367-9799 Endpoint: Mean Dry Biomass-mg
Analyzed: 07 Aug-18 9:45 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:24 (p 1 of 4)
 Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-7214-2348	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:24	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 21-4175-3443	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	11-9385-1829	08 May-18	09 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	85h		
GH_FR1	09-6484-3222	08 May-18	09 May-18	85h		
CM_MC2	18-9467-5517	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
CM_MC2	Water Sample	Teck Coal	CM_MC2		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	0.7521	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.7521	1.0000	Exact	Non-Significant Effect

Data Summary

C-%		NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	Dilution Water	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1		60	0	60	1	0	-1.7%
GH_FR1		59	1	60	0.9833	0.01667	0.0%
CM_MC2		59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.9333	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	0.9333
CM_MC2	0.9333	1	1	1

Hatched Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	14/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	14/15
CM_MC2	14/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:24 (p 2 of 4)
Test Code: 180714-715b | 01-1249-3306

Fathead Minnow 32-d Survival and Growth Test

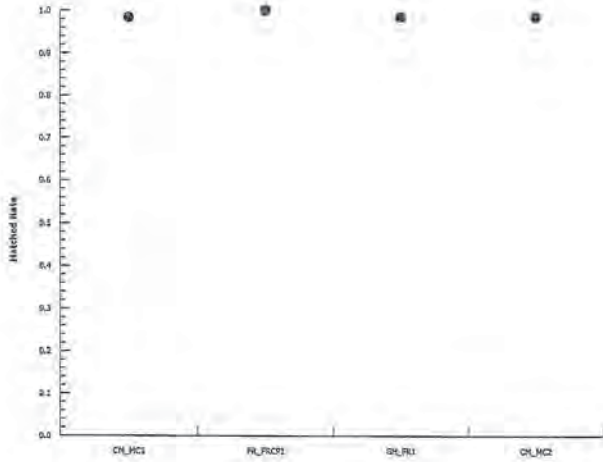
Nautilus Environmental

Analysis ID: 08-7214-2348
Analyzed: 09 Jul-18 11:24

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 5 of 8)

Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-4507-8165	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:47	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	0.3312	0.9937	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	48	12	60	0.8	0.2	0.0%
FR_FRCP1 20µg	50	10	60	0.8333	0.1667	-4.17%
CM_MC2 20µg	54	5	59	0.9153	0.08475	-14.41%
GH_FR1 20µg	45	15	60	0.75	0.25	6.25%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	0.8	0.8667	0.8667	0.8667
FR_FRCP1 20µg	0.8	0.8667	0.8667	0.8
CM_MC2 20µg	1	1	0.8667	0.7857
GH_FR1 20µg	0.2667	0.8667	1	0.8667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	12/15	13/15	10/15	13/15
FR_FRCP1 20µg	12/15	13/15	13/15	12/15
CM_MC2 20µg	15/15	15/15	13/15	11/15
GH_FR1 20µg	4/15	13/15	15/15	13/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 6 of 8)

Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-4507-8165

Endpoint: Survival Rate

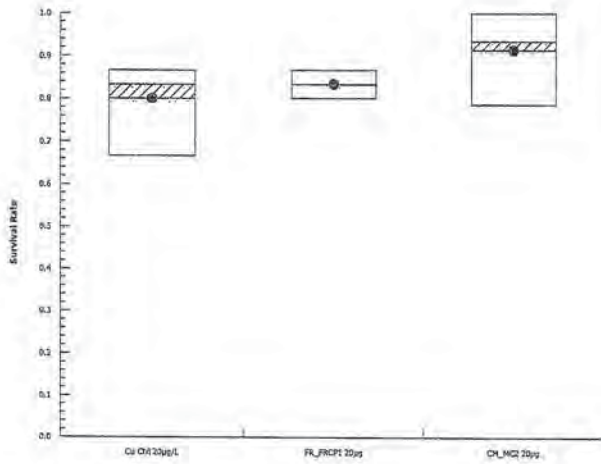
CETIS Version: CETISv1.8.7

Analyzed: 09 Jul-18 11:47

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 7 of 8)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-0658-1754	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:47	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	0.407	0.8140	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	0.06148	0.1844	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	48	12	60	0.8	0.2	0.0%
FR_FRCP1 20µg	50	10	60	0.8333	0.1667	-4.17%
CM_MC2 20µg	54	5	59	0.9153	0.08475	-14.41%
GH_FR1 20µg	45	15	60	0.75	0.25	6.25%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	0.8	0.8667	0.6667	0.8667
FR_FRCP1 20µg	0.8	0.8667	0.8667	0.8
CM_MC2 20µg	1	1	0.8667	0.7857
GH_FR1 20µg	0.2667	0.8667	1	0.8667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	12/15	13/15	10/15	13/15
FR_FRCP1 20µg	12/15	13/15	13/15	12/15
CM_MC2 20µg	15/15	15/15	13/15	11/15
GH_FR1 20µg	4/15	13/15	15/15	13/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 8 of 8)
Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

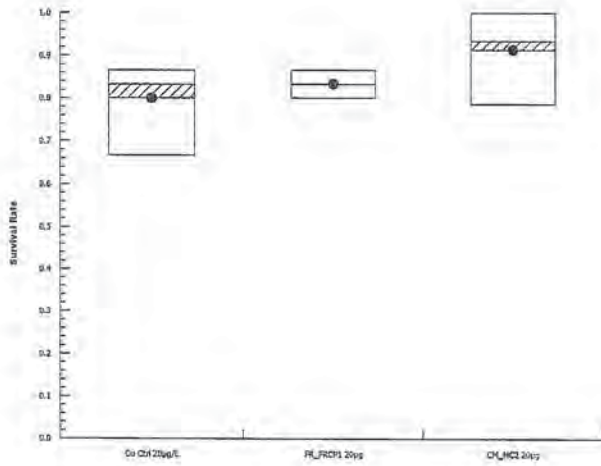
Nautilus Environmental

Analysis ID: 16-0658-1754
Analyzed: 09 Jul-18 11:47

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 04 Sep-18 12:39 (p 1 of 4)
 Test Code/ID: 180714-715a / 10-7024-0286

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-1673-2930	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 04 Sep-18 12:37	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 15-0903-9952	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L	
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water		FR_FRCP1 20µg	1.0000	Exact	1.0000	Non-Significant Effect
Cu Ctrl		CM_MC2 20µg	0.4706	Exact	1.0000	Non-Significant Effect
20µg/L		GH_FR1 20µg	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	D	47	1	48	0.9792	0.02083	0.09%
FR_FRCP1 20µg		49	1	50	0.98	0.02	0.0%
CM_MC2 20µg		54	0	54	1	0	-2.04%
GH_FR1 20µg		45	0	45	1	0	-2.04%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	D	1.0000	1.0000	0.9000	1.0000
FR_FRCP1 20µg		1.0000	1.0000	0.9231	1.0000
CM_MC2 20µg		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg		1.0000	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	D	12/12	13/13	9/10	13/13
FR_FRCP1 20µg		12/12	13/13	12/13	12/12
CM_MC2 20µg		15/15	15/15	13/13	11/11
GH_FR1 20µg		4/4	13/13	15/15	13/13

CETIS Analytical Report

Report Date: 04 Sep-18 12:39 (p 2 of 4)
Test Code/ID: 180714-715a / 10-7024-0286

Fathead Minnow 32-d Survival and Growth Test

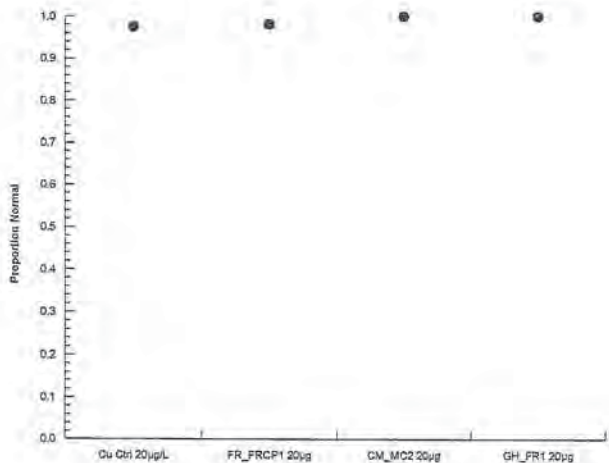
Nautilus Environmental

Analysis ID: 12-1673-2930
Analyzed: 04 Sep-18 12:37

Endpoint: Proportion Normal
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



Handwritten signature
Sept. 5/18

CETIS Analytical Report

Report Date: 07 Aug-18 09:50 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 03-1210-6024	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:50	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L	
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 20µg passed length-mm	10.60%
		CM_MC2 20µg passed length-mm	10.60%
		GH_FR1 20µg passed length-mm	10.60%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1 20µg	0.8126	1.943	0.735	6	CDF	0.2237	Non-Significant Effect
		CM_MC2 20µg	-0.06168	1.943	0.709	6	CDF	0.5236	Non-Significant Effect
		GH_FR1 20µg	-0.9978	1.943	1.168	6	CDF	0.8215	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.72103	0.573675	3	1.004	0.4247	Non-Significant Effect
Error	6.85935	0.571612	12			
Total	8.58037		15			

Distributional Tests


Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.288	11.34	0.3493	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9342	0.8408	0.2840	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	N	4	11.03	10.45	11.61	11.09	10.54	11.4	0.182	3.30%	0.00%
FR_FRCP1 20µg		4	10.72	9.664	11.78	10.69	10	11.5	0.3318	6.19%	2.79%
CM_MC2 20µg		4	11.05	10.04	12.06	10.95	10.47	11.82	0.3161	5.72%	-0.20%
GH_FR1 20µg		4	11.63	9.804	13.45	11.24	10.77	13.25	0.5731	9.86%	-5.44%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	11.17	11	11.4	10.54
FR_FRCP1 20µg		11.5	10.38	10	11
CM_MC2 20µg		10.6	10.47	11.31	11.82
GH_FR1 20µg		13.25	11.62	10.87	10.77


 Analyst: EMM QA: Aug 7/18

CETIS Analytical Report

Report Date: 07 Aug-18 09:50 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

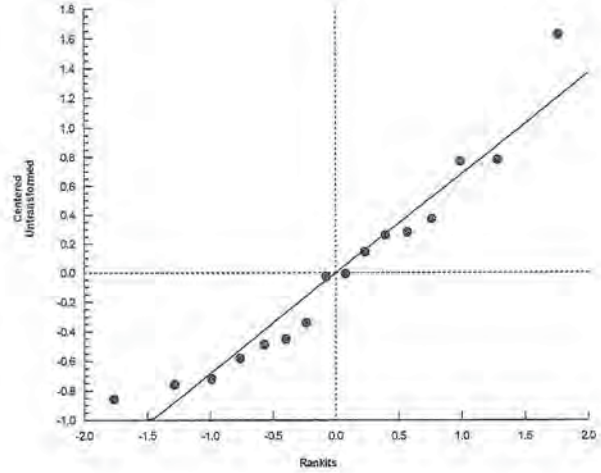
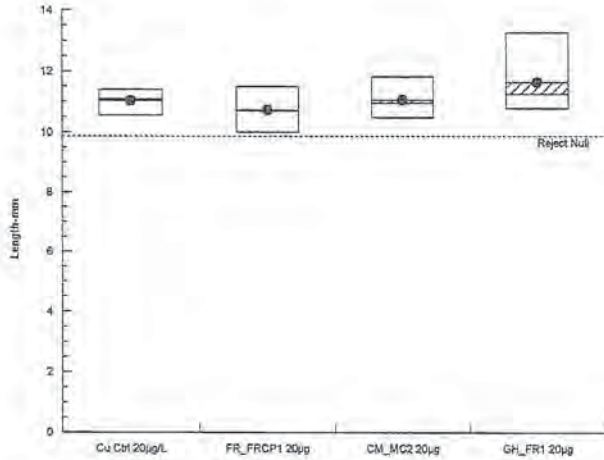
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-1210-6024 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:50 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:56 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-1140-5295	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:56	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L	
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP1 20µg passed length-mm	10.60%
		CM_MC2 20µg passed length-mm	10.60%
		GH_FR1 20µg passed length-mm	10.60%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1 20µg	-0.8126	1.943	0.735	6	CDF	0.7763	Non-Significant Effect
		CM_MC2 20µg	0.06168	1.943	0.709	6	CDF	0.4764	Non-Significant Effect
		GH_FR1 20µg	0.9978	1.943	1.168	6	CDF	0.1785	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.72103	0.573675	3	1.004	0.4247	Non-Significant Effect
Error	6.85935	0.571612	12			
Total	8.58037		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.288	11.34	0.3493	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9342	0.8408	0.2840	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	N	4	11.03	10.45	11.61	11.09	10.54	11.4	0.182	3.30%	0.00%
FR_FRCP1 20µg		4	10.72	9.664	11.78	10.69	10	11.5	0.3318	6.19%	2.79%
CM_MC2 20µg		4	11.05	10.04	12.06	10.95	10.47	11.82	0.3161	5.72%	-0.20%
GH_FR1 20µg		4	11.63	9.804	13.45	11.24	10.77	13.25	0.5731	9.86%	-5.44%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	11.17	11	11.4	10.54
FR_FRCP1 20µg		11.5	10.38	10	11
CM_MC2 20µg		10.6	10.47	11.31	11.82
GH_FR1 20µg		13.25	11.62	10.87	10.77

CETIS Analytical Report

Report Date: 07 Aug-18 09:56 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

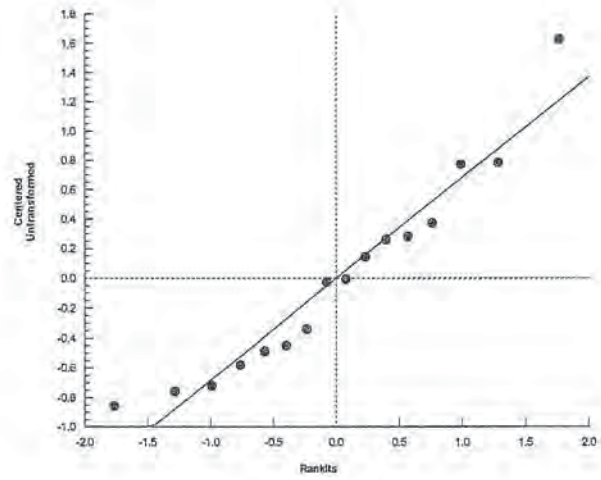
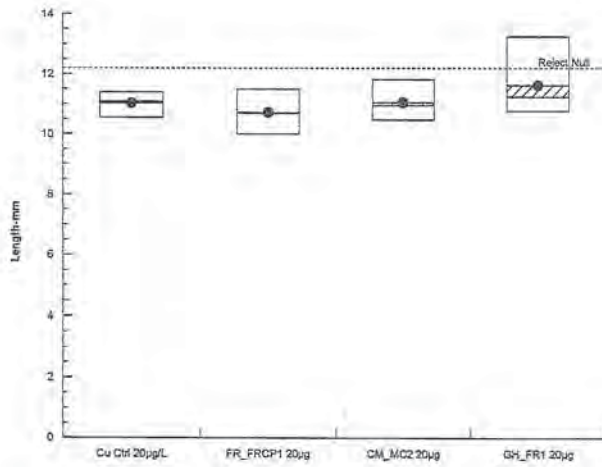
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-1140-5295 Endpoint: Length-mm
Analyzed: 07 Aug-18 9:56 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:51 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 18-9849-3360	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:51	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L	
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 20µg passed mean dry biomass-	23.52%
		CM_MC2 20µg passed mean dry biomass-mg	23.52%
		GH_FR1 20µg passed mean dry biomass-mg	23.52%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1 20µg	1.621	1,943	0.215	6	CDF	0.0781	Non-Significant Effect
		CM_MC2 20µg	-0.8784	1,943	0.265	6	CDF	0.7933	Non-Significant Effect
		GH_FR1 20µg	0.1934	1,943	0.586	6	CDF	0.4265	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.18521	0.0617368	3	0.5329	0.6684	Non-Significant Effect
Error	1.39031	0.115859	12			
Total	1.57552		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.721	11.34	0.0521	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8874	0.8408	0.0507	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	N	4	2.493	2.32	2.665	2.497	2.374	2.603	0.05436	4.36%	0.00%
FR_FRCP1 20µg		4	2.313	2.007	2.62	2.265	2.147	2.577	0.09615	8.31%	7.18%
CM_MC2 20µg		4	2.612	2.215	3.01	2.518	2.431	2.981	0.1249	9.56%	-4.80%
GH_FR1 20µg		4	2.434	1.49	3.379	2.614	1.591	2.917	0.2967	24.38%	2.34%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	2.565	2.603	2.374	2.429
FR_FRCP1 20µg		2.577	2.199	2.147	2.331
CM_MC2 20µg		2.495	2.431	2.542	2.981
GH_FR1 20µg		1.591	2.917	2.767	2.461

CETIS Analytical Report

Report Date: 07 Aug-18 09:51 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

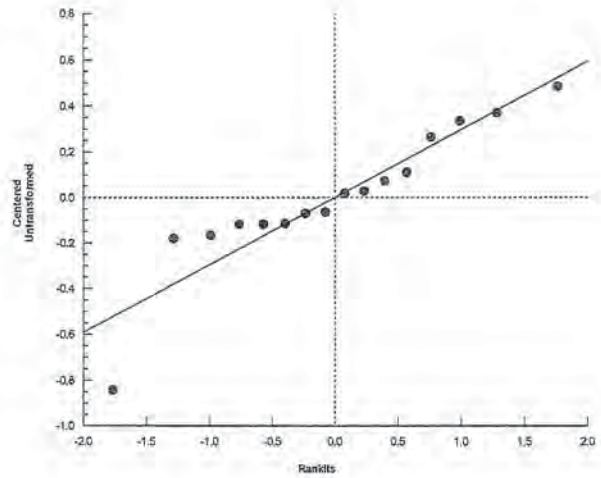
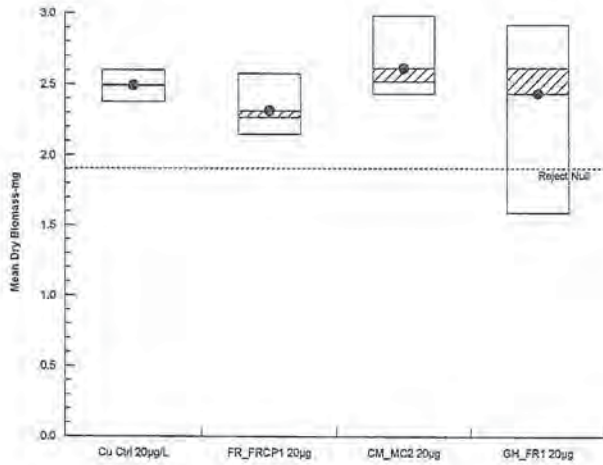
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-9849-3360 Endpoint: Mean Dry Biomass-mg
Analyzed: 07 Aug-18 9:51 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Aug-18 09:55 (p 1 of 2)
 Test Code/ID: 180714-180715fh / 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 06-4407-8115	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 07 Aug-18 9:55	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 32d 2h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L	
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP1 20µg passed mean dry biomass-	23.52%
		CM_MC2 20µg passed mean dry biomass-mg	23.52%
		GH_FR1 20µg passed mean dry biomass-mg	23.52%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1 20µg	-1.621	1.943	0.215	6	CDF	0.9219	Non-Significant Effect
		CM_MC2 20µg	0.8784	1.943	0.265	6	CDF	0.2067	Non-Significant Effect
		GH_FR1 20µg	-0.1934	1.943	0.586	6	CDF	0.5735	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.18521	0.0617368	3	0.5329	0.6684	Non-Significant Effect
Error	1.39031	0.115859	12			
Total	1.57552		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.721	11.34	0.0521	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8874	0.8408	0.0507	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	N	4	2.493	2.32	2.665	2.497	2.374	2.603	0.05436	4.36%	0.00%
FR_FRCP1 20µg		4	2.313	2.007	2.62	2.265	2.147	2.577	0.09615	8.31%	7.18%
CM_MC2 20µg		4	2.612	2.215	3.01	2.518	2.431	2.981	0.1249	9.56%	-4.80%
GH_FR1 20µg		4	2.434	1.49	3.379	2.614	1.591	2.917	0.2967	24.38%	2.34%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	2.565	2.603	2.374	2.429
FR_FRCP1 20µg		2.577	2.199	2.147	2.331
CM_MC2 20µg		2.495	2.431	2.542	2.981
GH_FR1 20µg		1.591	2.917	2.767	2.461

CETIS Analytical Report

Report Date: 07 Aug-18 09:55 (p 2 of 2)
Test Code/ID: 180714-180715fh / 13-6749-9890

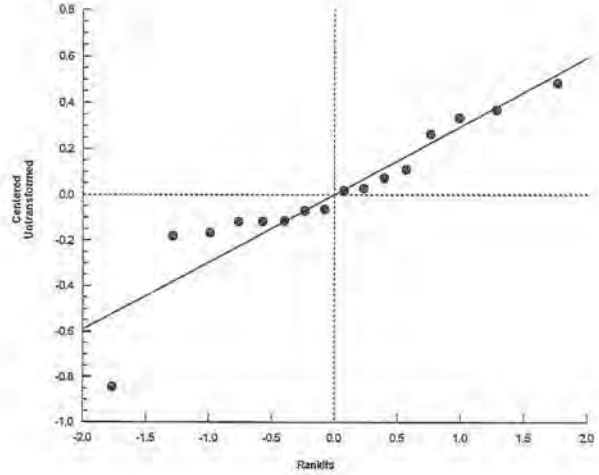
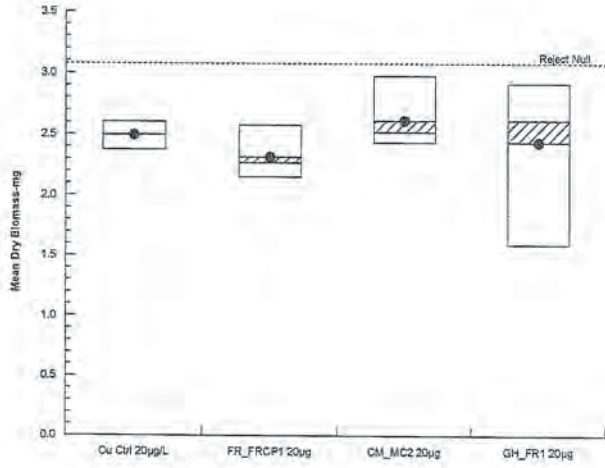
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4407-8115 Endpoint: Mean Dry Biomass-mg
Analyzed: 07 Aug-18 9:55 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 1 of 8)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-6269-0065	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:48	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	0.05936	0.1781	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	0.2479	0.4958	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	60	0	60	1	0	0.0%
FR_FRCP1 20µg	56	4	60	0.9333	0.06667	6.67%
CM_MC2 20µg	60	0	60	1	0	0.0%
GH_FR1 20µg	58	2	60	0.9667	0.03333	3.33%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	1	1	1	1
FR_FRCP1 20µg	0.9333	1	0.9333	0.8667
CM_MC2 20µg	1	1	1	1
GH_FR1 20µg	0.9333	0.9333	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15
FR_FRCP1 20µg	14/15	15/15	14/15	13/15
CM_MC2 20µg	15/15	15/15	15/15	15/15
GH_FR1 20µg	14/15	14/15	15/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 2 of 8)

Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-6269-0065

Endpoint: Hatched Rate

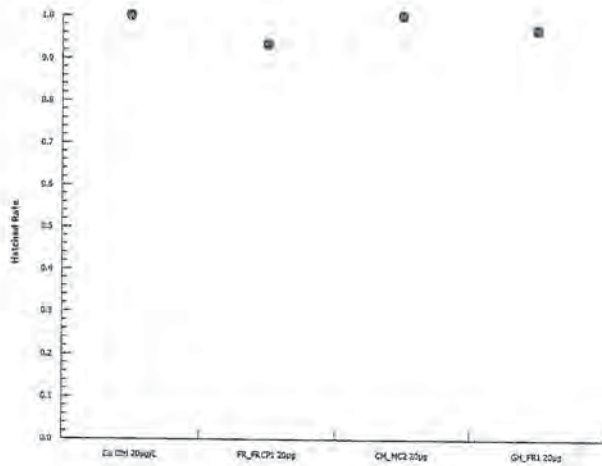
CETIS Version: CETISv1.8.7

Analyzed: 09 Jul-18 11:48

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 3 of 8)
 Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-6352-3933	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 09 Jul-18 11:48	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 20-5053-5903	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 11 May-18 12:30	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 12 Jun-18 14:00	Species: Pimephales promelas	Brine:
Duration: 32d 2h	Source: Aquatic Biosystems, CO	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	14-4675-2770	08 May-18	08 May-18	85h	Teck Coal	Teck Coal Q2 2018
FR_FRCP1 20µg	01-8753-5095	08 May-18	09 May-18	85h		
CM_MC2 20µg	20-6001-0638	08 May-18	09 May-18	85h		
GH_FR1 20µg	06-1152-1330	08 May-18	09 May-18	85h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20µg/L		
FR_FRCP1 20µg	Water Sample	Teck Coal	FR_FRCP1 20µg/L		
CM_MC2 20µg	Water Sample	Teck Coal	CM_MC2 20µg/L		
GH_FR1 20µg	Water Sample	Teck Coal	GH_FR1 20µg/L		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C < T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20µg/L		FR_FRCP1 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		CM_MC2 20µg	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20µg/L		GH_FR1 20µg	1	1.0000	Exact	Non-Significant Effect

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L Dilution Water	60	0	60	1	0	0.0%
FR_FRCP1 20µg	56	4	60	0.9333	0.06667	6.67%
CM_MC2 20µg	60	0	60	1	0	0.0%
GH_FR1 20µg	58	2	60	0.9667	0.03333	3.33%

Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	1	1	1	1
FR_FRCP1 20µg	0.9333	1	0.9333	0.8667
CM_MC2 20µg	1	1	1	1
GH_FR1 20µg	0.9333	0.9333	1	1

Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	15/15	15/15	15/15	15/15
FR_FRCP1 20µg	14/15	15/15	14/15	13/15
CM_MC2 20µg	15/15	15/15	15/15	15/15
GH_FR1 20µg	14/15	14/15	15/15	15/15

CETIS Analytical Report

Report Date: 09 Jul-18 11:49 (p 4 of 8)
Test Code: 180714-180715fh | 13-6749-9890

Fathead Minnow 32-d Survival and Growth Test

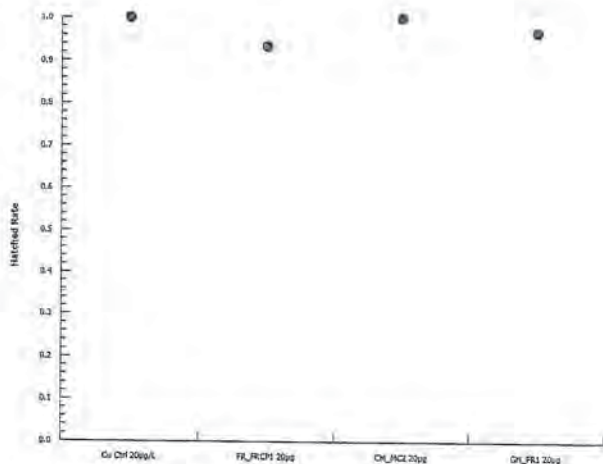
Nautilus Environmental

Analysis ID: 03-6352-3933
Analyzed: 09 Jul-18 11:48

Endpoint: Hatched Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



APPENDIX E – *Oncorhynchus mykiss* (rainbow trout) Toxicity Test Data

Embryo-Alevin Test Summary Sheet

Client: Teck Test Date: May 9 - June 8, 2018
 Work Order No.: 180712 Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Various - see table below
 Sample Date: May 8, 15, 22, 29 and June 5, 2018
 Date Received: May 9, 16, 23, 30 and June 6, 2018
 Sample Volume: (2-10) x 20 L to (1-2) x 200L per refresh

Dilution Water:

Type: Dechlorinated Tap Water
 Hardness (mg/L CaCO₃): 10 - 13
 Alkalinity (mg/L CaCO₃): 11 - 13

Test Organism Information:

Batch No: 050918
 Source: Ted's Trout, Campbell Lake, BC Number male broodstock used: 3
 Loading Density: 1.43 g/L Number female broodstock used: 4
 Sperm motility check: Verification of sperm motility using a compound microscope

SDS Reference Toxicant Results:

Reference Toxicant ID: RTE106
 Stock Solution ID: 18S01
 Date Initiated: May 9, 2018
 7-d EC50 (95% CL): 4.9 (4.7 - 5.2) mg/L SDS

Reference Toxicant Mean and Range: 4.2 (2.0 - 8.7) mg/L SDS
 Reference Toxicant CV (%): 45

Test Results:

Sample ID	Survival (%) (Mean ± SD)	Normal (%) (Mean ± SD)	Length (mm) (Mean ± SD)	Wet weight (mg) (Mean ± SD)
Control	92.7 ± 6.6	88.7 ± 11.2	21.9 ± 0.8	114.8 ± 20.0
FR_UFR1	89.2 ± 8.7	87.5 ± 9.6	22.2 ± 0.3	115.2 ± 19.7
GH_ER2	90.0 ± 3.8	89.2 ± 3.2	23.1 ± 0.5	120.1 ± 20.8
CM_MC1	96.7 ± 0.0	95.0 ± 1.9	23.0 ± 0.8	120.3 ± 27.2
FR_FRCP1	84.9 ± 12.6 ^a	82.4 ± 11.0 ^a	22.6 ± 0.8	123.7 ± 21.2
GH_FR1	88.1 ± 4.6	84.7 ± 6.7	23.2 ± 0.6	132.4 ± 16.0
GH_ERC	91.0 ± 7.2	90.1 ± 7.0	23.0 ± 0.4	122.5 ± 21.3
EV_HC1	86.7 ± 8.2 ^a	85.0 ± 6.9	23.4 ± 1.0	129.2 ± 23.8
EV_MC2	98.3 ± 2.0	96.6 ± 4.7	23.1 ± 0.6	127.0 ± 25.1
CM_MC2	86.8 ± 7.8 ^a	83.4 ± 6.7 ^a	23.3 ± 0.4	129.4 ± 28.2
LC_SLC	93.4 ± 4.7	91.7 ± 6.4	23.0 ± 0.4	124.2 ± 22.7
LC_LCDSSLCC	94.2 ± 3.2	91.7 ± 1.9	22.7 ± 1.1	125.3 ± 18.0

No results were significantly lower relative to the laboratory control or reference sites FR_UFR1 and GH_ER2 and LC_SLC.

^a Indicates results that were significantly lower relative to reference site CM_MC1

Reviewed by: JG

Date reviewed: July 9/18

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	0		1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	14.5	14.5	14.5	14.6	14.6	14.5	14.6	14.5	14.6	15.0	14.5	14.5	14.5	
DO (mg/L)	10.1	10.0	10.1	10.0	9.8	10.1	9.8	10.1	10.0	10.0	9.8	10.1	9.9	
pH	7.1	6.8	6.8	6.8	6.8	7.0	7.1	7.0	7.1	6.8	6.9	6.8	6.9	
Cond. (µS/cm)	34	35		34		35		35		35		35		
Initials	A	MM		A		A		A		MM		MM		

FR-UFR1 Concentration 100	Days													
	0		1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	
DO (mg/L)	10.0	9.8	10.1	9.9	9.7	10.1	9.9	10.1	10.0	10.0	9.8	9.9	10.0	
pH	7.3	7.7	6.7	7.8	7.9	7.9	7.8	7.9	7.7	6.7	7.9	7.8	7.9	
Cond. (µS/cm)	200	205		206		207		207		216		225		
Initials	A	MM		A		A		A		MM		MM		

GH-ER2 Concentration 100	Days													
	0		1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	
DO (mg/L)	10.1	9.9	10.0	9.9	9.7	10.1	9.8	10.1	9.9	9.8	9.7	10.0	9.9	
pH	7.6	7.8	7.9	7.9	8.2	7.9	8.1	7.9	7.8	7.9	8.0	7.8	8.0	
Cond. (µS/cm)	276	276		281		279		280		281		279		
Initials	A	MM		MM		A		A		MM		MM		

CM-MCI Concentration 100	Days													
	0		1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	
DO (mg/L)	10.2	9.8	10.0	9.9	9.8	10.1	9.9	10.2	9.9	9.9	9.7	10.0	9.9	
pH	7.7	7.8	7.8	7.8	8.1	7.9	8.0	7.9	8.0	7.8	7.9	7.8	8.0	
Cond. (µS/cm)	185	187		189		188		187		189		187		
Initials	A	MM		A		A		A		MM		MM		

Thermometer: CER-3 DO meter: 2/3 / 2/3 pH meter: 2/3 / 2/3 Conductivity meter: 2/3 / 2/3
probe probe probe probe

	Control	FR-UFR1	GH-ER2	CM-MCI
Hardness*	10	170	220	132
Alkalinity*	11	106	140	96

Analysts: AWD, MM

Reviewed by: Joh

Date reviewed: July 6/18

* mg/L as CaCO3

Sample Description: FR-UFR1 - clear, light yellowish-brown, no odour, some particulates
GH-ER2, CM-MCI - slightly turbid, light brown, no odour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: VARIOUS
 Work Order #: 1807296

Start Date & Time: MAY 9, 2018 @ 1845h
 Stop Date & Time: JUNE 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

FR-FRCPI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	10.1	9.8	10.0	9.8	9.8	10.1	9.8	10.0	10.1	9.7	9.8	9.7	10.0
pH	7.6	7.7	7.8	7.9	8.1	7.9	8.1	7.9	8.0	7.9	8.0	7.9	8.1
Cond. (µS/cm)	543	544		544		544		545		546		545	
Initials	UML	UML		A		A		A		UML		UML	

GH-FRI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	10.2	10.0	10.0	9.9	9.6	10.0	9.9	10.0	10.0	9.8	9.8	9.7	9.9
pH	7.7	7.8	7.9	7.9	8.3	7.8	8.2	7.9	8.1	8.0	8.2	8.1	8.2
Cond. (µS/cm)	506	507		506		505		505		507		507	
Initials	UML	UML		A		A		A		UML		UML	

GH-ERC Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	10.2	9.7	9.9	9.8	9.8	10.0	9.8	10.0	9.9	9.7	9.8	9.9	10.0
pH	7.7	7.8	7.9	8.0	8.2	8.0	8.1	8.0	8.0	8.0	8.0	8.0	8.1
Cond. (µS/cm)	318	319		315		320		321		320		319	
Initials	UML	UML		A		A		A		UML		UML	

EV-HCI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	10.2	9.9	9.8	9.8	9.8	10.0	9.8	9.9	10.1	9.7	9.8	9.9	10.0
pH	7.8	7.9	8.0	8.0	8.2	8.0	8.1	8.0	8.0	8.0	8.1	8.0	8.1
Cond. (µS/cm)	429	433		438		433		435		435		438	
Initials	UML	UML		A		A		A		UML		UML	

Thermometer: CER-3 DO meter: 2/3/2/3 pH meter: 2/3/2/3 Conductivity meter: 2/3/2/3
FR-FRCPI probe probe probe

	UML Control	GH-FRI	GH-ERC	EV-HCI
Hardness*	410	400	170	360
Alkalinity*	142	140	140	148

Analysts: AWQ UML

Reviewed by: JBL

Date reviewed: July 6/18

* mg/L as CaCO3

Sample Description: FR-FRCPI, GH-FRI, GH-ERC, EV-HCI - slightly turbid, light brown, no colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

EV-MC2 Concentration 100	Days														
	0		1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	10.2	10.0	10.0	9.8	9.7	10.0	9.8	10.1	10.0	9.9	9.9	9.9	9.9	9.9	10.1
pH	7.8	7.9	8.0	8.0	7.9	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.1	8.0	7.9
Cond. (µS/cm)	220		221		223		225		224		225		225		224
Initials	uml		uml		A		A		A		uml		uml		uml

CM-MC2 Concentration 100	Days														
	0		1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	10.2	10.6	10.0	10.0	9.7	10.0	9.8	10.1	10.1	9.7	9.9	9.9	9.9	9.9	10.0
pH	7.8	7.9	7.9	8.0	8.2	8.0	8.0	8.0	8.0	8.0	8.1	8.0	8.1	8.0	8.0
Cond. (µS/cm)	493		497		499		497		496		498		498		499
Initials	uml		uml		A		A		A		uml		uml		uml

LC-SLC Concentration 100	Days														
	0		1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	10.1	9.9	10.1	9.9	9.2	10.0	9.9	10.0	10.0	9.7	9.7	10.0	9.9	10.0	9.9
pH	7.7	7.9	7.9	8.0	8.1	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.2
Cond. (µS/cm)	230		240		240		241		240		241		241		239
Initials	uml		uml		A		A		A		uml		uml		uml

LC-LCDSLCC Concentration 100	Days														
	0		1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	10.2	9.9	10.1	9.8	9.7	10.1	9.8	10.0	10.1	9.8	9.8	9.9	9.9	9.9	10.0
pH	7.8	7.9	7.9	8.0	8.2	8.0	8.2	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.2
Cond. (µS/cm)	531		533		532		531		530		530		530		532
Initials	uml		uml		A		A		A		uml		uml		uml

Thermometer: CER-3 DO meter: 2/3/2/3 pH meter: 2/3/2/3 Conductivity meter: 2/3/2/3
 EV-MC2 probe probe probe

	Control	CM-MC2	LC-SLC	LC-LCDSLCC
Hardness*	136	430	148	390
Alkalinity*	88	136	118	146

Analysts: Awd, uml
 Reviewed by: Jak
 Date reviewed: July 6/18

* mg/L as CaCO3
 Sample Description: EV-MC2, CM-MC2 - slightly turbid, light brown, no odour, some particulates
LC-SLC, LC-LCDSLCC - clear, no colour, no odour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712ab

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.0	9.9	10.2	10.1	10.2	9.9	10.1	10.0	10.1	9.9	10.2	10.0
pH	6.8	7.9	6.8	6.9	6.7	6.9	6.8	7.0	6.8	7.0	6.8	6.9	6.7	6.8
Cond. (µS/cm)	35		34		34		37		37		34		34	
Initials	uml		uml		uml		a		a		uml		uml	

FR-VFRI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.0	9.9	9.9	10.0	9.9	10.1	9.8	10.1	9.9	10.0	9.8	10.2	10.1
pH	7.9	7.9	7.8	7.9	7.9	8.0	7.9	7.8	7.9	7.8	7.9	7.9	7.9	7.9
Cond. (µS/cm)	228		199		202		198		199		200		199	
Initials	uml		uml		uml		a		a		uml		uml	

GH-ER2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.1	10.1	10.0	9.8	9.9	10.1	9.8	10.1	10.1	10.0	9.9	10.2	10.1
pH	7.9	8.0	7.9	8.1	7.9	8.1	7.9	7.7	7.9	7.8	7.9	8.0	7.9	8.0
Cond. (µS/cm)	281		276		250		263		261		269		267	
Initials	uml		uml		uml		a		a		uml		uml	

CM-MCI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.1	10.1	10.1	9.8	9.8	10.0	9.9	10.0	10.0	10.2	9.7	10.0	10.1
pH	7.8	8.1	7.8	8.0	7.8	7.9	7.8	7.7	7.8	7.8	7.8	7.9	7.7	7.9
Cond. (µS/cm)	187		175		177		176		175		178		179	
Initials	uml		uml		uml		a		a		uml		uml	

Thermometer: CER-3 DO meter: 2/3/2/3 pH meter: 2/3/2/3 Conductivity meter: 2/3/2/3
probe probe probe

	Control	FR-VFRI	GH-ER2	CM-MCI
Hardness*	10	190	220	109
Alkalinity*	13	90	128	86

Analysts: AWO, uml
 Reviewed by: JOH
 Date reviewed: July 6/18

* mg/L as CaCO₃
 Sample Description: FR-VFRI - clear, light yellowish-brown, no odour, some particulates
GH-ER2, CM-MCI - slightly turbid, light brown, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

FR-FRCPI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	9.9	9.6	9.9	9.9	10.0	10.1	9.9	10.1	10.0	10.1	9.8	10.0	10.1
pH	8.0	8.1	8.0	8.2	8.0	8.2	8.0	8.2	8.0	8.2	8.0	8.1	7.9	8.1
Cond. (µS/cm)	545		481.0		483		483		486		486		487	
Initials	MM		MM		MM		A		A		MM		MM	

GH-FRI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	9.9	9.8	9.6	10.0	10.1	10.0	10.0	9.9	10.0	9.8	9.9	10.1
pH	8.1	8.2	8.1	8.3	8.1	8.2	8.1	7.9	8.1	8.0	8.1	8.2	8.1	8.2
Cond. (µS/cm)	508		494		487		481		484		483		478	
Initials	MM		MM		MM		A		A		MM		MM	

GH-ERC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	9.8	9.8	9.8	9.9	10.1	9.9	10.0	9.9	10.1	9.8	10.1	10.1
pH	8.0	8.3	8.1	8.2	8.1	8.3	8.1	8.0	8.1	8.0	8.0	8.2	8.0	8.1
Cond. (µS/cm)	320		309		307		298		304		310		312	
Initials	MM		MM		MM		A		A		MM		MM	

EV-HCI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.0	9.9	9.9	9.9	10.0	10.1	9.9	10.1	9.9	10.0	9.9	10.1	10.0
pH	8.1	8.2	8.1	8.2	8.1	8.3	8.1	8.0	8.1	8.0	8.1	8.2	8.1	8.3
Cond. (µS/cm)	434		446		448		451		453		452		452	
Initials	MM		MM		MM		A		A		MM		MM	

Thermometer: CER-3 DO meter: 2/3/2/3 pH meter: 2/3/2/3 Conductivity meter: 2/3/2/3
FR-FRCPI probe GH-FRI probe

	Control	GH-FRI	GH-ERC	EV-HCI
Hardness*	370	390	170	360
Alkalinity*	130	136	132	146

Analysts: AWD, MM
 Reviewed by: JCh
 Date reviewed: July 6/18

* mg/L as CaCO3
 Sample Description: FR-FRCPI, GH-FRI, GH-ERC, EV-HCI - slightly turbid, light brown, no odour, some proliferates

Comments: 0 confirmed at 2 weeks (C-2, C-3)

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

EV-MC2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.1	9.9	9.7	9.9	10.0	10.1	9.9	10.1	10.0	10.0	9.7	10.1	10.1
pH	8.0	8.0	7.9	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.9	7.9	7.9	8.0
Cond. (µS/cm)	224		232		231		235		234		234		234	
Initials	MM		MM		MM		A		A		MM		MM	

CM-MC2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.1	10.1	9.8	9.7	10.1	10.1	9.8	10.1	10.0	10.0	9.6	10.1	10.1
pH	7.9	8.3	8.0	8.2	8.0	8.2	8.0	8.0	8.1	8.1	8.0	8.2	8.0	8.2
Cond. (µS/cm)	497		478		477		455		457		477		481	
Initials	MM		MM		MM		A		A		MM		MM	

LC-SLC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.5
DO (mg/L)	10.0	10.0	10.1	9.5	9.8	10.0	10.1	9.9	10.1	9.9	9.9	9.8	10.0	10.2
pH	7.9	8.1	7.9	8.1	8.1	8.2	8.1	7.9	8.1	8.0	8.1	8.1	8.1	8.0
Cond. (µS/cm)	239		218		218		231		230		233		218	
Initials	MM		MM		MM		A		A		MM		MM	

LC-LCOSSLCC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.5
DO (mg/L)	9.9	10.0	10.2	10.0	9.8	10.0	10.1	9.9	10.2	10.0	9.8	9.6	10.1	10.2
pH	8.0	8.2	8.0	8.2	8.1	8.2	8.1	8.0	8.1	8.0	8.1	8.2	8.0	8.2
Cond. (µS/cm)	532		474		456		455		451		454		454	
Initials	MM		MM		MM		A		A		MM		MM	

Thermometer: CER-3 DO meter: 2/3/2/3 pH meter: 2/3/2/3 Conductivity meter: 2/3/2/3
 EV-MC2 probe CM-MC2 probe LC-SLC probe LC-LCOSSLCC probe

	MM Control	CM-MC2	LC-SLC	LC-LCOSSLCC
Hardness*	132	340	130	320
Alkalinity*	84	126	102	130

Analysts: AWD, MM

Reviewed by: JOU

Date reviewed: July 6/18

* mg/L as CaCO3

EV-MC2, CM-MC2 - slightly turbid, light brown, no odour, some particulates

Sample Description: LC-SLC, LC-LCOSSLCC - clear, no colour, no odour, some particulates

Comments: 0 confirmed w/ 2 meters (C2, C-3)

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	9.9	10.0	10.2	10.1	10.2	10.1	10.1	9.9	10.1	10.0	10.2	10.1	10.1	10.3
pH	6.7	6.8	6.7	6.9	6.7	6.8	6.9	7.0	6.9	7.1	6.7	6.8	6.7	6.8
Cond. (µS/cm)	34		34		34		32		32		34		34	
Initials	MM		MM		MM		A		A		MM		MM	

FRUFRI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	9.8	10.0	10.0	10.1	9.9	10.1	10.0	9.8	10.0	10.0	10.2	10.0	10.1	10.2
pH	7.8	7.9	7.9	8.0	7.9	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.7	7.8
Cond. (µS/cm)	200		208		209		209		208		212		207	
Initials	MM		MM		MM		A		A		MM		MM	

GH-ERZ Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	9.8	10.1	9.8	10.0	10.0	10.0	10.0	9.9	10.0	9.9	10.1	10.1	10.2	10.2
pH	8.0	8.0	7.9	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.0	8.1	7.8	7.9
Cond. (µS/cm)	266		261		260		259		260		263		261	
Initials	MM		MM		MM		A		A		MM		MM	

CM-MCI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.0	10.1	10.0	10.0	10.1	10.1	9.9	10.0	10.0	10.0	10.0	10.0	10.1
pH	7.7	7.8	7.8	7.9	7.8	7.9	7.9	8.2	7.9	8.1	7.8	8.0	7.7	7.8
Cond. (µS/cm)	178		174		173		172		173		174		173	
Initials	MM		MM		MM		A		A		MM		MM	

Thermometer: CER-3 DO meter: 213 / 213 pH meter: 213 / 213 Conductivity meter: 213 / 213
probe probe probe probe

	Control	FRUFRI	GH-ERZ	CM-MCI
Hardness*	11	170	190	104
Alkalinity*	12	100	124	84

Analysts: AWD, MM

Reviewed by: JBO
 Date reviewed: July 6/18

* mg/L as CaCO3

Sample Description: FRUFRI - clear, light yellowish-brown, no odour, some particulates
GH-ERZ, CM-MCI - slightly turbid, light brown, no odour, some particulates.

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

FR-FRCPI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.1	10.1	9.9	10.2	9.8	10.1	10.1	10.0	10.1	9.9	10.0	10.2	10.0	10.2
pH	7.9	8.1	7.9	8.2	8.0	8.2	8.3	8.1	8.0	8.1	8.0	8.3	7.9	8.1
Cond. (µS/cm)	484		550		550		547		546		554		546	
Initials	MM		MM		MM		A		A		MM		MM	

GH-FRI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.2	10.1	10.3	10.0	10.2	10.0	10.0	10.1	9.8	10.3	10.2	9.7	10.2
pH	8.0	8.1	8.1	8.3	8.2	8.3	8.1	8.1	8.1	8.2	8.2	8.3	8.0	8.1
Cond. (µS/cm)	487		531		530		526		527		535		532	
Initials	MM		MM		MM		A		A		MM		MM	

GH-ERC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	9.7	10.1	10.1	10.2	10.0	10.1	10.0	9.9	10.0	9.8	10.2	10.1	9.9	10.1
pH	8.0	8.1	7.9	8.2	8.0	8.3	8.1	8.2	8.1	8.2	8.1	8.3	7.9	8.1
Cond. (µS/cm)	310		298		297		297		298		300		298	
Initials	MM		MM		MM		A		A		MM		MM	

EV-HCI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.2	10.2	10.2	9.9	10.2	10.1	10.0	10.0	10.1	10.2	10.0	10.0	10.1
pH	8.0	8.2	8.1	8.3	8.1	8.3	8.1	8.2	8.1	8.2	8.1	8.3	8.0	8.2
Cond. (µS/cm)	451		487		487		484		482		490		492	
Initials	MM		MM		MM		A		A		MM		MM	

Thermometer: CER-3 DO meter: 2/3 / 2/3 pH meter: 2/3 / 2/3 Conductivity meter: 2/3 / 2/3
FR-FRCPI probe GH-FRI probe GH-ERC probe EV-HCI probe

Control	GH-FRI	GH-ERC	EV-HCI	
Hardness*	410	380	160	300
Alkalinity*	138	146	136	150

Analysts: AWD, YML
 Reviewed by: John
 Date reviewed: July 6/18

* mg/L as CaCO3
 Sample Description: FR-FRCPI, GH-FRI, GH-ERC, EV-HCI - slightly turbid, light brown, no odour, some particulates

Comments: Confirmed w/ C-2, C-3

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

EV-MC2 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.1	10.2	9.8	10.3	10.0	10.2	10.0	10.0	10.0	10.0	10.1	10.3	10.0	10.1
pH	7.8	8.0	7.8	8.0	7.8	8.0	7.9	8.0	7.7	8.1	7.9	8.1	7.8	7.9
Cond. (µS/cm)	233		253		272		280		278		278		276	
Initials	MM		MM		MM		A		A		MM		MM	

CM-MC2 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.2	9.9	10.2	10.1	10.2	10.1	10.0	10.1	10.0	10.1	10.2	10.0	10.1
pH	7.9	8.2	8.0	8.3	8.1	8.2	8.1	8.1	8.1	8.2	8.1	8.3	7.9	8.1
Cond. (µS/cm)	479		520		521		516		518		523		519	
Initials	MM		MM		MM		A		A		MM		MM	

LC-SLC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.2	9.9	10.1	9.9	10.1	10.0	9.9	10.0	10.1	10.0	10.2	9.9	10.1
pH	7.9	8.0	8.0	8.1	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.0	8.0
Cond. (µS/cm)	224		219		220		220		221		221		219	
Initials	MM		MM		MM		A		A		MM		MM	

LC-LCDSSLCC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.0	10.2	10.0	10.2	9.9	10.1	10.0	10.0	10.1	10.0	10.1	10.1	9.9	10.1
pH	8.0	8.2	8.0	8.3	8.1	8.3	8.1	8.2	8.1	8.2	8.0	8.3	7.9	8.1
Cond. (µS/cm)	452		497		496		494		496		501		498	
Initials	MM		MM		MM		A		A		MM		MM	

Thermometer: CER-3 DO meter: 213 | 213 pH meter: 213 | 213 Conductivity meter: 213 | 213
 EV-MC2 probe DO meter probe pH meter probe Conductivity meter probe

	Control	CM-MC2	LC-SLC	LC-LCDSSLCC
Hardness*	140	310	124	300
Alkalinity*	82	132	100	136

Analysts: AWD, MM

Reviewed by: JBL

Date reviewed: July 6/18

Sample Description: EV-MC2, CM-MC2 - slightly turbid, light brown, no colour, some precipitates
LC-SLC, LC-LCDSSLCC - clear, no colour, no colour, some precipitates.

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 18071295

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

FR-FRCPI Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.6	14.5	14.5	14.6	14.6	14.5	14.5	14.5	14.5
DO (mg/L)	9.7	10.1	10.0	10.1	10.0	10.2	10.1	9.8	10.1	10.0	9.8	10.0	9.7	10.1
pH	7.8	8.0	7.9	8.1	8.0	8.2	8.0	8.1	8.0	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	550		530		529		525		526		531		528	
Initials	MM		MM		A		A		A		MM		MM	

GH-FRI Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.6	14.5	14.6	14.6	14.6	14.5	14.5	14.5	14.5
DO (mg/L)	9.9	10.1	10.1	10.0	10.1	10.1	10.2	9.8	10.1	9.9	10.0	10.0	9.7	10.1
pH	8.1	8.1	8.0	8.1	8.1	8.2	8.0	8.1	8.1	8.2	8.1	8.2	8.2	8.3
Cond. (µS/cm)	536		522		522		517		517		522		520	
Initials	MM		MM		A		A		A		MM		MM	

GH-ERC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.6	14.5	14.6	14.5	14.6	14.5	14.5	14.5	14.5
DO (mg/L)	12.0	10.0	10.0	10.0	10.1	10.1	10.1	9.8	10.0	9.8	10.0	10.1	9.8	10.1
pH	7.8	8.1	7.9	8.1	8.0	8.2	8.0	8.1	8.0	8.1	8.0	8.1	8.1	8.1
Cond. (µS/cm)	298		284		271		280		279		285		282	
Initials	MM		MM		A		A		A		MM		MM	

EV-HCI Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	9.9	10.0	9.8	10.1	10.1	10.1	10.0	9.8	10.1	9.9	9.9	10.0	9.8	10.0
pH	8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.0	8.1	8.2	8.2	8.2
Cond. (µS/cm)	486		512		512		509		510		514		513	
Initials	MM		MM		A		A		A		MM		MM	

Thermometer: CER 83 DO meter: 213 | 213 pH meter: 213 | 213 Conductivity meter: 213 | 213
 FR-FRCPI probe DO probe pH probe

	Control	GH-FRI	GH-ERC	EV-HCI
Hardness*	380	350	158	310
Alkalinity*	144	148	134	156

Analysts: AND MM
 Reviewed by: JGU
 Date reviewed: July 6/18

* mg/L as CaCO3

Sample Description: FR-FRCPI, GH-FRI, GH-ERC, EV-HCI - slightly turbid, light brown, no odour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

EV-MC2 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.5	14.5
DO (mg/L)	9.8	10.1	9.9	10.1	10.1	10.2	10.1	9.8	10.2	9.9	10.0	10.0	9.9	10.0
pH	7.8	8.0	7.8	7.9	7.9	8.2	7.9	8.1	8.0	8.1	7.9	8.1	8.0	8.0
Cond. (µS/cm)	275		258		259		254		256		255		258	
Initials	MM		MM		A		A		A		MM		MM	

CM-MC2 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.5	14.5
DO (mg/L)	9.7	10.0	9.9	10.2	10.1	10.1	10.1	9.9	10.1	9.8	9.9	10.0	9.7	9.9
pH	7.9	8.1	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.0	8.0	8.1	8.1	8.0
Cond. (µS/cm)	59		448.0		448		445		446		455		447	
Initials	MM		MM		A		A		A		MM		MM	

LC-SLC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.5	14.5
DO (mg/L)	9.8	10.0	10.0	10.1	10.0	10.1	10.1	9.9	10.1	9.8	9.9	10.0	9.8	10.1
pH	8.0	8.0	8.0	8.0	8.1	8.2	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.2
Cond. (µS/cm)	221		211		203		208		209		211		210	
Initials	MM		MM		A		A		A		MM		MM	

LC-LCDSLCC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.5	14.5
DO (mg/L)	9.7	10.1	9.9	10.1	10.1	10.1	10.1	9.8	10.2	9.9	9.9	10.0	9.8	10.0
pH	7.9	8.1	7.9	8.2	8.1	8.1	8.1	8.2	8.1	8.0	8.1	8.2	8.1	8.2
Cond. (µS/cm)	497		476		473		474.8		472		475		475	
Initials	MM		MM		A		A		A		MM		MM	

Thermometer: CER 83 DO meter: 213 | 213 pH meter: 213 | 213 Conductivity meter: 213 | 213
 EV-MC2 probe DO meter probe pH meter probe Conductivity meter probe

	Control	CM-MC2	LC-SLC	LC-LCDSLCC
Hardness*	138	310	120	300
Alkalinity*	86	124	98	138

Analysts: AWD/MM

Reviewed by: Jou
 Date reviewed: July 6/18

*mg/L as CaCO3

Sample Description: EV-MC2, CM-MC2 - slightly turbid, light brown, no odour, some particulates
LC-SLC, LC-LCDSLCC - clear, no odour, no colour, some particulates

Comments: Confirmed at C-2, C-3

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712 a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% JV)	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	10.1	10.1	10.0	10.1	/	10.1								
pH	7.2	7.2	7.2	7.2	/	7.3								
Cond. (µS/cm)	83		33			38								
Initials	mm		mm			mm								

FR_UFRI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.9	10.1	9.9	10.1	/	10.0								
pH	8.0	8.1	8.1	8.1	/	8.1								
Cond. (µS/cm)	214		240			234								
Initials	mm		mm			mm								

GH-ER2 Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.8	10.0	9.9	10.1	/	10.1								
pH	8.0	8.2	8.1	8.2	/	8.2								
Cond. (µS/cm)	253		267			263								
Initials	mm		mm			mm								

CM-MCI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.9	10.1	9.8	10.0	/	10.1								
pH	7.9	8.0	8.0	8.0	/	8.0								
Cond. (µS/cm)	163		183			180								
Initials	mm		mm			mm								

Thermometer: CER#3 DO meter: 2/3 / 2/3 pH meter: 2/3 / 2/3 Conductivity meter: 2/3 / 2/3
probe

	Control	FR_UFRI	GH-ER2	CM-MCI
Hardness*	13	190	180	110
Alkalinity*	13	116	126	82

Analysts: mm
 Reviewed by: Joh
 Date reviewed: July 6/18

* mg/L as CaCO3
 Sample Description: FR_UFRI - clear, light yellowish-brown, no odour, some particulates
GH-ER2, CM-MCI - slightly turbid, light brown, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712 a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

FR-FRCPI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.9	10.2	10.0	10.1	/	9.9								
pH	8.1	8.2	8.1	8.2	/	8.3								
Cond. (µS/cm)	527		6160		591									
Initials	uml		uml		uml									

GH-FRI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.8	10.0	9.8	10.1	/	10.0								
pH	8.2	8.3	8.2	8.3	/	8.3								
Cond. (µS/cm)	518		6150		582									
Initials	uml		uml		uml									

GH-ERC Concentration	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.8	10.1	9.9	10.0	/	10.0								
pH	8.0	8.1	8.1	8.1	/	8.2								
Cond. (µS/cm)	283		282		288									
Initials	uml		uml		uml									

EV-HCI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	10.0	10.1	9.9	10.0	/	10.1								
pH	8.2	8.3	8.2	8.3	/	8.3								
Cond. (µS/cm)	510		5750		556									
Initials	uml		uml		uml									

Thermometer: CER#3 DO meter: 2/3 | 2/3 pH meter: 2/3 | 2/3 Conductivity meter: 2/3 | 2/3
 FR-FRCPI probe GH-FRI probe GH-ERC probe EV-HCI probe

	Control	GH-FRI	GH-ERC	EV-HCI
Hardness*	350	360	156	320
Alkalinity*	168	150	1286	172

Analysts: uml
 Reviewed by: Jul
 Date reviewed: July 9/18

Sample Description: FR-FRCPI, GH-FRI, GH-ERC, EV-HCI - slightly turbid, light brown, no odour, some particulates

Comments: Confirmed w/ C-2, C-3

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: Various
 Work Order #: 180712 a, b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

EV-MC2 Concentration 100	Days													
	28		29		30 <i>final</i>									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	9.9	10.1	9.9	10.0	/	10.1								
pH	8.0	8.1	8.0	8.0	/	7.9								
Cond. (µS/cm)	257		307		292									
Initials	uml		uml		uml									

CM-MC2 Concentration 100	Days													
	28		29		30 <i>final</i>									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	10.0	10.2	9.8	10.0	/	10.1								
pH	8.1	8.2	8.1	8.2	/	8.2								
Cond. (µS/cm)	447		5320		500									
Initials	uml		uml		uml									

LC-SLC Concentration 100	Days													
	28		29		30 <i>final</i>									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	10.0	10.1	10.0	10.0	/	10.1								
pH	8.0	8.2	8.1	8.1	/	8.2								
Cond. (µS/cm)	209		233		231									
Initials	uml		uml		uml									

LC-LCDSSLC Concentration 100	Days													
	28		29		30 <i>final</i>									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.5	14.5	14.5	/	14.5								
DO (mg/L)	10.0	10.2	10.0	9.9	/	10.1								
pH	8.1	8.3	8.1	8.2	/	8.3								
Cond. (µS/cm)	473		5820		554									
Initials	uml		uml		uml									

Thermometer: CER#3 DO meter: 2/3 | 2/3 pH meter: 2/3 | 2/3 Conductivity meter: 2/3 | 2/3
EV-MC2 probe probe probe probe

	44 Control	CM-MC2	LC-SLC	LC-LCDSSLC
Hardness*	164	300	130	310
Alkalinity*	88	124	102	156

Analysts: uml

Reviewed by: JOH

Date reviewed: July 6/18

* mg/L as CaCO3
 EV-MC2, CM-MC2 - slightly turbid, light brown, no odour, some particulates
 Sample Description: LC-SLC, LC-LCDSSLC - clear, no colour, no odour, some particulates.

Comments: confirmed w/ C2, C-3

Embryo-Alevin Toxicity Test Daily Mortality

Client: Tech
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		1	2	3	4	5	6	7	8	9	10	11	12	
Control	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
FR_VFR1 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
GH-ER2 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
CM-MCI 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
FR-FCP1 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
GH-FR1 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
GH-ERC 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
EV-HCI 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Tech Initials		nmw	nmw	A	A	nmw	nmw	nmw	nmw	nmw	nmw	nmw	nmw	nmw

Comments: _____

Reviewed by: JGh Date reviewed: July 6/18
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% vol)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		1	2	3	4	5	6	7	8	9	10	11	12	
EV-MCZ 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
CM-MCZ 100	1	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2
LC-SLC 100	1	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
LC-LCDSLC 100	1	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
Tech Initials		UM	UM	A	~	UM	UM	UM	UM	A	A	A	UM	UM

Comments: _____

Reviewed by: Jon Date reviewed: July 6/18
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: Various
 Work Order #: 180712a,b

Start Date & Time: May 9, 2018 @ 1845h
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% d/d)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins	
		13	14 ^①	15	16	17	18	19	20	21	22	23	24		
Control	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2				0								②	③	0
	3				0						②	③			0
	4				1							②	③		1
FR_VFR1 100	1				0				②		③				0
	2								1	②	1	③	1		3
	3		①	①		1		①	0	②	②	③	0		0
	4		1	1		2		1	②			③	②		6
GH_LER2 100	1		0	0		0		0	0	②	②		1		1
	2								0		②	③	0		0
	3								②		③		0	①	1
	4								0	②	③		2		2
CM-MCI 100	1									②	③		0		0
	2									②		③			0
	3									②	③				0
	4									②	1	③			1
FR_FRCP1 100	1				①					②	③				1
	2				1					②	0		③		1
	3			①	0			①	②			③	①		0
	4		①	1	2			1	②	②		③	1		7
GH-FR1 100	1		1	0	0			0	0	②	③		0		1
	2		0	0						②		③	0		0
	3			0					①	②	③	①	2		2
	4			1					①	②	③	1	0		2
GH_LERC 100	1			0					①	②	③	0			1
	2							0	1	②	③	0	③		1
	3								②	0	③				0
	4							1	②	②	③		①		1
EV-HCI 100	1							0		②	③		1		1
	2								①	②	③	①	0		0
	3								1	②	③	1	1		3
	4	①	①	①	①	①	①	①	0	②	③	0	0		0
Tech Initials		mm	mm	mm	mm	A	mm	mm	mm	mm	mm	mm	mm	mm	mm

Comments: ① at eyed stage ② starting to hatch ③ >50% hatched

Reviewed by: Joh

Date reviewed: July 9/18

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: various
 Work Order #: 180712 a,b

Start Date & Time: May 9, 2018 @ 1845
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% w/v)	Rep	Day of Test - No. of Mortalities							Total Dead Embryos/ Alevins	① Total Undeveloped/ Unhatched <small>Above Placenta</small>	Total No. Alevins - Normal	Total Exposed Eggs
		25	26	27	28	29	30	✓				
Control	1	0	0	0	0	0	1④		1	0	29	30
	2	0	0	0	0	0	0		0	0	29	29
	3	0	0	0	1	1	0		3	2	24	30
	4	0	0	0	1	1	1		3	3	25	32
FR_UFRI 100	1	0	0	1④	0	0	0		1	0	28	30
	2	0	0	0	0	0	0		0	0	28	31
	3	0	0	1④	0	0	0		1	1	27	29
	4	0	0	0	0	0	0		0	1	22	30
GH-ER2 100	1	0	0	0	0	0	0		1	0	28	30
	2	0	0	1④	0	0	0		2	1	27	30
	3	0	3④	0	0	0	0		3	0	26	30
	4	0	0	0	0	0	0		0	0	26	30
CM-MCI 100	1	0	1④	0	0	0	0		1	0	29	30
	2	0	0	0	0	0	0		0	1	28	30
	3	0	0	0	0	0	1④		1	0	29	30
	4	0	0	0	0	0	0		0	1	28	30
FR_FRCP1 100	1	0	0	0	0	0	0		0	1	27	30
	2	0	0	0	1④	0	0		1	1	24	29
	3	0	1④	0	0	0	0		1	1	27	30
	4	0	0	0	0	0	0		0	0	20	30
GH-FRI 100	1	0	1④	0	1④	0	0		2	1	23	29
	2	0	0	0	0	1	0		3	1	26	30
	3	0	0	0	0	0	0		0	0	28	30
	4	0	0	0	0	0	1④		2	2	28	29
GH-ERC 100	1	0	0	0	0	0	1④		1	0	26	31
	2	0	0	0	0	0	0		0	1	27	30
	3	0	0	0	0	0	0		0	0	30	30
	4	0	0	0	0	0	0		0	0	26	30
EV-HCl 100	1	0	0	0	0	0	0		0	1	28	30
	2	0	0	0	0	0	0		1	1	25	30
	3	0	0	0	0	1④	0		1	0	26	30
	4	0	0	0	1	0	0		1	0	23	30
Tech Initials		mm	mm	mm	mm	mm	mm		mm	mm	mm	mm

Comments: ① 2 fuzzy dead eggs ② lordosis ③ 1 fuzzy dead egg
 ④ yolk sac edema ⑤ 1 w/ kyphosis & yolk sac edema
 ⑥ 1 w/ lordosis & yolk sac edema ⑦ see summary sheet for deformity assessment at test termination.

Reviewed by: John

Date reviewed: July 9/18

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: various
 Work Order #: 180712 a,b

Start Date & Time: May 9, 2018 @ 1845
 Stop Date & Time: June 8, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities							Total Dead Embryos/ Alevins	⑤ Total Undeveloped/ Unhatched	Total No. Alevins Normal	Total Exposed Eggs
		25	26	27	28	29	30	/				
EV-MCZ 100	1	0	0	0	0	0	0		0	0	30	30
	2								0	2	27	30
	3								0	0	29	29
	4								0	0	28	29
CM-MCZ 100	1								0	0	25	30
	2								0	2	25	29
	3		↓						0	1	27	30
	4		↓				① 10		2	1	23	31
LC-SLE 100	1		↓		↓		② 10		1	0	30	31
	2				10		③ 0		1	1	27	30
	3				0		0		0	0	29	30
	4						0		0	1	25	30
LC-LCDSLCC 100	1						② 10		1	1	28	30
	2						1		1	1	27	30
	3						0		0	0	27	30
	4		↓	↓	↓	↓	↓		0	1	28	30
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials		2	mm	mm	mm	mm	mm		mm	mm	mm	mm

Comments: ① yolk sac edema ② yolk sac edema, kyphosis ③ yolk sac edema, bent tail
 ④ yolk sac edema + short tail
 ⑤ See summary sheet for deformity assessment at test termination

Reviewed by: Joh

Date reviewed: July 6/18

13/148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: Control

Termination Date: June 8, 2018

Work Order No.: 180712 a, b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
A	1	22.0	/		
	2	22.0	/		
	3	23.0	/		
	4	22.5	/		
	5	23.5	/		
	6	23.0	/		
	7	23.0	/		
	8	22.5	/		
	9	23.0	/		
	10	22.5	/		
	11	22.0	/		
	12	22.5	/		
	13	22.0	/		
	14	22.5	/		
	15	22.5	/		
	16	23.0	/		
	17	23.5	/		
	18	23.0	/		
	19	23.5	/		
	20	22.0	/		
	21	22.5	/		
	22	23.0	/		
	23	23.0	/		
	24	23.0	/		
	25	24.0	/		
	26	23.0	/		
	27	22.0	/		
	28	24.0	/		
	29	24.5	/		
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.29 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, MM

Reviewed by: Jou

Date Reviewed: July 6/18

B3248

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: Control
Work Order No.: 180712 a, b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
B	1	21.0	/		
	2	22.0	/		
	3	22.0	/		
	4	21.5	/		
	5	22.5	/		
	6	23.0	/		
	7	23.0	/		
	8	22.5	/		
	9	22.5	/		
	10	23.0	/		
	11	22.5 23.0	/		
	12	22.0	/		
	13	23.0	/		
	14	21.0	/		
	15	22.0	/		
	16	21.0	/		
	17	23.0	/		
	18	22.5	/		
	19	23.0	/		
	20	23.0	/		
	21	21.5	/		
	22	22.5	/		
	23	21.5	/		
	24	21.5	/		
	25	22.5	/		
	26	22.0	/		
	27	22.5	/		
	28	22.0	/		
	29	22.0	/		
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.16 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, YML

Reviewed by: Joh

Date Reviewed: July 6/18

03148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: Control
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
C	1	21.5	/		
	2	20.0	/		
	3	22.0	/		
	4	20.0	/		
	5	22.5	/		
	6	22.5	/		
	7	20.8	/		
	8	21.5	/		
	9	21.5	/		
	10	21.5	/		
	11	21.0 21.0	/		
	12	21.0	/		
	13	21.5	/		
	14	20.0	/		
	15	22.5	/		
	16	23.5	/		
	17	21.0	/		
	18	21.5	/		
	19	21.0	/		
	20	23.5	/		
	21	23.0	/		
	22	22.5	/		
	23	22.0	/		
	24	22.0	/		
	25	18.5	/	/	missing tail-fin
	26	15.0		/	scotiosis (difficulty swimming)
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.67 g
Number of survivors: ~ 24 26
Number of deformed/have difficulty swimming: 2/21
Initials: JB, K, L, M
Reviewed by: JOU

Date Reviewed: July 6/18

PS 4148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: Control
 Work Order No.: 180712a,b

Start Date: May 9, 2018
 Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
D	1	22.0	/		
	2	20.5	/		
	3	22.0	/		
	4	22.5	/		
	5	21.5	/		
	6	22.0	/		
	7	21.0	/		
	8	21.5	/		
	9	21.0	/		
	10	22.0	/		
	11	22.5 22.5	/		
	12	22.5	/		
	13	22.0	/		
	14	22.5	/		
	15	21.0	/		
	16	22.0	/		
	17	22.0	/		
	18	21.5	/		
	19	21.0	/		
	20	20.5	/		
	21	20.0	/		
	22	22.0 22.0	/		
	23	21.0	/		
	24	21.0	/		
	25	22.5	/		
	26	20.0		/	abnormal jaw
	27	15.0		/	scaly & yolk-sac edema (difficulty swimming)
	28	19.5		/	kyphosis (difficulty swimming)
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 279 g
 Number of survivors: 28
 Number of deformed/have difficulty swimming: 3/2

Initials: JR, KLMHL
 Reviewed by: JG

Date Reviewed: July 6/18

5148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: FRUFRI
Work Order No.: 180712 a b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	22.5	/		
	2	22.0	/		
	3	20.5	/		
	4	22.5	/		
	5	22.0	/		
	6	21.0	/		
	7	21.0	/		
	8	23.5	/		
	9	22.0	/		
	10	23.0	/		
	11	23.0	/		
	12	21.5	/		
	13	21.5	/		
	14	22.0	/		
	15	22.0	/		
	16	22.0	/		
	17	22.0	/		
	18	21.5	/		
	19	22.5	/		
	20	23.0	/		
	21	21.0	/		
	22	23.0	/		
	23	22.5	/		
	24	22.0	/		
	25	22.5	/		
	26	22.0	/		
	27	22.5	/		
	28	22.5	/		
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.26 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KLM

Reviewed by: Jah

Date Reviewed: July 6/18

res 6/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: FR_UFR1

Termination Date: June 8, 2018

Work Order No.: 180712 a, b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	23.0	/		
	2	22.5	/		
	3	22.5	/		
	4	22.5	/		
	5	23.0	/		
	6	23.0	/		
	7	23.0	/		
	8	24.0	/		
	9	22.0	/		
	10	22.5	/		
	11	24.0	/		
	12	23.0	/		
	13	24.0	/		
	14	22.5	/		
	15	21.5	/		
	16	19.5	/		
	17	22.0	/		
	18	23.0	/		
	19	22.0	/		
	20	23.0	/		
	21	22.5	/		
	22	22.5	/		
	23	22.5	/		
	24	22.5	/		
	25	23.0	/		
	26	23.0	/		
	27	23.0	/		
	28	22.0	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.99 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KLY, JL

Reviewed by: Joh

Date Reviewed: July 6/18

237148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: FR_UFR1

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 c	1	22.0	/		
	2	23.0	/		
	3	23.0	/		
	4	21.5	/		
	5	23.0	/		
	6	23.0	/		
	7	23.0	/		
	8	22.0	/		
	9	21.5	/		
	10	22.0	/		
	11	22.0	/		
	12	22.5	/		
	13	22.5	/		
	14	22.5	/		
	15	22.5	/		
	16	21.0	/		
	17	24.0	/		
	18	22.5	/		
	19	21.0	/		
	20	22.0	/		
	21	23.0	/		
	22	22.0	/		
	23	23.0	/		
	24	22.5	/		
	25	22.0	/		
	26	21.5	/		
	27	22.5	/		
	28	17.5		/	yolk sack edema
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.77 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: SB, KLM

Reviewed by: POH

Date Reviewed: July 6/18

138148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: FR_UFRI

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	20.5	/			
	2	20.0	/			
	3	22.5	/			
	4	22.0	/			
	5	22.0	/			
	6	21.5	/			
	7	20.5	/			
	8	22.5	/			
	9	22.5	/			
	10	23.0	/			
	11	22.5	/			
	12	22.0	/			
	13	23.0	/			
	14	23.0	/			
	15	22.0	/			
	16	23.0	/			
	17	21.0	/			
	18	22.5	/			
	19	22.5	/			
	20	23.0	/			
	21	20.0	/			
	22	22.5	/			
	23	19.0			/	Kyphosis & abnormal eye (difficulty swimming)
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.37 g

Number of survivors: 23

Number of deformed/have difficulty swimming: 1/01

Initials: JB, KLM

Reviewed by: JOU

Date Reviewed: July 6/18

23 9/10/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: GH-ER2

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	22.5	/		
	2	24.6	/		
	3	23.0	/		
	4	24.5	/		
	5	24.0	/		
	6	23.0	/		
	7	24.5	/		
	8	23.0	/		
	9	23.0	/		
	10	24.5	/		
	11	24.5	/		
	12	23.0	/		
	13	24.0	/		
	14	25.0	/		
	15	24.0	/		
	16	24.0	/		
	17	19.0	/		
	18	23.0	/		
	19	23.5	/		
	20	22.5	/		
	21	23.5	/		
	22	23.0	/		
	23	23.0	/		
	24	25.0	/		
	25	24.5	/		
	26	24.0	/		
	27	25.5	/		
	28	23.0	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.33 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KLYML

Reviewed by: JCA

Date Reviewed: July 6/18

23-10/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: GH.E22

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	23.0	/		
	2	24.0	/		
	3	23.0	/		
	4	24.0	/		
	5	25.5	/		
	6	24.0	/		
	7	23.0	/		
	8	24.0	/		
	9	22.5	/		
	10	23.0	/		
	11	23.0	/		
	12	22.0	/		
	13	25.0	/		
	14	25.0	/		
	15	24.0	/		
	16	23.5	/		
	17	23.5	/		
	18	22.5	/		
	19	23.5	/		
	20	24.0	/		
	21	24.0	/		
	22	24.0	/		
	23	22.5	/		
	24	23.5	/		
	25	24.0	/		
	26	24.0	/		
	27	23.0	/		
	28	21.5		/	Yolk sack edema & jaw abnormality
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.16 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: SB, KLM

Reviewed by: Jon

Date Reviewed: July 6/18

15-11-18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: GHL-ER2
Work Order No.: 180712 m b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 E	1	28.0	/		
	2	22.5	/		
	3	22.5	/		
	4	23.0	/		
	5	23.0	/		
	6	22.0	/		
	7	23.0	/		
	8	22.0	/		
	9	22.5	/		
	10	23.5	/		
	11	23.5	/		
	12	22.5	/		
	13	23.0	/		
	14	22.0	/		
	15	22.0	/		
	16	22.5	/		
	17	22.5	/		
	18	22.0	/		
	19	23.0	/		
	20	23.5	/		
	21	21.5	/		
	22	21.5	/		
	23	22.0	/		
	24	21.0	/		
	25	22.0	/		
	26	22.5	/		
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.57 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KLYM

Reviewed by: Jon

Date Reviewed: July 6/18

12/1/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-ER2
Work Order No.: 180712 m, b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	22.5	/		
	2	22.5	/		
	3	23.0	/		
	4	23.0	/		
	5	21.5	/		
	6	23.5	/		
	7	23.0	/		
	8	23.0	/		
	9	23.0	/		
	10	23.0	/		
	11	24.0	/		
	12	22.5	/		
	13	24.5	/		
	14	24.0	/		
	15	23.5	/		
	16	23.0	/		
	17	23.0	/		
	18	23.0	/		
	19	24.0	/		
	20	23.5	/		
	21	23.5	/		
	22	20.5	/		
	23	22.0	/		
	24	23.0	/		
	25	23.0	/		
	26	22.0	/		
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.97 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KLYL

Reviewed by: JOU

Date Reviewed: July 6/18

13/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: CH_MCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	24.5	/		
	2	23.5	/		
	3	23.0	/		
	4	23.0	/		
	5	24.5	/		
	6	23.0	/		
	7	22.5	/		
	8	23.5	/		
	9	22.0	/		
	10	25.0	/		
	11	22.0	/		
	12	23.0	/		
	13	24.5	/		
	14	24.5	/		
	15	23.5	/		
	16	23.5	/		
	17	23.5	/		
	18	24.0	/		
	19	24.0	/		
	20	24.0	/		
	21	21.0	/		
	22	22.0	/		
	23	24.0	/		
	24	24.0	/		
	25	23.5	/		
	26	23.5	/		
	27	24.0	/		
	28	25.0	/		
	29	22.5	/		
	30				
31					
32					
33					
34					
35					

Total Weight (pooled): 3.67 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, YML

Reviewed by: JG

Date Reviewed: July 6/18

13-19/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: CM-HCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	25.0	/		
	2	24.5	/		
	3	25.0	/		
	4	24.0	/		
	5	24.0	/		
	6	22.0	/		
	7	24.5	/		
	8	25.5	/		
	9	24.0	/		
	10	23.0	/		
	11	25.0	/		
	12	23.5	/		
	13	24.5	/		
	14	23.0	/		
	15	24.0	/		
	16	24.5	/		
	17	24.5	/		
	18	24.0	/		
	19	24.0	/		
	20	25.5	/		
	21	23.5	/		
	22	24.0	/		
	23	24.0	/		
	24	25.0	/		
	25	24.0	/		
	26	21.0	/		
	27	23.5	/		
	28	24.0	/		
	29	20.0		/	yolk sack edema & short tailfin
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.51 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 1/0

Initials: SB, KL, YUC

Reviewed by: JOU

Date Reviewed: July 6/18

1315148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: CM-MCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	21.5	/		
	2	22.5	/		
	3	23.0	/		
	4	21.0	/		
	5	21.0	/		
	6	21.0	/		
	7	22.0	/		
	8	22.0	/		
	9	22.5	/		
	10	21.5	/		
	11	22.5	/		
	12	22.0	/		
	13	23.0	/		
	14	23.0	/		
	15	23.0	/		
	16	21.5	/		
	17	21.5	/		
	18	22.0	/		
	19	23.0	/		
	20	22.5	/		
	21	23.0	/		
	22	22.5	/		
	23	22.0	/		
	24	23.5	/		
	25	22.0	/		
	26	22.5	/		
	27	22.5	/		
	28	21.5	/		
	29	28 23.5	/		
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.72 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, YML

Reviewed by: [Signature]

Date Reviewed: July 6/18

29-16/48

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: CH-MC1
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	22.5	/		
	2	23.0	/		
	3	23.0	/		
	4	23.5	/		
	5	23.0	/		
	6	21.5	/		
	7	22.0	/		
	8	22.5	/		
	9	22.5	/		
	10	22.5	/		
	11	23.0	/		
	12	23.0	/		
	13	23.0	/		
	14	22.5	/		
	15	23.0	/		
	16	JB 23.0 23.5	/		
	17	24.0	/		
	18	22.0	/		
	19	21.5	/		
	20	22.0	/		
	21	23.0	/		
	22	22.0	/		
	23	22.0	/		
	24	21.5	/		
	25	22.0	/		
	26	22.0	/		
	27	22.5	/		
	28	22.0	/		
	29	20.5		/	facial deformity - abnormal jaw
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.05 g
Number of survivors: JB-28 29
Number of deformed/have difficulty swimming: JB-29 1/0
Initials: JB, KL, YL
Reviewed by: JCh

Date Reviewed: July 6/18

19:17/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: FR_FRCPI
Work Order No.: 180712 a, b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	23.5	/		
	2	23.0	/		
	3	23.0	/		
	4	23.5	/		
	5	23.5	/		
	6	23.0	/		
	7	22.5	/		
	8	22.0	/		
	9	22.5	/		
	10	21.5	/		
	11	22.0	/		
	12	22.0	/		
	13	21.5	/		
	14	22.5	/		
	15	22.0	/		
	16	22.0	/		
	17	22.5	/		
	18	21.5	/		
	19	22.0	/		
	20	22.0	/		
	21	22.5	/		
	22	22.0	/		
	23	22.0	/		
	24	23.0	/		
	25	22.0	/		
	26	23.5	/		
	27	24.0	/		
	28	18.0		/	Scoliosis (difficulty swimming)
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.74 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/01

Initials: JB, KL, YLL

Reviewed by: Jou

Date Reviewed: July 6/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: FR-FRCPI
Work Order No.: 180712 a, b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	22.5	/		
	2	24.0	/		
	3	24.5	/		
	4	23.0	/		
	5	23.5	/		
	6	23.0	/		
	7	23.0	/		
	8	23.5	/		
	9	23.0	/		
	10	23.0	/		
	11	23.0	/		
	12	23.5	/		
	13	22.5	/		
	14	23.0	/		
	15	23.5	/		
	16	24.5	/		
	17	22.0	/		
	18	24.5	/		
	19	22.5	/		
	20	24.0	/		
	21	23.0	/		
	22	24.5	/		
	23	22.0	/		
	24	24.0	/		
	25	20.5		/	Yolk sack edema
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.64 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 1/0

Initials: JB, KL, MM

Reviewed by: JGh

Date Reviewed: July 6/18

2219148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: FR-FRCPI
Work Order No.: 100712 a, b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	21.5	/		
	2	22.0	/		
	3	22.5	/		
	4	22.0	/		
	5	21.0	/		
	6	21.0	/		
	7	21.5	/		
	8	22.0	/		
	9	21.5	/		
	10	21.5	/		
	11	20.5	/		
	12	23.0	/		
	13	21.0	/		
	14	21.5	/		
	15	23.0	/		
	16	22.0	/		
	17	20.5	/		
	18	22.5	/		
	19	21.5	/		
	20	21.5	/		
	21	22.5	/		
	22	22.0	/		
	23	22.0	/		
	24	21.0	/		
	25	22.0	/		
	26	21.5	/		
	27	21.5	/		
	28	19.0		/	Kyphosis
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.78 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: SB, KLM

Reviewed by: JGh

Date Reviewed: July 6/18

ps 2/1/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: FR-FRCPI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	23.5	/			
	2	24.0	/			
	3	23.0	/			
	4	JB 23.5 23.5	/			
	5	23.5	/			
	6	22.5	/			
	7	22.5	/			
	8	23.0	/			
	9	JB 22.5 23.0	/			
	10	JB 23.5 23.0	/			
	11	24.0	/			
	12	23.5	/			
	13	24.0	/			
	14	22.5	/			
	15	23.5	/			
	16	23.5	/			
	17	24.0	/			
	18	23.0	/			
	19	23.0	/			
	20	23.0	/			
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.29 g
Number of survivors: 20
Number of deformed/have difficulty swimming: 0/0
Initials: JB, KL, YML
Reviewed by: [Signature]

Date Reviewed: July 6/18

222148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH_FRI
Work Order No.: 180712 A, B

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	25.0	/			
	2	24.0	/			
	3	23.5	/			
	4	24.5	/			
	5	24.5	/			
	6	24.0	/			
	7	25.0	/			
	8	23.5	/			
	9	24.0	/			
	10	24.0	/			
	11	24.0	/			
	12	23.5	/			
	13	23.5	/			
	14	24.0	/			
	15	24.5	/			
	16	25.0	/			
	17	24.5	/			
	18	25.0	/			
	19	24.0	/			
	20	24.0	/			
	21	24.5	/			
	22	23.5	/			
	23	25.0	/			
	24	20.0			/	Yolk sack edema
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 3.42 g

Number of survivors: 24

Number of deformed/have difficulty swimming: 1/0

Initials: JB, KLM

Reviewed by: JCh

Date Reviewed: July 6/18

18-22148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-FR1
Work Order No.: 180712 a b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
180 B	1	22.5	/		
	2	23.5	/		
	3	23.5	/		
	4	22.5	/		
	5	23.0	/		
	6	23.5	/		
	7	24.0	/		
	8	23.5	/		
	9	UB 20 22.5	/		
	10	23.0	/		
	11	24.5	/		
	12	23.5	/		
	13	24.0	/		
	14	24.5	/		
	15	22.5	/		
	16	24.0	/		
	17	23.5	/		
	18	22.5	/		
	19	24.0	/		
	20	24.0	/		
	21	23.5	/		
	22	24.0	/		
	23	23.0	/		
	24	22.5	/		
	25	24.5	/		
	26	23.5	/		
	27	18.5		/	Yolk sack edema
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.03 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 1/0

Initials: SKLMM

Reviewed by: JKW

Date Reviewed: July 6/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-FR1
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.5	/		
	2	22.5	/		
	3	23.0	/		
	4	23.0	/		
	5	22.5	/		
	6	JB 23.0 22.5	/		
	7	22.5	/		
	8	22.0	/		
	9	22.5	/		
	10	23.0	/		
	11	23.5	/		
	12	22.0	/		
	13	22.5	/		
	14	22.5	/		
	15	23.0	/		
	16	23.0	/		
	17	22.5	/		
	18	23.0	/		
	19	22.5	/		
	20	JB 25 22.5	/		
	21	21.5	/		
	22	24.0	/		
	23	24.0	/		
	24	24.0	/		
	25	23.0	/		
	26	23.5	/		
	27	22.5	/		
	28	24.0	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.24 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, VML

Reviewed by: JOU

Date Reviewed: July 6/18

09-24148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-FR1
Work Order No.: 180712 arb

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	24.0	/			
	2	22.5	/			
	3	24.0	/			
	4	22.0	/			
	5	22.0	/			
	6	22.0	/			
	7	23.5	/			
	8	22.0	/			
	9	22.0	/			
	10	23.0	/			
	11	24.0	/			
	12	23.5	/			
	13	22.5	/			
	14	23.0	/			
	15	23.0	/			
	16	22.0	/			
	17	23.5	/			
	18	24.0	/			
	19	22.0	/			
	20	22.5	/			
	21	22.5	/			
	22	22.5	/			
	23	24.0	/			
	24	22.0			/	Abnormal eye
	25	19.0			/	Kyphosis (at difficulty swimming)
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						

Total Weight (pooled): 3.05 g
Number of survivors: 25
Number of deformed/have difficulty swimming: 2/01
Initials: SB, KL, YML
Reviewed by: JGH

Date Reviewed: July 6/18

25198

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-FRC
Work Order No.: 180712 9,6

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	22.0	/		
	2	24.5	/		
	3	23.0	/		
	4	24.0	/		
	5	25.5	/		
	6	23.5	/		
	7	24.5	/		
	8	24.0	/		
	9	JB 23.5 23.5	/		
	10	23.0	/		
	11	23.5	/		
	12	24.0	/		
	13	23.5	/		
	14	22.0	/		
	15	23.5	/		
	16	24.0	/		
	17	22.5	/		
	18	23.5	/		
	19	23.0	/		
	20	23.5	/		
	21	23.0	/		
	22	23.0	/		
	23	23.5	/		
	24	24.0	/		
	25	24.0	/		
	26	23.5	/		
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.13 g
Number of survivors: 26
Number of deformed/have difficulty swimming: 0/0

Initials: SB, KL, MW

Reviewed by: Joh

Date Reviewed: July 6/18

23-26/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: GH-ERC

Termination Date: June 8, 2018

Work Order No.: 180712 a, b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	23.0	/		
	2	23.0	/		
	3	22.5	/		
	4	23.5	/		
	5	22.0	/		
	6	21.5	/		
	7	24.0	/		
	8	25.0	/		
	9	23.5	/		
	10	22.5	/		
	11	22.0	/		
	12	24.0	/		
	13	23.5	/		
	14	23.0	/		
	15	21.0	/		
	16	19.5	/		
	17	23.5	/		
	18	23.5	/		
	19	23.5	/		
	20	20.0	/		
	21	23.0	/		
	22	22.5	/		
	23	22.5	/		
	24	22.0	/		
	25	23.5	/		
	26	23.5	/		
	27	24.0	/		
	28	18.0			/
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 4.28 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 10

Initials: SB, KL, YML

Reviewed by: Jon

Date Reviewed: July 8/18

13-27148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-ERC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 c	1	22.5	/		
	2	22.5	/		
	3	22.5	/		
	4	23.5	/		
	5	25.0	/		
	6	22.0	/		
	7	22.5	/		
	8	23.5	/		
	9	22.5	/		
	10	23.0	/		
	11	22.0	/		
	12	23.0	/		
	13	22.5	/		
	14	22.5	/		
	15	22.5	/		
	16	23.0	/		
	17	23.5	/		
	18	23.0	/		
	19	22.5	/		
	20	22.5	/		
	21	24.0	/		
	22	23.0	/		
	23	23.0	/		
	24	22.0	/		
	25	22.5	/		
	26	22.5	/		
	27	22.0	/		
	28	22.0	/		
	29	23.0	/		
	30	24.0	/		
31					
32					
33					
34					
35					

Total Weight (pooled): 3.12 g

Number of survivors: 30 - 0 JS

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, MML

Reviewed by: Jou

Date Reviewed: July 6/18

03-28-18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: GH-ERC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	22.0	/		
	2	24.0	/		
	3	22.0	/		
	4	22.0	/		
	5	24.0	/		
	6	22.5	/		
	7	22.5	/		
	8	22.5	/		
	9	22.5	/		
	10	22.5	/		
	11	23.0	/		
	12	23.0	/		
	13	24.5	/		
	14	23.5	/		
	15	23.5	/		
	16	JB-22.5 23.0	/		
	17	23.5	/		
	18	20.0	/		
	19	22.5	/		
	20	23.0	/		
	21	23.5	/		
	22	23.0	/		
	23	23.0	/		
	24	24.0	/		
	25	22.5	/		
	26	23.0	/		
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.93 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KLY, MW

Reviewed by: JGh

Date Reviewed: July 6/18

03.29148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: EV-HCI

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	24.5	/		
	2	24.5	/		
	3	23.0	/		
	4	23.5	/		
	5	23.0	/		
	6	24.0	/		
	7	24.5	/		
	8	23.5	/		
	9	24.5	/		
	10	23.0	/		
	11	24.5	/		
	12	25.0	/		
	13	22.5	/		
	14	23.5	/		
	15	23.5	/		
	16	24.0	/		
	17	23.0	/		
	18	24.0	/		
	19	25.0	/		
	20	23.5	/		
	21	23.0	/		
	22	23.5	/		
	23	23.5	/		
	24	24.5	/		
	25	24.0	/		
	26	23.0	/		
	27	23.0	/		
	28	24.0	/		
	29	18.5		/	Two-headed (difficulty swimming)
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.79 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 1/01

Initials: SB, KL, YML

Reviewed by: JBW

Date Reviewed: July 6/18

30
PS 2/1/148
42

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-HCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	25.5	/		
	2	23.5	/		
	3	25.5	/		
	4	25.0	/		
	5	24.0	/		
	6	23.5	/		
	7	25.0	/		
	8	23.5	/		
	9	25.0	/		
	10	24.5	/		
	11	26.0	/		
	12	23.5	/		
	13	25.0	/		
	14	24.5	/		
	15	24.5	/		
	16	24.5	/		
	17	24.0	/		
	18	24.0	/		
	19	25.0	/		
	20	24.0	/		
	21	25.0	/		
	22	24.5	/		
	23	25.0	/		
	24	24.5	/		
	25	23.5	/		
	26	23.5		/	Yolk sack edema
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 4.22 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 1/0

Initials: SB, KL, YML

Reviewed by: Jan

Date Reviewed: July 6/18

31
23/20/48
40

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EY-HCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.5	/		
	2	22.0	/		
	3	23.0	/		
	4	22.5	/		
	5	22.0	/		
	6	22.0	/		
	7	22.5	/		
	8	22.0	/		
	9	23.0	/		
	10	22.5	/		
	11	22.0	/		
	12	22.0	/		
	13	22.5	/		
	14	21.0	/		
	15	21.0	/		
	16	21.5	/		
	17	23.0	/		
	18	22.0	/		
	19	22.5	/		
	20	23.0	/		
	21	20.0	/		
	22	22.5	/		
	23	21.5	/		
	24	21.5	/		
	25	21.5	/		
	26	23.0	/		
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.85 g
Number of survivors: 26
Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, VM
Reviewed by: JGU

Date Reviewed: July 6/18

23/4/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-HCI
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	24.5	/			
	2	23.0	/			
	3	24.0	/			
	4	23.0	/			
	5	22.5	/			
	6	22.0	/			
	7	22.5	/			
	8	24.5	/			
	9	22.5	/			
	10	23.5	/			
	11	23.5	/			
	12	24.0	/			
	13	23.5	/			
	14	23.0	/			
	15	23.5	/			
	16	23.0	/			
	17	23.5	/			
	18	24.5	/			
	19	24.0	/			
	20	22.5	/			
	21	22.5	/			
	22	23.0	/			
	23	23.5	/			
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.63 g

Number of survivors: 23

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KL, MM

Reviewed by: Jon

Date Reviewed: July 6/18

23-3/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: EY-MC2

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	23.5	/		
	2	23.5	/		
	3	23.0	/		
	4	23.5	/		
	5	23.0	/		
	6	24.0	/		
	7	23.0	/		
	8	22.5	/		
	9	23.5	/		
	10	22.0	/		
	11	22.5	/		
	12	24.0	/		
	13	23.5	/		
	14	24.0	/		
	15	23.0	/		
	16	23.5	/		
	17	24.5	/		
	18	22.0	/		
	19	23.0	/		
	20	22.5	/		
	21	23.5	/		
	22	22.0	/		
	23	24.0	/		
	24	24.0	/		
	25	24.5	/		
	26	23.5	/		
	27	23.0	/		
	28	23.0	/		
	29	23.0	/		
	30	23.5	/		
31					
32					
33					
34					
35					

Total Weight (pooled): 3.88 g

Number of survivors: 30

Number of deformed/have difficulty swimming: 0/0

Initials: SBK/ML

Reviewed by: JKH

Date Reviewed: July 6/18

34
19-33148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-MC2
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	22.5	/		
	2	23.5	/		
	3	24.5	/		
	4	25.0	/		
	5	25.0	/		
	6	25.5	/		
	7	23.5	/		
	8	23.5	/		
	9	24.5	/		
	10	21.0	/		
	11	25.0	/		
	12	27.5	/		
	13	24.5	/		
	14	24.0	/		
	15	25.0	/		
	16	25.0	/		
	17	24.5	/		
	18	23.5	/		
	19	24.0	/		
	20	24.0	/		
	21	23.5	/		
	22	23.0	/		
	23	25.0	/		
	24	23.0	/		
	25	24.0	/		
	26	24.0	/		
	27	24.5	/		
	28	20.0		/	Yolk sack edema & jaw abnormality
	29	22.0		/	Shortened tail
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.68 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 2/0

Initials: SBK/ML

Reviewed by: JOH

Date Reviewed: July 6/18

35
05/31/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-MC2
Work Order No.: 180912 a,b
7
mu

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	23.0	/		
	2	22.5	/		
	3	22.5	/		
	4	22.0	/		
	5	23.0	/		
	6	20.5	/		
	7	22.0	/		
	8	22.0	/		
	9	22.5	/		
	10	22.5	/		
	11	23.0	/		
	12	23.5	/		
	13	22.5	/		
	14	22.5	/		
	15	22.0	/		
	16	22.0	/		
	17	22.5	/		
	18	22.5	/		
	19	21.5	/		
	20	22.5	/		
	21	22.0	/		
	22	23.0	/		
	23	22.0	/		
	24	22.5	/		
	25	22.0	/		
	26	23.5	/		
	27	22.0	/		
	28	22.5	/		
	29	22.0	/		
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.04 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KLYM

Reviewed by: JOU

Date Reviewed: July 6/18

B-36148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-MC2
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	22.5	/		
	2	23.0	/		
	3	22.0	/		
	4	22.5	/		
	5	23.0	/		
	6	23.0	/		
	7	23.5	/		
	8	23.5	/		
	9	24.0	/		
	10	23.5	/		
	11	23.0	/		
	12	23.0	/		
	13	23.5	/		
	14	24.0	/		
	15	23.5	/		
	16	23.0	/		
	17	23.5	/		
	18	22.5	/		
	19	21.0	/		
	20	23.0	/		
	21	23.5	/		
	22	22.0	/		
	23	22.0	/		
	24	22.5	/		
	25	23.0	/		
	26	23.0	/		
	27	23.5	/		
	28	22.5	/		
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.15 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KL, MW

Reviewed by: JBN

Date Reviewed: July 6/18

13.37148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: CM-MC2

Termination Date: June 8, 2018

Work Order No.: 180712 a, b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	25.0	/		
	2	24.0	/		
	3	23.5	/		
	4	23.0	/		
	5	25.0	/		
	6	23.0	/		
	7	24.0	/		
	8	24.0	/		
	9	23.5	/		
	10	22.0	/		
	11	22.5	/		
	12	23.5	/		
	13	23.5	/		
	14	23.0	/		
	15	23.5	/		
	16	24.0	/		
	17	23.5	/		
	18	24.0	/		
	19	23.5	/		
	20	23.0	/		
	21	24.0	/		
	22	23.5	/		
	23	23.0	/		
	24	23.0	/		
	25	23.0	/		
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.26 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KL, YML

Reviewed by: JGn

Date Reviewed: July 6/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: CM-MC2
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	24.5	/		
	2	23.0	/		
	3	24.0	/		
	4	23.0	/		
	5	24.0	/		
	6	25.0	/		
	7	24.0	/		
	8	24.0	/		
	9	24.5	/		
	10	23.5	/		
	11	24.0	/		
	12	22.5	/		
	13	24.5	/		
	14	24.0	/		
	15	24.0	/		
	16	24.5	/		
	17	22.5	/		
	18	24.0 ^{0.1}	/		
	19	24.5	/		
	20	24.5	/		
	21	24.5	/		
	22	23.0	/		
	23	24.0 ^{0.5}	/		
	24	24.0 ^{0.1}	/		
	25	24.5	/		
	26	20.0		/	Yolk sack edema
	27	18.5		/	Yolk sack edema
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.55 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 2/0

Initials: SB, KLM

Reviewed by: JGU

Date Reviewed: July 6/18

1339148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: CM-MC2

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.5	/		
	2	23.5	/		
	3	23.0	/		
	4	23.0	/		
	5	22.5	/		
	6	23.0	/		
	7	23.5	/		
	8	23.0	/		
	9	22.5	/		
	10	22.5	/		
	11	22.0	/		
	12	23.5	/		
	13	23.0	/		
	14	23.0	/		
	15	22.5	/		
	16	22.5	/		
	17	23.0	/		
	18	22.5	/		
	19	22.5	/		
	20	22.5	/		
	21	23.0	/		
	22	23.0	/		
	23	24.0	/		
	24	22.0	/		
	25	22.5	/		
	26	22.0	/		
	27	23.5	/		
	28	22.0		/	Abnormal growth on neck
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.92 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: JB, KLM

Reviewed by: JOU

Date Reviewed: July 6/18

P340148

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: CM-MC2

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	18.23.0 23.5	/		
	2	18.22.0 22.5	/		
	3	22.5	/		
	4	24.0	/		
	5	24.0	/		
	6	23.0	/		
	7	23.5	/		
	8	23.0	/		
	9	23.5	/		
	10	23.5	/		
	11	22.0	/		
	12	24.0	/		
	13	22.5	/		
	14	22.0	/		
	15	23.0	/		
	16	24.0	/		
	17	23.0	/		
	18	23.0	/		
	19	24.0	/		
	20	23.0	/		
	21	24.0	/		
	22	24.0	/		
	23	23.5	/		
	24	21.0		/	Scoliosis (difficultly swimming)
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.75 g

Number of survivors: 23-18 24

Number of deformed/have difficulty swimming: 0-18 1/01

Initials: SB/KL/MC

Reviewed by: JGU

Date Reviewed: July 6/18

134148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC_SLC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	24.5	/			
	2	23.5	/			
	3	24.0	/			
	4	23.0	/			
	5	25.0	/			
	6	24.0	/			
	7	23.0	/			
	8	23.5	/			
	9	23.5	/			
	10	24.0	/			
	11	23.5	/			
	12	23 23.0	/			
	13	23.0	/			
	14	23.5	/			
	15	24.0	/			
	16	23.0	/			
	17	23.5	/			
	18	23.0	/			
	19	22.0	/			
	20	23.5	/			
	21	23.0	/			
	22	23.5	/			
	23	24.5	/			
	24	23.0	/			
	25	23.0	/			
	26	23.0	/			
	27	23.5	/			
	28	22.0	/			
	29	23.0	/			
	30	23.0	/			
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 3.81 g

Number of survivors: 30

Number of deformed/have difficulty swimming: 0/0

Initials: JB, KL, ML

Reviewed by: Joh

Date Reviewed: July 6/18

03/02/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-SLC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	24.5	/		
	2	23.5	/		
	3	23.0	/		
	4	24.0	/		
	5	22.5	/		
	6	23.5	/		
	7	23.5	/		
	8	23.0	/		
	9	24.0	/		
	10	23.0	/		
	11	24.5	/		
	12	23.0	/		
	13	24.5	/		
	14	23.0	/		
	15	JB 24.5 24.0	/		
	16	JB 24.0 24.5	/		
	17	JB 24.5 22.5	/		
	18	JB 22.5 22.0	/		
	19	JB 22.5 22.5	/		
	20	22.5	/		
	21	23.5	/		
	22	23.5	/		
	23	24.5	/		
	24	24.5	/		
	25	24.5	/		
	26	23.5	/		
	27	22.5	/		
	28	20.5		/	Yolk sack edema & shortened tail
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 4.33 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: SB, Kym

Reviewed by: Jon

Date Reviewed: July 6/18

10343/40

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LCSLC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.0	/		
	2	22.5	/		
	3	22.5	/		
	4	22.5	/		
	5	23.0	/		
	6	23.0	/		
	7	23.0	/		
	8	23.0	/		
	9	23.0	/		
	10	22.5	/		
	11	22.0	/		
	12	23.0	/		
	13	22.0	/		
	14	23.0	/		
	15	23.5	/		
	16	23.0	/		
	17	21.0	/		
	18	22.5	/		
	19	22.5	/		
	20	21.5	/		
	21	22.5	/		
	22	22.5	/		
	23	21.0	/		
	24	22.5	/		
	25	22.5	/		
	26	24.0	/		
	27	22.0	/		
	28	23.5	/		
	29	22.0	/		
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.96 g
Number of survivors: 29
Number of deformed/have difficulty swimming: 0/0

Initials: SB, Dym

Reviewed by: JCh

Date Reviewed: July 6/18

1344/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: LC_SLC

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	22.0	/		
	2	23.0	/		
	3	22.5	/		
	4	24.0	/		
	5	23.0	/		
	6	22.5	/		
	7	23.5	/		
	8	22.0	/		
	9	24.0	/		
	10	23.5	/		
	11	22.5 23.0	/		
	12	23.0	/		
	13	23.5	/		
	14	23.0	/		
	15	22.0	/		
	16	23.0	/		
	17	22.0	/		
	18	22.0	/		
	19	22.5	/		
	20	22.5	/		
	21	22.0	/		
	22	23.0	/		
	23	23.0	/		
	24	24.0	/		
	25	23.5	/		
	26	22.5		/	Yolk sack edema
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.94 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 1/0

Initials: SB, K/ML

Reviewed by: Jon

Date Reviewed: July 6/18

P3-45/46

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: LC_LCDSS LCC

Termination Date: June 8, 2018

Work Order No.: 180712 a, b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.5	/		
	2	23.0	/		
	3	21.0	/		
	4	22.5	/		
	5	21.0	/		
	6	21.5	/		
	7	23.0	/		
	8	22.0	/		
	9	22.5	/		
	10	22.0	/		
	11	22.0	/		
	12	22.0	/		
	13	20.0	/		
	14	21.5	/		
	15	21.5	/		
	16	UB 22.2 22.5	/		
	17	21.5	/		
	18	22.5	/		
	19	22.0	/		
	20	21.5	/		
	21	22.0	/		
	22	22.0	/		
	23	22.5	/		
	24	23.0	/		
	25	21.5	/		
	26	23.0	/		
	27	22.5	/		
	28	22.5	/		
	29	20.0		/	Kyphosis, difficulty swimming
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.39 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 1/01

Initials: SB, KLM

Reviewed by: [Signature]

Date Reviewed: July 6/18

10346/18

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC_LCDSSLCC
Work Order No.: 180712_{a,b}

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	25.0	/		
	2	24.0	/		
	3	25.0	/		
	4	24.0	/		
	5	22.0	/		
	6	24.5	/		
	7	23.5	/		
	8	23.0	/		
	9	24.0	/		
	10	24.0	/		
	11	24.0	/		
	12	JB 24.5 25.5	/		
	13	24.5	/		
	14	24.6	/		
	15	24.0	/		
	16	24.5	/		
	17	25.5	/		
	18	25.5	/		
	19	24.0	/		
	20	24.0	/		
	21	24.0	/		
	22	24.0	/		
	23	24.0	/		
	24	20.0	/		
	25	23.0	/		
	26	23.5	/		
	27	24.5	/		
	28	20.0	JB /	/	yolk sack edema & shortened tail
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 4.22 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 1/0

Initials: JB, KLNUL

Reviewed by: JGh

Date Reviewed: July 6/18

10347148

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC - LCDSS LCC
Work Order No.: 180712 a,b

Start Date: May 9, 2018
Termination Date: June 8, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	23.0	/		
	2	21.5	/		
	3	21.0	/		
	4	21.0	/		
	5	21.5	/		
	6	22.0	/		
	7	21.0	/		
	8	21.0	/		
	9	22.0	/		
	10	20.5	/		
	11	21.0	/		
	12	22.5	/		
	13	21.0	/		
	14	22.0	/		
	15	21.0	/		
	16	22.0	/		
	17	21.5	/		
	18	22.5	/		
	19	21.5	/		
	20	21.0	/		
	21	20.5	/		
	22	23.5	/		
	23	22.0	/		
	24	21.0	/		
	25	21.5	/		
	26	22.0	/		
	27	22.0	/		
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.95 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 0/0

Initials: SB, KL, YML

Reviewed by: JGK

Date Reviewed: July 6/18

PS 4/21/48

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: May 9, 2018

Sample ID: LC_LCDSSLCC

Termination Date: June 8, 2018

Work Order No.: 180712 a,b

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	23.5	/		
	2	22.5	/		
	3	22.5	/		
	4	23.0	/		
	5	23.0	/		
	6	24.0	/		
	7	24.5	/		
	8	23.5	/		
	9	23.5	/		
	10	23.0	/		
	11	23.5	/		
	12	23.5	/		
	13	23.0	/		
	14	24.0	/		
	15	23.0	/		
	16	23.0	/		
	17	23.0	/		
	18	22.5	/		
	19	23.5	/		
	20	23.0	/		
	21	JB 23.0 23.0	/		
	22	23.5	/		
	23	23.5	/		
	24	23.5	/		
	25	24.0	/		
	26	25.0	/		
	27	24.5	/		
	28	23.0	/		
	29	22.5		/	yolk sack edema
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.60 g

Number of survivors: 29.

Number of deformed/have difficulty swimming: 1/0

Initials: JB, KLM

Reviewed by: JGM

Date Reviewed: July 6/18

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 1 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Batch ID: 02-9358-8644 Test Type: Survival-Development Analyst: Jill Sones
 Start Date: 09 May-18 18:45 Protocol: EC/EPS 1/RM/28 Diluent: Dechlorinated Tap Water
 Ending Date: 08 Jun-18 09:30 Species: Oncorhynchus mykiss Brine:
 Test Length: 29d 15h Taxon: Actinopterygii Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
① LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1	① FR_UFR1, GH_ER2, CM_MC1 + LC_SLC one reference sites
① GH_ER2	Water Sample	Teck Coal	GH_ER2	
① CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
① LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 2 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.2356	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5534	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	LC_SLC passed proportion normal	1

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 3 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.5308	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.9719	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	LC_SLC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	0.3318	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
09-7576-9705	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 4 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2703	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.8309	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 5 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9895	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	LC_LCDSSLCC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	EV_HC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.5642	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed survival rate	1

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 6 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
14-4585-0393	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1

Proportion Normal Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	4	0.8870	0.7082	1.0000	0.7812	1.0000	0.0562	0.1124	12.67%	0.00%
FR_UFR1		4	0.8752	0.7231	1.0000	0.7333	0.9333	0.0478	0.0956	10.92%	1.32%
GH_ER2		4	0.8917	0.8409	0.9424	0.8667	0.9333	0.0160	0.0319	3.58%	-0.53%
CM_MC1		4	0.9500	0.9194	0.9806	0.9333	0.9667	0.0096	0.0193	2.03%	-7.11%
FR_FRCP1		4	0.8236	0.6485	0.9986	0.6667	0.9000	0.0550	0.1100	13.36%	7.15%
GH_FR1		4	0.8466	0.7392	0.9539	0.7931	0.9333	0.0337	0.0675	7.97%	4.56%
GH_ERC		4	0.9013	0.7894	1.0000	0.8387	1.0000	0.0352	0.0704	7.81%	-1.62%
EV_HC1		4	0.8500	0.7396	0.9604	0.7667	0.9333	0.0347	0.0694	8.16%	4.17%
EV_MC2		4	0.9664	0.8914	1.0000	0.9000	1.0000	0.0236	0.0471	4.88%	-8.95%
CM_MC2		4	0.8343	0.7271	0.9415	0.7419	0.9000	0.0337	0.0674	8.08%	5.94%
LC_SLC	XC	4	0.9169	0.8149	1.0000	0.8333	0.9677	0.0321	0.0641	6.99%	-3.38%
LC_LCDSSLCC		4	0.9167	0.8860	0.9473	0.9000	0.9333	0.0096	0.0193	2.10%	-3.35%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	4	0.9271	0.8213	1.0000	0.8667	1.0000	0.0332	0.0665	7.17%	0.00%
FR_UFR1		4	0.8922	0.7530	1.0000	0.7667	0.9655	0.0437	0.0875	9.80%	3.76%
GH_ER2		4	0.9000	0.8388	0.9612	0.8667	0.9333	0.0193	0.0385	4.28%	2.92%
CM_MC1		4	0.9667	0.9667	0.9667	0.9667	0.9667	0.0000	0.0000	0.00%	-4.27%
FR_FRCP1		4	0.8489	0.6483	1.0000	0.6667	0.9333	0.0630	0.1260	14.85%	8.44%
GH_FR1		4	0.8807	0.8078	0.9537	0.8276	0.9333	0.0229	0.0459	5.21%	5.00%
GH_ERC		4	0.9097	0.7949	1.0000	0.8387	1.0000	0.0361	0.0721	7.93%	1.88%
EV_HC1		4	0.8667	0.7367	0.9966	0.7667	0.9667	0.0408	0.0817	9.42%	6.52%
EV_MC2		4	0.9830	0.9519	1.0000	0.9655	1.0000	0.0098	0.0196	1.99%	-6.04%
CM_MC2		4	0.8680	0.7439	0.9921	0.7742	0.9333	0.0390	0.0780	8.98%	6.38%
LC_SLC	XC	4	0.9336	0.8582	1.0000	0.8667	0.9677	0.0237	0.0474	5.08%	-0.70%
LC_LCDSSLCC		4	0.9417	0.8909	0.9924	0.9000	0.9667	0.0160	0.0319	3.39%	-1.57%

① FR_UFR1, GH_ER2, CM_MC1 + LC_SLC
 are reference sites

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 7 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	0.9667	1.0000	0.8000	0.7812
FR_UFR1		0.9333	0.9032	0.9310	0.7333
GH_ER2		0.9333	0.9000	0.8667	0.8667
CM_MC1		0.9667	0.9333	0.9667	0.9333
FR_FRCP1		0.9000	0.8276	0.9000	0.6667
GH_FR1		0.7931	0.8667	0.9333	0.7931
GH_ERC		0.8387	0.9000	1.0000	0.8667
EV_HC1		0.9333	0.8333	0.8667	0.7667
EV_MC2		1.0000	0.9000	1.0000	0.9655
CM_MC2		0.8333	0.8621	0.9000	0.7419
LC_SLC	XC	0.9677	0.9000	0.9667	0.8333
LC_LCDSSLCC		0.9333	0.9000	0.9000	0.9333

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	0.9667	1.0000	0.8667	0.8750
FR_UFR1		0.9333	0.9032	0.9655	0.7667
GH_ER2		0.9333	0.9333	0.8667	0.8667
CM_MC1		0.9667	0.9667	0.9667	0.9667
FR_FRCP1		0.9333	0.8621	0.9333	0.6667
GH_FR1		0.8276	0.9000	0.9333	0.8621
GH_ERC		0.8387	0.9333	1.0000	0.8667
EV_HC1		0.9667	0.8667	0.8667	0.7667
EV_MC2		1.0000	0.9667	1.0000	0.9655
CM_MC2		0.8333	0.9310	0.9333	0.7742
LC_SLC	XC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC		0.9667	0.9333	0.9000	0.9667

CETIS Summary Report

Report Date: 10 Oct-18 13:45 (p 8 of 8)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	29/30	29/29	24/30	25/32
FR_UFR1		28/30	28/31	27/29	22/30
GH_ER2		28/30	27/30	26/30	26/30
CM_MC1		29/30	28/30	29/30	28/30
FR_FRCP1		27/30	24/29	27/30	20/30
GH_FR1		23/29	26/30	28/30	23/29
GH_ERC		26/31	27/30	30/30	26/30
EV_HC1		28/30	25/30	26/30	23/30
EV_MC2		30/30	27/30	29/29	28/29
CM_MC2		25/30	25/29	27/30	23/31
LC_SLC	XC	30/31	27/30	29/30	25/30
LC_LCDSSLCC		28/30	27/30	27/30	28/30

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	29/30	29/29	26/30	28/32
FR_UFR1		28/30	28/31	28/29	23/30
GH_ER2		28/30	28/30	26/30	26/30
CM_MC1		29/30	29/30	29/30	29/30
FR_FRCP1		28/30	25/29	28/30	20/30
GH_FR1		24/29	27/30	28/30	25/29
GH_ERC		26/31	28/30	30/30	26/30
EV_HC1		29/30	26/30	26/30	23/30
EV_MC2		30/30	29/30	29/29	28/29
CM_MC2		25/30	27/29	28/30	24/31
LC_SLC	XC	30/31	28/30	29/30	26/30
LC_LCDSSLCC		29/30	28/30	27/30	29/30

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 16-3182-0822	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:28	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-5424-1506	09 May-18	09 May-18	19h	Teck Coal	
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)		
② GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
③ CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Lab Control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
② GH_ER2	Water Sample	Teck Coal	GH_ER2		
③ CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Control	① FR_UFR1	0.245	1.0000	Exact	Non-Significant Effect
Control	② GH_ER2	0.3172	1.0000	Exact	Non-Significant Effect
Control	③ CM_MC1	1	1.0000	Exact	Non-Significant Effect
Control	FR_FRCP1	0.04581	0.5039	Exact	Non-Significant Effect
Control	GH_FR1	0.1735	1.0000	Exact	Non-Significant Effect
Control	GH_ERC	0.408	1.0000	Exact	Non-Significant Effect
Control	EV_HC1	0.09828	0.9828	Exact	Non-Significant Effect
Control	EV_MC2	1	1.0000	Exact	Non-Significant Effect
Control	CM_MC2	0.09828	0.9828	Exact	Non-Significant Effect
Control	LC_SLC	1	1.0000	Exact	Non-Significant Effect
Control	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 & CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 16-3182-0822 Endpoint: Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:28 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	112	9	121	0.9256	0.07438	0.0%
FR_UFR1	107	13	120	0.8917	0.1083	3.67%
GH_ER2	108	12	120	0.9	0.1	2.77%
CM_MC1	116	4	120	0.9667	0.03333	-4.44%
FR_FRCP1	101	18	119	0.8487	0.1513	8.31%
GH_FR1	104	14	118	0.8814	0.1186	4.78%
GH_ERC	110	11	121	0.9091	0.09091	1.79%
EV_HC1	104	16	120	0.8667	0.1333	6.37%
EV_MC2	116	2	118	0.9831	0.01695	-6.21%
CM_MC2	104	16	120	0.8667	0.1333	6.37%
LC_SLC	113	8	121	0.9339	0.06612	-0.89%
LC_LCDSSLCC	113	7	120	0.9417	0.05833	-1.73%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.9667	1	0.8667	0.875
FR_UFR1	0.9333	0.9032	0.9655	0.7667
GH_ER2	0.9333	0.9333	0.8667	0.8667
CM_MC1	0.9667	0.9667	0.9667	0.9667
FR_FRCP1	0.9333	0.8621	0.9333	0.6667
GH_FR1	0.8276	0.9	0.9333	0.8621
GH_ERC	0.8387	0.9333	1	0.8667
EV_HC1	0.9667	0.8667	0.8667	0.7667
EV_MC2	1	0.9667	1	0.9655
CM_MC2	0.8333	0.931	0.9333	0.7742
LC_SLC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC	0.9667	0.9333	0.9	0.9667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	29/30	29/29	26/30	28/32
FR_UFR1	28/30	28/31	28/29	23/30
GH_ER2	28/30	28/30	26/30	26/30
CM_MC1	29/30	29/30	29/30	29/30
FR_FRCP1	28/30	25/29	28/30	20/30
GH_FR1	24/29	27/30	28/30	25/29
GH_ERC	26/31	28/30	30/30	26/30
EV_HC1	29/30	26/30	26/30	23/30
EV_MC2	30/30	29/30	29/29	28/29
CM_MC2	25/30	27/29	28/30	24/31
LC_SLC	30/31	28/30	29/30	26/30
LC_LCDSSLCC	29/30	28/30	27/30	29/30

FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-4491-6447	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:29	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① FR_UFR1	①	GH_ER2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1	①	CM_MC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.2135	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.4814	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ERC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	0.3463	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.3463	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_SLC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-4491-6447 Endpoint: Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:29 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1 Upstream Contr	107	13	120	0.8917	0.1083	0.0%
① GH_ER2	108	12	120	0.9	0.1	-0.93%
① CM_MC1	116	4	120	0.9667	0.03333	-8.41%
FR_FRCP1	101	18	119	0.8487	0.1513	4.81%
GH_FR1	104	14	118	0.8814	0.1186	1.16%
GH_ERC	110	11	121	0.9091	0.09091	-1.95%
EV_HC1	104	16	120	0.8667	0.1333	2.8%
EV_MC2	116	2	118	0.9831	0.01695	-10.25%
CM_MC2	104	16	120	0.8667	0.1333	2.8%
LC_SLC	113	8	121	0.9339	0.06612	-4.74%
LC_LCDSSLCC	113	7	120	0.9417	0.05833	-5.61%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	0.9333	0.9032	0.9655	0.7667
① GH_ER2	0.9333	0.9333	0.8667	0.8667
① CM_MC1	0.9667	0.9667	0.9667	0.9667
FR_FRCP1	0.9333	0.8621	0.9333	0.6667
GH_FR1	0.8276	0.9	0.9333	0.8621
GH_ERC	0.8387	0.9333	1	0.8667
EV_HC1	0.9667	0.8667	0.8667	0.7667
EV_MC2	1	0.9667	1	0.9655
CM_MC2	0.8333	0.931	0.9333	0.7742
LC_SLC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC	0.9667	0.9333	0.9	0.9667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	28/30	28/31	28/29	23/30
① GH_ER2	28/30	28/30	26/30	26/30
① CM_MC1	29/30	29/30	29/30	29/30
FR_FRCP1	28/30	25/29	28/30	20/30
GH_FR1	24/29	27/30	28/30	25/29
GH_ERC	26/31	28/30	30/30	26/30
EV_HC1	29/30	26/30	26/30	23/30
EV_MC2	30/30	29/30	29/29	28/29
CM_MC2	25/30	27/29	28/30	24/31
LC_SLC	30/31	28/30	29/30	26/30
LC_LCDSSLCC	29/30	28/30	27/30	29/30

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

Salmonid Embryo-Alevin Survival and Development Test

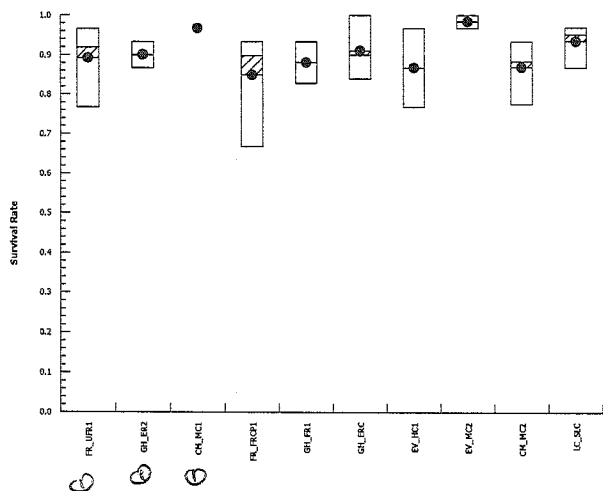
Nautilus Environmental

Analysis ID: 00-4491-6447
Analyzed: 08 Jul-18 9:29

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFR1, GH_ER2 + CM_MCI
are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-1324-3591	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:30	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① GH_ER2	①	FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2	①	CM_MC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.1585	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	0.4001	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_ERC	1	1.0000	Exact	Non-Significant Effect
GH_ER2		EV_HC1	0.2735	1.0000	Exact	Non-Significant Effect
GH_ER2		EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.2735	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_SLC	1	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-1324-3591 Endpoint: Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:30 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	107	13	120	0.8917	0.1083	0.93%
GH_ER2 Receiving Water	108	12	120	0.9	0.1	0.0%
CM_MC1	116	4	120	0.9667	0.03333	-7.41%
FR_FRCP1	101	18	119	0.8487	0.1513	5.7%
GH_FR1	104	14	118	0.8814	0.1186	2.07%
GH_ERC	110	11	121	0.9091	0.09091	-1.01%
EV_HC1	104	16	120	0.8667	0.1333	3.7%
EV_MC2	116	2	118	0.9831	0.01695	-9.23%
CM_MC2	104	16	120	0.8667	0.1333	3.7%
LC_SLC	113	8	121	0.9339	0.06612	-3.77%
LC_LCDSSLCC	113	7	120	0.9417	0.05833	-4.63%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.9032	0.9655	0.7667
GH_ER2	0.9333	0.9333	0.8667	0.8667
CM_MC1	0.9667	0.9667	0.9667	0.9667
FR_FRCP1	0.9333	0.8621	0.9333	0.6667
GH_FR1	0.8276	0.9	0.9333	0.8621
GH_ERC	0.8387	0.9333	1	0.8667
EV_HC1	0.9667	0.8667	0.8667	0.7667
EV_MC2	1	0.9667	1	0.9655
CM_MC2	0.8333	0.931	0.9333	0.7742
LC_SLC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC	0.9667	0.9333	0.9	0.9667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/30	28/31	28/29	23/30
GH_ER2	28/30	28/30	26/30	26/30
CM_MC1	29/30	29/30	29/30	29/30
FR_FRCP1	28/30	25/29	28/30	20/30
GH_FR1	24/29	27/30	28/30	25/29
GH_ERC	26/31	28/30	30/30	26/30
EV_HC1	29/30	26/30	26/30	23/30
EV_MC2	30/30	29/30	29/29	28/29
CM_MC2	25/30	27/29	28/30	24/31
LC_SLC	30/31	28/30	29/30	26/30
LC_LCDSSLCC	29/30	28/30	27/30	29/30

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

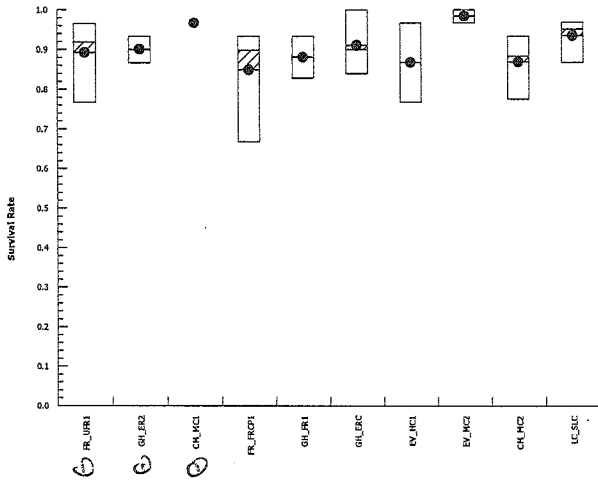
Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-1324-3591 Endpoint: Survival Rate
Analyzed: 08 Jul-18 9:30 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_VFR1, GH_ER2 + CH_MCI
are reference sites.

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-1642-2976	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:26	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① CM_MC1	① FR_UFR1	0.02065	0.1239	Exact	Non-Significant Effect
CM_MC1	① GH_ER2	0.03356	0.1678	Exact	Non-Significant Effect
CM_MC1	FR_FRCP1	0.00132	0.0132	Exact	Significant Effect
CM_MC1	GH_FR1	0.01131	0.0792	Exact	Non-Significant Effect
CM_MC1	GH_ERC	0.05532	0.2213	Exact	Non-Significant Effect
CM_MC1	EV_HC1	0.004328	0.0389	Exact	Significant Effect
CM_MC1	EV_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1	CM_MC2	0.004328	0.0389	Exact	Significant Effect
CM_MC1	LC_SLC	0.1917	0.5751	Exact	Non-Significant Effect
CM_MC1	LC_LCDSSLCC	0.2696	0.5391	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
are reference sites.

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-1642-2976 Endpoint: Survival Rate CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:26 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	107	13	120	0.8917	0.1083	7.76%
GH_ER2	108	12	120	0.9	0.1	6.9%
CM_MC1 Site Control	116	4	120	0.9667	0.03333	0.0%
FR_FRCP1	101	18	119	0.8487	0.1513	12.2%
GH_FR1	104	14	118	0.8814	0.1186	8.83%
GH_ERC	110	11	121	0.9091	0.09091	5.96%
EV_HC1	104	16	120	0.8667	0.1333	10.34%
EV_MC2	116	2	118	0.9831	0.01695	-1.7%
CM_MC2	104	16	120	0.8667	0.1333	10.34%
LC_SLC	113	8	121	0.9339	0.06612	3.39%
LC_LCDSSLCC	113	7	120	0.9417	0.05833	2.59%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.9032	0.9655	0.7667
GH_ER2	0.9333	0.9333	0.8667	0.8667
CM_MC1	0.9667	0.9667	0.9667	0.9667
FR_FRCP1	0.9333	0.8621	0.9333	0.6667
GH_FR1	0.8276	0.9	0.9333	0.8621
GH_ERC	0.8387	0.9333	1	0.8667
EV_HC1	0.9667	0.8667	0.8667	0.7667
EV_MC2	1	0.9667	1	0.9655
CM_MC2	0.8333	0.931	0.9333	0.7742
LC_SLC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC	0.9667	0.9333	0.9	0.9667

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/30	28/31	28/29	23/30
GH_ER2	28/30	28/30	26/30	26/30
CM_MC1	29/30	29/30	29/30	29/30
FR_FRCP1	28/30	25/29	28/30	20/30
GH_FR1	24/29	27/30	28/30	25/29
GH_ERC	26/31	28/30	30/30	26/30
EV_HC1	29/30	26/30	26/30	23/30
EV_MC2	30/30	29/30	29/29	28/29
CM_MC2	25/30	27/29	28/30	24/31
LC_SLC	30/31	28/30	29/30	26/30
LC_LCDSSLCC	29/30	28/30	27/30	29/30

FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

Salmonid Embryo-Alevin Survival and Development Test

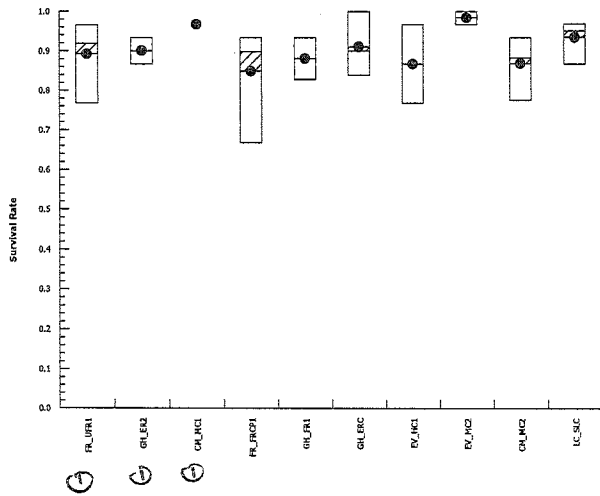
Nautilus Environmental

Analysis ID: 11-1642-2976
Analyzed: 08 Jul-18 9:26

Endpoint: Survival Rate
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR-VFRI, GH-ER2 + CMLMCI
are reference sites

CETIS Analytical Report

Report Date: 10 Oct-18 12:54 (p 4 of 6)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-4585-0393 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 12:54 Analysis: STP 2xK Contingency Tables Status Level: 1

Batch ID: 02-9358-8644 Test Type: Survival-Development Analyst: Jill Sones
 Start Date: 09 May-18 18:45 Protocol: EC/EPS 1/RM/28 Diluent: Dechlorinated Tap Water
 Ending Date: 08 Jun-18 09:30 Species: Oncorhynchus mykiss Brine:
 Test Length: 29d 15h Taxon: Actinopterygii Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	0.1754	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.2362	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.9301	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.0270	Exact	0.2703	Non-Significant Effect
		GH_FR1	0.1187	Exact	0.8309	Non-Significant Effect
		GH_ERC	0.3169	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0627	Exact	0.5642	Non-Significant Effect
		EV_MC2	0.9895	Exact	0.9895	Non-Significant Effect
		CM_MC2	0.0627	Exact	0.5642	Non-Significant Effect
		LC_LCDSSLCC	0.6965	Exact	1.0000	Non-Significant Effect

① LC_SLC = site control

JK
 Oct 11/18

CETIS Analytical Report

Report Date: 10 Oct-18 12:54 (p 5 of 6)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-4585-0393 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 12:54 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		107	13	120	0.8917	0.1083	0.93%
GH_ER2		108	12	120	0.9	0.1	0.0%
CM_MC1		116	4	120	0.9667	0.03333	-7.41%
FR_FRCP1		101	18	119	0.8487	0.1513	5.7%
GH_FR1		104	14	118	0.8814	0.1186	2.07%
GH_ERC		110	11	121	0.9091	0.09091	-1.01%
EV_HC1		104	16	120	0.8667	0.1333	3.7%
EV_MC2		116	2	118	0.9831	0.01695	-9.23%
CM_MC2		104	16	120	0.8667	0.1333	3.7%
LC_SLC	XC	113	8	121	0.9339	0.06612	-3.77%
LC_LCDSSLCC		113	7	120	0.9417	0.05833	-4.63%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		0.9333	0.9032	0.9655	0.7667
GH_ER2		0.9333	0.9333	0.8667	0.8667
CM_MC1		0.9667	0.9667	0.9667	0.9667
FR_FRCP1		0.9333	0.8621	0.9333	0.6667
GH_FR1		0.8276	0.9000	0.9333	0.8621
GH_ERC		0.8387	0.9333	1.0000	0.8667
EV_HC1		0.9667	0.8667	0.8667	0.7667
EV_MC2		1.0000	0.9667	1.0000	0.9655
CM_MC2		0.8333	0.9310	0.9333	0.7742
LC_SLC	XC	0.9677	0.9333	0.9667	0.8667
LC_LCDSSLCC		0.9667	0.9333	0.9000	0.9667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		28/30	28/31	28/29	23/30
GH_ER2		28/30	28/30	26/30	26/30
CM_MC1		29/30	29/30	29/30	29/30
FR_FRCP1		28/30	25/29	28/30	20/30
GH_FR1		24/29	27/30	28/30	25/29
GH_ERC		26/31	28/30	30/30	26/30
EV_HC1		29/30	26/30	26/30	23/30
EV_MC2		30/30	29/30	29/29	28/29
CM_MC2		25/30	27/29	28/30	24/31
LC_SLC	XC	30/31	28/30	29/30	26/30
LC_LCDSSLCC		29/30	28/30	27/30	29/30

JS
Oct. 11/18

Salmonid Embryo-Alevin Survival and Development Test

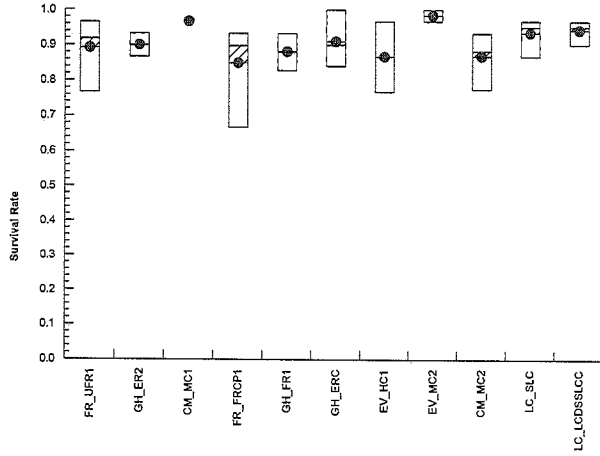
Nautilus Environmental

Analysis ID: 14-4585-0393
Analyzed: 10 Oct-18 12:54

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-8797-7812	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:28	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-5424-1506	09 May-18	09 May-18	19h	Teck Coal	
④ FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)		
④ GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
④ CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Lab Control	Teck Coal	Control		
④ FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
④ GH_ER2	Water Sample	Teck Coal	GH_ER2		
④ CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
Control	④ FR_UFR1	0.4904	1.0000	Exact	Non-Significant Effect
Control	④ GH_ER2	1	1.0000	Exact	Non-Significant Effect
Control	④ CM_MC1	1	1.0000	Exact	Non-Significant Effect
Control	FR_FRCP1	0.1248	1.0000	Exact	Non-Significant Effect
Control	GH_FR1	0.2592	1.0000	Exact	Non-Significant Effect
Control	GH_ERC	1	1.0000	Exact	Non-Significant Effect
Control	EV_HC1	0.2763	1.0000	Exact	Non-Significant Effect
Control	EV_MC2	1	1.0000	Exact	Non-Significant Effect
Control	CM_MC2	0.1708	1.0000	Exact	Non-Significant Effect
Control	LC_SLC	1	1.0000	Exact	Non-Significant Effect
Control	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

④ FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-8797-7812 Endpoint: Proportion Normal CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:28 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	107	14	121	0.8843	0.1157	0.0%
④ FR_UFR1	105	15	120	0.875	0.125	1.05%
④ GH_ER2	107	13	120	0.8917	0.1083	-0.83%
④ CM_MC1	114	6	120	0.95	0.05	-7.43%
FR_FRCP1	98	21	119	0.8235	0.1765	6.87%
GH_FR1	100	18	118	0.8475	0.1525	4.17%
GH_ERC	109	12	121	0.9008	0.09917	-1.87%
EV_HC1	102	18	120	0.85	0.15	3.88%
EV_MC2	114	4	118	0.9661	0.0339	-9.25%
CM_MC2	100	20	120	0.8333	0.1667	5.76%
LC_SLC	111	10	121	0.9174	0.08264	-3.74%
LC_LCDSSLCC	110	10	120	0.9167	0.08333	-3.66%

Proportion Normal Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.9667	1	0.8	0.7813
④ FR_UFR1	0.9333	0.9032	0.931	0.7333
④ GH_ER2	0.9333	0.9	0.8667	0.8667
④ CM_MC1	0.9667	0.9333	0.9667	0.9333
FR_FRCP1	0.9	0.8276	0.9	0.6667
GH_FR1	0.7931	0.8667	0.9333	0.7931
GH_ERC	0.8387	0.9	1	0.8667
EV_HC1	0.9333	0.8333	0.8667	0.7667
EV_MC2	1	0.9	1	0.9655
CM_MC2	0.8333	0.8621	0.9	0.7419
LC_SLC	0.9677	0.9	0.9667	0.8333
LC_LCDSSLCC	0.9333	0.9	0.9	0.9333

Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	29/30	29/29	24/30	25/32
④ FR_UFR1	28/30	28/31	27/29	22/30
④ GH_ER2	28/30	27/30	26/30	26/30
④ CM_MC1	29/30	28/30	29/30	28/30
FR_FRCP1	27/30	24/29	27/30	20/30
GH_FR1	23/29	26/30	28/30	23/29
GH_ERC	26/31	27/30	30/30	26/30
EV_HC1	28/30	25/30	26/30	23/30
EV_MC2	30/30	27/30	29/29	28/29
CM_MC2	25/30	25/29	27/30	23/31
LC_SLC	30/31	27/30	29/30	25/30
LC_LCDSSLCC	28/30	27/30	27/30	28/30

④ FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-5699-7266	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:29	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① FR_UFR1		① GH_ER2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		① CM_MC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.1759	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.3348	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ERC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	0.3541	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.2324	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_SLC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-5699-7266 Endpoint: Proportion Normal CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:29 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	105	15	120	0.875	0.125	0.0%
GH_ER2	107	13	120	0.8917	0.1083	-1.91%
CM_MC1	114	6	120	0.95	0.05	-8.57%
FR_FRCP1	98	21	119	0.8235	0.1765	5.88%
GH_FR1	100	18	118	0.8475	0.1525	3.15%
GH_ERC	109	12	121	0.9008	0.09917	-2.95%
EV_HC1	102	18	120	0.85	0.15	2.86%
EV_MC2	114	4	118	0.9661	0.0339	-10.41%
CM_MC2	100	20	120	0.8333	0.1667	4.76%
LC_SLC	111	10	121	0.9174	0.08264	-4.84%
LC_LCDSSLCC	110	10	120	0.9167	0.08333	-4.76%

Proportion Normal Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.9032	0.931	0.7333
GH_ER2	0.9333	0.9	0.8667	0.8667
CM_MC1	0.9667	0.9333	0.9667	0.9333
FR_FRCP1	0.9	0.8276	0.9	0.6667
GH_FR1	0.7931	0.8667	0.9333	0.7931
GH_ERC	0.8387	0.9	1	0.8667
EV_HC1	0.9333	0.8333	0.8667	0.7667
EV_MC2	1	0.9	1	0.9655
CM_MC2	0.8333	0.8621	0.9	0.7419
LC_SLC	0.9677	0.9	0.9667	0.8333
LC_LCDSSLCC	0.9333	0.9	0.9	0.9333

Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/30	28/31	27/29	22/30
GH_ER2	28/30	27/30	26/30	26/30
CM_MC1	29/30	28/30	29/30	28/30
FR_FRCP1	27/30	24/29	27/30	20/30
GH_FR1	23/29	26/30	28/30	23/29
GH_ERC	26/31	27/30	30/30	26/30
EV_HC1	28/30	25/30	26/30	23/30
EV_MC2	30/30	27/30	29/29	28/29
CM_MC2	25/30	25/29	27/30	23/31
LC_SLC	30/31	27/30	29/30	25/30
LC_LCDSSLCC	28/30	27/30	27/30	28/30

*FR_UFR1, GH_ER2 + CM_MC1
 are reference sites*

Salmonid Embryo-Alevin Survival and Development Test

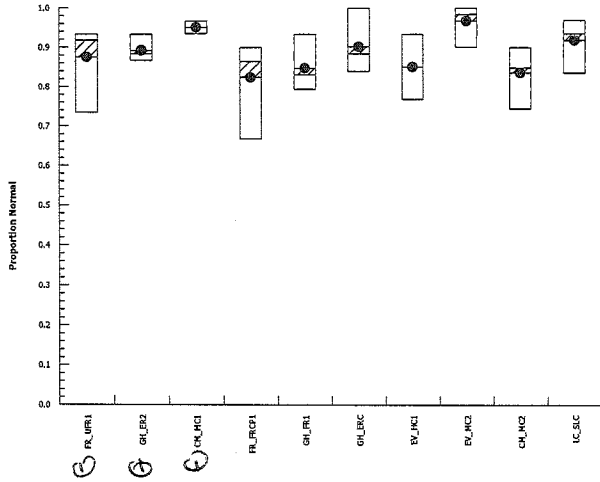
Nautilus Environmental

Analysis ID: 00-5699-7266
Analyzed: 08 Jul-18 9:29

Endpoint: Proportion Normal
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFR1, GH_ER2 + CH_MCI
are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-0364-4960	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:30	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
① GH_ER2	① FR_UFR1	0.4205	1.0000	Exact	Non-Significant Effect
GH_ER2	① CM_MC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2	FR_FRCP1	0.09273	0.9273	Exact	Non-Significant Effect
GH_ER2	GH_FR1	0.2061	1.0000	Exact	Non-Significant Effect
GH_ER2	GH_ERC	1	1.0000	Exact	Non-Significant Effect
GH_ER2	EV_HC1	0.2209	1.0000	Exact	Non-Significant Effect
GH_ER2	EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2	CM_MC2	0.1303	1.0000	Exact	Non-Significant Effect
GH_ER2	LC_SLC	1	1.0000	Exact	Non-Significant Effect
GH_ER2	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR_UFR1, GH_ER2 & CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-0364-4960 Endpoint: Proportion Normal CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:30 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	105	15	120	0.875	0.125	1.87%
① GH_ER2 Receiving Wate	107	13	120	0.8917	0.1083	0.0%
① CM_MC1	114	6	120	0.95	0.05	-6.54%
FR_FRCP1	98	21	119	0.8235	0.1765	7.64%
GH_FR1	100	18	118	0.8475	0.1525	4.96%
GH_ERC	109	12	121	0.9008	0.09917	-1.03%
EV_HC1	102	18	120	0.85	0.15	4.67%
EV_MC2	114	4	118	0.9661	0.0339	-8.35%
CM_MC2	100	20	120	0.8333	0.1667	6.54%
LC_SLC	111	10	121	0.9174	0.08264	-2.88%
LC_LCDSSLCC	110	10	120	0.9167	0.08333	-2.8%

Proportion Normal Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	0.9333	0.9032	0.931	0.7333
① GH_ER2	0.9333	0.9	0.8667	0.8667
① CM_MC1	0.9667	0.9333	0.9667	0.9333
FR_FRCP1	0.9	0.8276	0.9	0.6667
GH_FR1	0.7931	0.8667	0.9333	0.7931
GH_ERC	0.8387	0.9	1	0.8667
EV_HC1	0.9333	0.8333	0.8667	0.7667
EV_MC2	1	0.9	1	0.9655
CM_MC2	0.8333	0.8621	0.9	0.7419
LC_SLC	0.9677	0.9	0.9667	0.8333
LC_LCDSSLCC	0.9333	0.9	0.9	0.9333

Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	28/30	28/31	27/29	22/30
① GH_ER2	28/30	27/30	26/30	26/30
① CM_MC1	29/30	28/30	29/30	28/30
FR_FRCP1	27/30	24/29	27/30	20/30
GH_FR1	23/29	26/30	28/30	23/29
GH_ERC	26/31	27/30	30/30	26/30
EV_HC1	28/30	25/30	26/30	23/30
EV_MC2	30/30	27/30	29/29	28/29
CM_MC2	25/30	25/29	27/30	23/31
LC_SLC	30/31	27/30	29/30	25/30
LC_LCDSSLCC	28/30	27/30	27/30	28/30

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

Salmonid Embryo-Alevin Survival and Development Test

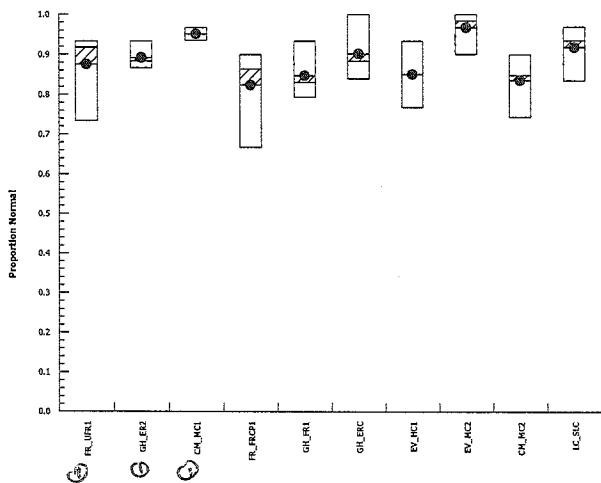
Nautilus Environmental

Analysis ID: 11-0364-4960
Analyzed: 08 Jul-18 9:30

Endpoint: Proportion Normal
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFR1, GH_ER2 + CH_LK1
are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 1 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 13-7641-3735	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 08 Jul-18 9:26	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-8383-0708	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
CM_MC1	FR_UFR1	0.03273	0.1964	Exact	Non-Significant Effect
CM_MC1	GH_ER2	0.07495	0.3748	Exact	Non-Significant Effect
CM_MC1	FR_FRCP1	0.001647	0.0165	Exact	Significant Effect
CM_MC1	GH_FR1	0.007264	0.0581	Exact	Non-Significant Effect
CM_MC1	GH_ERC	0.1134	0.4535	Exact	Non-Significant Effect
CM_MC1	EV_HC1	0.008204	0.0574	Exact	Non-Significant Effect
CM_MC1	EV_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1	CM_MC2	0.003003	0.0270	Exact	Significant Effect
CM_MC1	LC_SLC	0.2245	0.4490	Exact	Non-Significant Effect
CM_MC1	LC_LCDSSLCC	0.2193	0.6579	Exact	Non-Significant Effect

FR_UFR1, GH_ER2 + CM_MC1
are reference sites

CETIS Analytical Report

Report Date: 08 Jul-18 09:32 (p 2 of 3)
 Test Code: 180712a | 07-0938-8413

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 13-7641-3735 Endpoint: Proportion Normal CETIS Version: CETISv1.8.7
 Analyzed: 08 Jul-18 9:26 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	105	15	120	0.875	0.125	7.9%
GH_ER2	107	13	120	0.8917	0.1083	6.14%
CM_MC1 Site Control	114	6	120	0.95	0.05	0.0%
FR_FRCP1	98	21	119	0.8235	0.1765	13.31%
GH_FR1	100	18	118	0.8475	0.1525	10.79%
GH_ERC	109	12	121	0.9008	0.09917	5.18%
EV_HC1	102	18	120	0.85	0.15	10.53%
EV_MC2	114	4	118	0.9661	0.0339	-1.7%
CM_MC2	100	20	120	0.8333	0.1667	12.28%
LC_SLC	111	10	121	0.9174	0.08264	3.44%
LC_LCDSSLCC	110	10	120	0.9167	0.08333	3.51%

Proportion Normal Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.9032	0.931	0.7333
GH_ER2	0.9333	0.9	0.8667	0.8667
CM_MC1	0.9667	0.9333	0.9667	0.9333
FR_FRCP1	0.9	0.8276	0.9	0.6667
GH_FR1	0.7931	0.8667	0.9333	0.7931
GH_ERC	0.8387	0.9	1	0.8667
EV_HC1	0.9333	0.8333	0.8667	0.7667
EV_MC2	1	0.9	1	0.9655
CM_MC2	0.8333	0.8621	0.9	0.7419
LC_SLC	0.9677	0.9	0.9667	0.8333
LC_LCDSSLCC	0.9333	0.9	0.9	0.9333

Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/30	28/31	27/29	22/30
GH_ER2	28/30	27/30	26/30	26/30
CM_MC1	29/30	28/30	29/30	28/30
FR_FRCP1	27/30	24/29	27/30	20/30
GH_FR1	23/29	26/30	28/30	23/29
GH_ERC	26/31	27/30	30/30	26/30
EV_HC1	28/30	25/30	26/30	23/30
EV_MC2	30/30	27/30	29/29	28/29
CM_MC2	25/30	25/29	27/30	23/31
LC_SLC	30/31	27/30	29/30	25/30
LC_LCDSSLCC	28/30	27/30	27/30	28/30

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

Salmonid Embryo-Alevin Survival and Development Test

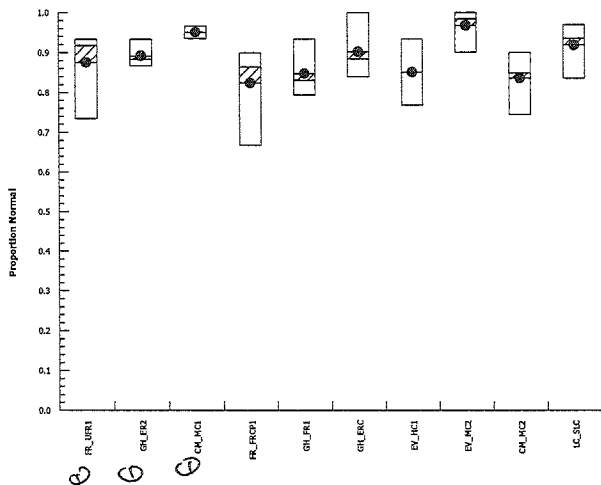
Nautilus Environmental

Analysis ID: 13-7641-3735
Analyzed: 08 Jul-18 9:26

Endpoint: Proportion Normal
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFRI, GH_ERZ + CM_MCI
are reference sites.

CETIS Analytical Report

Report Date: 10 Oct-18 12:54 (p 1 of 6)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 09-7576-9705 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 12:54 Analysis: STP 2xK Contingency Tables Status Level: 1

Batch ID: 02-9358-8644 Test Type: Survival-Development Analyst: Jill Sones
 Start Date: 09 May-18 18:45 Protocol: EC/EPS 1/RM/28 Diluent: Dechlorinated Tap Water
 Ending Date: 08 Jun-18 09:30 Species: Oncorhynchus mykiss Brine:
 Test Length: 29d 15h Taxon: Actinopterygii Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	0.1932	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.3233	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.8997	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.0236	Exact	0.2356	Non-Significant Effect
		GH_FR1	0.0692	Exact	0.5534	Non-Significant Effect
		GH_ERC	0.4118	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0758	Exact	0.5308	Non-Significant Effect
		EV_MC2	0.9719	Exact	0.9719	Non-Significant Effect
		CM_MC2	0.0369	Exact	0.3318	Non-Significant Effect
		LC_LCDSSLCC	0.5844	Exact	1.0000	Non-Significant Effect

① LC_SLC = site control

CETIS Analytical Report

Report Date: 10 Oct-18 12:54 (p 2 of 6)
 Test Code/ID: 180712f / 19-4534-3181

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 09-7576-9705 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 12:54 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		105	15	120	0.875	0.125	1.87%
GH_ER2		107	13	120	0.8917	0.1083	0.0%
CM_MC1		114	6	120	0.95	0.05	-6.54%
FR_FRCP1		98	21	119	0.8235	0.1765	7.64%
GH_FR1		100	18	118	0.8475	0.1525	4.96%
GH_ERC		109	12	121	0.9008	0.09917	-1.03%
EV_HC1		102	18	120	0.85	0.15	4.67%
EV_MC2		114	4	118	0.9661	0.0339	-8.35%
CM_MC2		100	20	120	0.8333	0.1667	6.54%
LC_SLC	XC	111	10	121	0.9174	0.08264	-2.88%
LC_LCDSSLCC		110	10	120	0.9167	0.08333	-2.8%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		0.9333	0.9032	0.9310	0.7333
GH_ER2		0.9333	0.9000	0.8667	0.8667
CM_MC1		0.9667	0.9333	0.9667	0.9333
FR_FRCP1		0.9000	0.8276	0.9000	0.6667
GH_FR1		0.7931	0.8667	0.9333	0.7931
GH_ERC		0.8387	0.9000	1.0000	0.8667
EV_HC1		0.9333	0.8333	0.8667	0.7667
EV_MC2		1.0000	0.9000	1.0000	0.9655
CM_MC2		0.8333	0.8621	0.9000	0.7419
LC_SLC	XC	0.9677	0.9000	0.9667	0.8333
LC_LCDSSLCC		0.9333	0.9000	0.9000	0.9333

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		28/30	28/31	27/29	22/30
GH_ER2		28/30	27/30	26/30	26/30
CM_MC1		29/30	28/30	29/30	28/30
FR_FRCP1		27/30	24/29	27/30	20/30
GH_FR1		23/29	26/30	28/30	23/29
GH_ERC		26/31	27/30	30/30	26/30
EV_HC1		28/30	25/30	26/30	23/30
EV_MC2		30/30	27/30	29/29	28/29
CM_MC2		25/30	25/29	27/30	23/31
LC_SLC	XC	30/31	27/30	29/30	25/30
LC_LCDSSLCC		28/30	27/30	27/30	28/30

Salmonid Embryo-Alevin Survival and Development Test

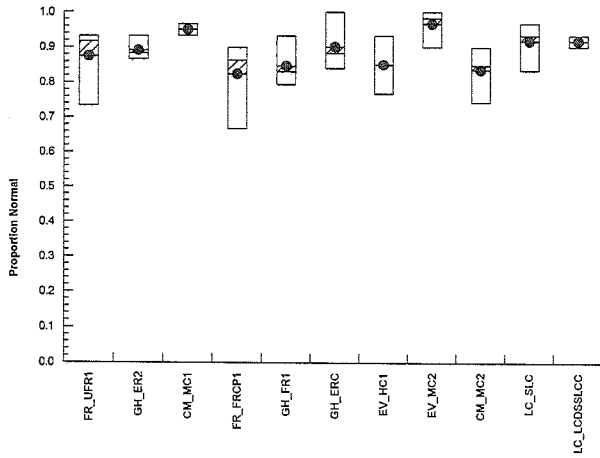
Nautilus Environmental

Analysis ID: 09-7576-9705
Analyzed: 10 Oct-18 12:54

Endpoint: Proportion Normal
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 1 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test **Nautilus Environmental**

Batch ID: 00-9484-6412	Test Type: Survival-Development-Growth	Analyst: Jill Sones
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 15h	Taxon: Actinopterygii	Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	11-9385-1829	08 May-18	09 May-18	43h		Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	43h		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Handwritten notes: FR_UFR1, GH_ER2, CM_MC1, LC_SLC, SLC are reference sites JS

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.2057	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9410	CM_MC2 passed length-mm	1

Handwritten: JS Oct 29/18

CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 2 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8979	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.5788	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9612	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.8685	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	Control passed length-mm	1

Oct 29/18

CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 3 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin- Fry Survival Development and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9845	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9286	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	EV_HC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.9730	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	GH_ER2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	FR_UFR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	GH_ERC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	Control passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	CM_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	GH_FR1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	FR_FRCP1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	LC_LCDSSLCC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	EV_MC2 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	LC_SLC passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	CM_MC1 passed length-mm	1
17-5122-7005	Length-mm	Dunnett Multiple Comparison Test	0.6640	EV_HC1 passed length-mm	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	EV_HC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	GH_ERC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	GH_FR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	CM_MC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	GH_ER2 passed mean dry weight-mg	1

CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 4 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	FR_UFR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.3429	Control passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	CM_MC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_ER2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_FR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_ERC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_UFR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	EV_HC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	Control passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	CM_MC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_ER2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_ERC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	EV_HC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	Control passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_UFR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	GH_FR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	Control passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	EV_HC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	GH_FR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	CM_MC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	GH_ERC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	GH_ER2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	FR_UFR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	FR_UFR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	Control passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	EV_HC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	GH_ERC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	GH_FR1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	GH_ER2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.7571	CM_MC1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_FRCP1 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	LC_LCDSSLCC passed mean dry weight-	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.4429	FR_UFR1 passed mean dry weight-mg	1

CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 6 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Ery Survival Development and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	EV_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	LC_SLC passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	CM_MC2 passed mean dry weight-mg	1
18-8791-0063	Mean Dry Weight-mg	Wilcoxon Rank Sum Two-Sample Test	0.5571	LC_LCDSSLCC passed mean dry weight-	1

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	4	21.9	20.67	23.13	21.27	22.84	0.3851	0.7702	3.52%	0.00%
FR_UFR1		4	22.19	21.69	22.69	21.87	22.62	0.1567	0.3134	1.41%	-1.32%
GH_ER2		4	23.13	22.29	23.96	22.46	23.57	0.262	0.5239	2.27%	-5.61%
CM_MC1		4	23.01	21.75	24.28	22.24	23.9	0.399	0.7979	3.47%	-5.09%
FR_FRCP1		4	22.6	21.34	23.86	21.61	23.28	0.3959	0.7918	3.50%	-3.21%
GH_FR1		4	23.21	22.24	24.17	22.68	24.04	0.304	0.608	2.62%	-5.96%
GH_ERC		4	22.96	22.33	23.58	22.61	23.52	0.1962	0.3925	1.71%	-4.83%
EV_HC1		4	23.36	21.81	24.91	22.1	24.46	0.4869	0.9739	4.17%	-6.66%
EV_MC2		4	23.09	22.14	24.04	22.36	23.78	0.2973	0.5947	2.58%	-5.43%
CM_MC2		4	23.27	22.68	23.85	22.79	23.61	0.1846	0.3692	1.59%	-6.24%
LC_SLC	XC	4	23.04	22.38	23.7	22.53	23.38	0.2082	0.4164	1.81%	-5.21%
LC_LCDSSLCC		4	22.69	20.98	24.4	21.63	23.84	0.5379	1.076	4.74%	-3.61%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	4	114.8	83	146.6	99.64	143.4	9.995	19.99	17.41%	0.00%
FR_UFR1		4	115.2	83.94	146.5	98.93	142.5	9.829	19.66	17.06%	-0.36%
GH_ER2		4	120.1	87.04	153.2	98.85	148.6	10.4	20.8	17.31%	-4.65%
CM_MC1		4	120.3	77.06	163.5	93.79	155.5	13.57	27.15	22.57%	-4.75%
FR_FRCP1		4	123.7	89.99	157.5	99.29	147.6	10.6	21.21	17.14%	-7.78%
GH_FR1		4	132.4	106.8	157.9	115.7	149.3	8.025	16.05	12.13%	-15.30%
GH_ERC		4	122.5	88.55	156.4	104	152.9	10.66	21.33	17.41%	-6.69%
EV_HC1		4	129.2	91.33	167.1	109.6	162.3	11.91	23.82	18.43%	-12.57%
EV_MC2		4	127	87.08	166.9	104.8	161.4	12.55	25.09	19.76%	-10.63%
CM_MC2		4	129.4	84.61	174.3	104.3	168.5	14.09	28.18	21.77%	-12.75%
LC_SLC	XC	4	124.2	88.05	160.3	102.1	154.6	11.36	22.72	18.29%	-8.18%
LC_LCDSSLCC		4	125.3	96.56	153.9	109.3	150.7	9.015	18.03	14.39%	-9.10%

① ~~FR_UFR1~~ FR_UFR1, GH_ER2, CM_MC1, LC_SLC are reference sites

CETIS Summary Report

Report Date: 29 Oct-18 16:00 (p 7 of 7)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	22.84	22.22	21.27	21.27
FR_UFR1		22.11	22.62	22.16	21.87
GH_ER2		23.57	23.52	22.46	22.96
CM_MC1		23.47	23.9	22.24	22.45
FR_FRCP1		22.32	23.2	21.61	23.28
GH_FR1		24.04	23.26	22.84	22.68
GH_ERC		23.52	22.61	22.82	22.88
EV_HC1		23.57	24.46	22.1	23.3
EV_MC2		23.27	23.78	22.36	22.95
CM_MC2		23.5	23.61	22.79	23.17
LC_SLC	XC	23.38	23.38	22.53	22.87
LC_LCDSSLCC		21.93	23.84	21.63	23.36

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	N	113.4	143.4	102.7	99.64
FR_UFR1		116.4	142.5	98.93	103
GH_ER2		118.9	148.6	98.85	114.2
CM_MC1		126.6	155.5	93.79	105.2
FR_FRCP1		133.6	147.6	99.29	114.5
GH_FR1		142.5	149.3	115.7	122
GH_ERC		120.4	152.9	104	112.7
EV_HC1		130.7	162.3	109.6	114.3
EV_MC2		129.3	161.4	104.8	112.5
CM_MC2		130.4	168.5	104.3	114.6
LC_SLC	XC	127	154.6	102.1	113.1
LC_LCDSSLCC		116.9	150.7	109.3	124.1

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 07-4496-8934	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 26 Jun-18 10:04	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-5424-1506	09 May-18	09 May-18	19h	Teck Coal	
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)		
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Lab Control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.65%	

Dunnett Multiple Comparison Test

Sample Code	vs Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	① FR_UFR1	-0.6045	2.581	1.238	6	0.9834	CDF	Non-Significant Effect
	① GH_ER2	-2.559	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	① CM_MC1	-2.324	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	FR_FRCP1	-1.464	2.581	1.238	6	0.9992	CDF	Non-Significant Effect
	GH_FR1	-2.72	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	GH_ERC	-2.205	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	EV_HC1	-3.038	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	EV_MC2	-2.481	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	CM_MC2	-2.851	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	LC_SLC	-2.376	2.581	1.238	6	1.0000	CDF	Non-Significant Effect
	LC_LCDSSLCC	-1.647	2.581	1.238	6	0.9996	CDF	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-4496-8934 Endpoint: Length-mm CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:04 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	8.749719	0.795429	11	1.728	0.1063	Non-Significant Effect
Error	16.56797	0.4602215	36			
Total	25.31769		47			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.832	24.72	0.6374	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9838	0.9345	0.7416	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	4	21.9	20.67	23.13	21.74	21.27	22.84	0.3851	3.52%	0.0%
① FR_UFR1	4	22.19	21.69	22.69	22.14	21.87	22.62	0.1567	1.41%	-1.32%
① GH_ER2	4	23.13	22.29	23.96	23.24	22.46	23.57	0.262	2.27%	-5.61%
① CM_MC1	4	23.01	21.75	24.28	22.96	22.24	23.9	0.399	3.47%	-5.09%
FR_FRCP1	4	22.6	21.34	23.86	22.76	21.61	23.28	0.3959	3.5%	-3.21%
GH_FR1	4	23.21	22.24	24.17	23.05	22.68	24.04	0.304	2.62%	-5.96%
GH_ERC	4	22.96	22.33	23.58	22.85	22.61	23.52	0.1962	1.71%	-4.83%
EV_HC1	4	23.36	21.81	24.91	23.43	22.1	24.46	0.4869	4.17%	-6.66%
EV_MC2	4	23.09	22.14	24.04	23.11	22.36	23.78	0.2973	2.58%	-5.43%
CM_MC2	4	23.27	22.68	23.85	23.33	22.79	23.61	0.1846	1.59%	-6.24%
LC_SLC	4	23.04	22.38	23.7	23.13	22.53	23.38	0.2082	1.81%	-5.21%
LC_LCDSSLCC	4	22.69	20.98	24.4	22.65	21.63	23.84	0.5379	4.74%	-3.61%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	22.84	22.22	21.27	21.27
① FR_UFR1	22.11	22.62	22.16	21.87
① GH_ER2	23.57	23.52	22.46	22.96
① CM_MC1	23.47	23.9	22.24	22.45
FR_FRCP1	22.32	23.2	21.61	23.28
GH_FR1	24.04	23.26	22.84	22.68
GH_ERC	23.52	22.61	22.82	22.88
EV_HC1	23.57	24.46	22.1	23.3
EV_MC2	23.27	23.78	22.36	22.95
CM_MC2	23.5	23.61	22.79	23.17
LC_SLC	23.38	23.38	22.53	22.87
LC_LCDSSLCC	21.93	23.84	21.63	23.36

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

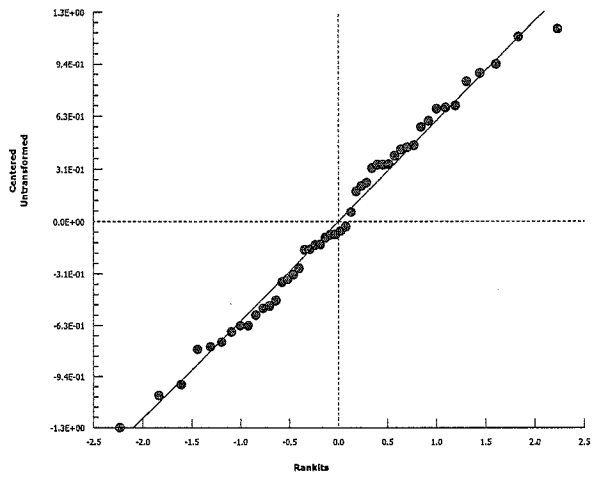
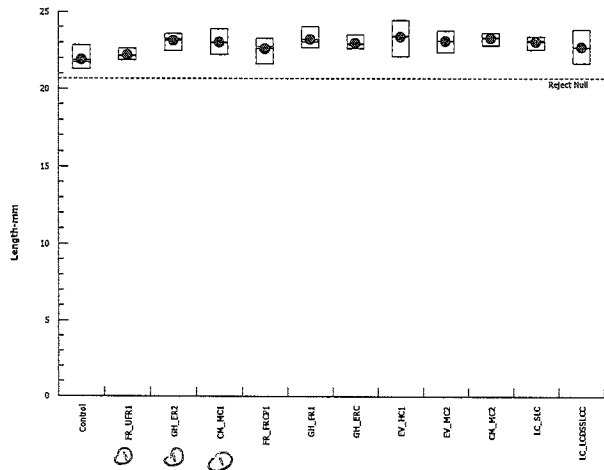
Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-4496-8934 Endpoint: Length-mm
Analyzed: 26 Jun-18 10:04 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFRI, GH_LER2 + CH_MCI
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test			Nautilus Environmental
Analysis ID: 13-8943-5197	Endpoint: Length-mm	CETIS Version: CETISv1.8.7	
Analyzed: 26 Jun-18 10:26	Analysis: Parametric-Control vs Treatments	Official Results: Yes	
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam	
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water	
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:	
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.46%	

Dunnnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
① FR_UFR1	①	GH_ER2	-1.981	2.56	1.212	6	0.9999	CDF	Non-Significant Effect
	③	CM_MC1	-1.743	2.56	1.212	6	0.9997	CDF	Non-Significant Effect
		FR_FRCP1	-0.8714	2.56	1.212	6	0.9918	CDF	Non-Significant Effect
		GH_FR1	-2.144	2.56	1.212	6	0.9999	CDF	Non-Significant Effect
		GH_ERC	-1.621	2.56	1.212	6	0.9994	CDF	Non-Significant Effect
		EV_HC1	-2.466	2.56	1.212	6	1.0000	CDF	Non-Significant Effect
		EV_MC2	-1.901	2.56	1.212	6	0.9998	CDF	Non-Significant Effect
		CM_MC2	-2.276	2.56	1.212	6	1.0000	CDF	Non-Significant Effect
		LC_SLC	-1.796	2.56	1.212	6	0.9997	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.056	2.56	1.212	6	0.9956	CDF	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 13-8943-5197 Endpoint: Length-mm CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:26 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.64221	0.4642209	10	1.036	0.4364	Non-Significant Effect
Error	14.78817	0.4481265	33			
Total	19.43038		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.721	23.21	0.5588	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9868	0.9295	0.8889	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1	4	22.19	21.69	22.69	22.14	21.87	22.62	0.1567	1.41%	0.0%
① GH_ER2	4	23.13	22.29	23.96	23.24	22.46	23.57	0.262	2.27%	-4.23%
① CM_MC1	4	23.01	21.75	24.28	22.96	22.24	23.9	0.399	3.47%	-3.72%
FR_FRCP1	4	22.6	21.34	23.86	22.76	21.61	23.28	0.3959	3.5%	-1.86%
GH_FR1	4	23.21	22.24	24.17	23.05	22.68	24.04	0.304	2.62%	-4.57%
GH_ERC	4	22.96	22.33	23.58	22.85	22.61	23.52	0.1962	1.71%	-3.46%
EV_HC1	4	23.36	21.81	24.91	23.43	22.1	24.46	0.4869	4.17%	-5.26%
EV_MC2	4	23.09	22.14	24.04	23.11	22.36	23.78	0.2973	2.58%	-4.06%
CM_MC2	4	23.27	22.68	23.85	23.33	22.79	23.61	0.1846	1.59%	-4.86%
LC_SLC	4	23.04	22.38	23.7	23.13	22.53	23.38	0.2082	1.81%	-3.83%
LC_LCDSSLCC	4	22.69	20.98	24.4	22.65	21.63	23.84	0.5379	4.74%	-2.25%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	22.11	22.62	22.16	21.87
① GH_ER2	23.57	23.52	22.46	22.96
① CM_MC1	23.47	23.9	22.24	22.45
FR_FRCP1	22.32	23.2	21.61	23.28
GH_FR1	24.04	23.26	22.84	22.68
GH_ERC	23.52	22.61	22.82	22.88
EV_HC1	23.57	24.46	22.1	23.3
EV_MC2	23.27	23.78	22.36	22.95
CM_MC2	23.5	23.61	22.79	23.17
LC_SLC	23.38	23.38	22.53	22.87
LC_LCDSSLCC	21.93	23.84	21.63	23.36

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

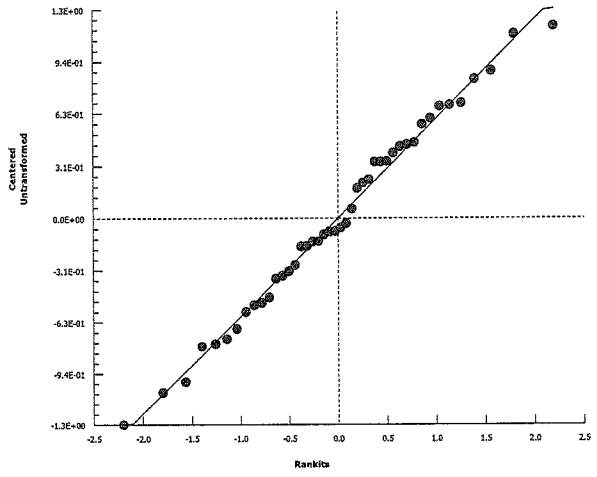
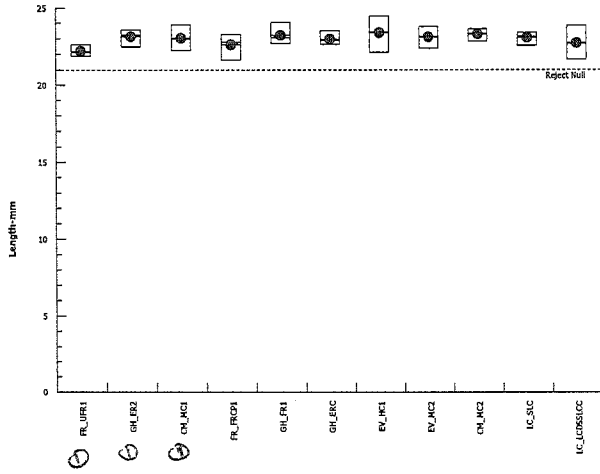
Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 13-8943-5197 Endpoint: Length-mm
Analyzed: 26 Jun-18 10:26 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_VFR1, GH_ER2 + CH_MCI
are reference sites

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 15-2540-5412	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 26 Jun-18 10:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
④ FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
④ GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
④ CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
④ FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
④ GH_ER2	Water Sample	Teck Coal	GH_ER2		
④ CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.24%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
④ GH_ER2	④	FR_UFR1	1.981	2.56	1.212	6	0.1521	CDF	Non-Significant Effect
	④	CM_MC1	0.2377	2.56	1.212	6	0.8511	CDF	Non-Significant Effect
		FR_FRCP1	1.109	2.56	1.212	6	0.4906	CDF	Non-Significant Effect
		GH_FR1	-0.1637	2.56	1.212	6	0.9379	CDF	Non-Significant Effect
		GH_ERC	0.3591	2.56	1.212	6	0.8135	CDF	Non-Significant Effect
		EV_HC1	-0.4859	2.56	1.212	6	0.9734	CDF	Non-Significant Effect
		EV_MC2	0.07922	2.56	1.212	6	0.8920	CDF	Non-Significant Effect
		CM_MC2	-0.2958	2.56	1.212	6	0.9555	CDF	Non-Significant Effect
		LC_SLC	0.1849	2.56	1.212	6	0.8657	CDF	Non-Significant Effect
	LC_LCDSSLCC	0.9243	2.56	1.212	6	0.5788	CDF	Non-Significant Effect	

④ FR_UFR1, GH_ER2 + CM_MC1
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 15-2540-5412 Endpoint: Length-mm CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:31 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.64221	0.4642209	10	1.036	0.4364	Non-Significant Effect
Error	14.78817	0.4481265	33			
Total	19.43038		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.721	23.21	0.5588	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9868	0.9295	0.8889	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	22.19	21.69	22.69	22.14	21.87	22.62	0.1567	1.41%	0.0%
GH_ER2	4	23.13	22.29	23.96	23.24	22.46	23.57	0.262	2.27%	-4.23%
CM_MC1	4	23.01	21.75	24.28	22.96	22.24	23.9	0.399	3.47%	-3.72%
FR_FRCP1	4	22.6	21.34	23.86	22.76	21.61	23.28	0.3959	3.5%	-1.86%
GH_FR1	4	23.21	22.24	24.17	23.05	22.68	24.04	0.304	2.62%	-4.57%
GH_ERC	4	22.96	22.33	23.58	22.85	22.61	23.52	0.1962	1.71%	-3.46%
EV_HC1	4	23.36	21.81	24.91	23.43	22.1	24.46	0.4869	4.17%	-5.26%
EV_MC2	4	23.09	22.14	24.04	23.11	22.36	23.78	0.2973	2.58%	-4.06%
CM_MC2	4	23.27	22.68	23.85	23.33	22.79	23.61	0.1846	1.59%	-4.86%
LC_SLC	4	23.04	22.38	23.7	23.13	22.53	23.38	0.2082	1.81%	-3.83%
LC_LCDSSLCC	4	22.69	20.98	24.4	22.65	21.63	23.84	0.5379	4.74%	-2.25%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	22.11	22.62	22.16	21.87
GH_ER2	23.57	23.52	22.46	22.96
CM_MC1	23.47	23.9	22.24	22.45
FR_FRCP1	22.32	23.2	21.61	23.28
GH_FR1	24.04	23.26	22.84	22.68
GH_ERC	23.52	22.61	22.82	22.88
EV_HC1	23.57	24.46	22.1	23.3
EV_MC2	23.27	23.78	22.36	22.95
CM_MC2	23.5	23.61	22.79	23.17
LC_SLC	23.38	23.38	22.53	22.87
LC_LCDSSLCC	21.93	23.84	21.63	23.36

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

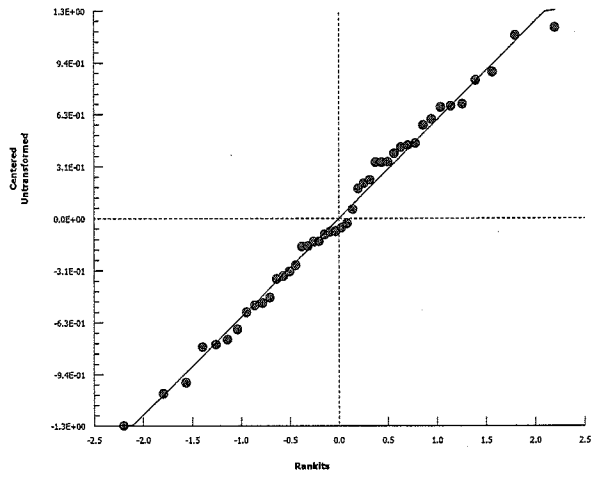
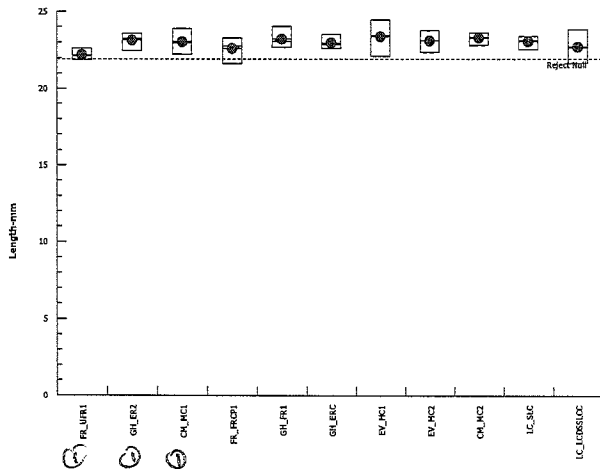
Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 15-2540-5412 Endpoint: Length-mm
Analyzed: 26 Jun-18 10:31 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_VFRI, GH_ER2 + CM_MCI
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 15-7678-6982	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 26 Jun-18 10:35	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.27%	

Dunnett Multiple Comparison Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
① CM_MC1	③	FR_UFR1	1.743	2.56	1.212	6	0.2231	CDF	Non-Significant Effect
	①	GH_ER2	-0.2377	2.56	1.212	6	0.9483	CDF	Non-Significant Effect
		FR_FRCP1	0.8714	2.56	1.212	6	0.6036	CDF	Non-Significant Effect
		GH_FR1	-0.4014	2.56	1.212	6	0.9664	CDF	Non-Significant Effect
		GH_ERC	0.1215	2.56	1.212	6	0.8820	CDF	Non-Significant Effect
		EV_HC1	-0.7236	2.56	1.212	6	0.9868	CDF	Non-Significant Effect
		EV_MC2	-0.1584	2.56	1.212	6	0.9371	CDF	Non-Significant Effect
		CM_MC2	-0.5334	2.56	1.212	6	0.9768	CDF	Non-Significant Effect
		LC_SLC	-0.05281	2.56	1.212	6	0.9193	CDF	Non-Significant Effect
		LC_LCDSSLCC	0.6866	2.56	1.212	6	0.6872	CDF	Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
are reference sites

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 15-7678-6982 Endpoint: Length-mm CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:35 Analysis: Parametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.64221	0.4642209	10	1.036	0.4364	Non-Significant Effect
Error	14.78817	0.4481265	33			
Total	19.43038		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.721	23.21	0.5588	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9868	0.9295	0.8889	Normal Distribution

Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1	4	22.19	21.69	22.69	22.14	21.87	22.62	0.1567	1.41%	0.0%
① GH_ER2	4	23.13	22.29	23.96	23.24	22.46	23.57	0.262	2.27%	-4.23%
① CM_MC1	4	23.01	21.75	24.28	22.96	22.24	23.9	0.399	3.47%	-3.72%
FR_FRCP1	4	22.6	21.34	23.86	22.76	21.61	23.28	0.3959	3.5%	-1.86%
GH_FR1	4	23.21	22.24	24.17	23.05	22.68	24.04	0.304	2.62%	-4.57%
GH_ERC	4	22.96	22.33	23.58	22.85	22.61	23.52	0.1962	1.71%	-3.46%
EV_HC1	4	23.36	21.81	24.91	23.43	22.1	24.46	0.4869	4.17%	-5.26%
EV_MC2	4	23.09	22.14	24.04	23.11	22.36	23.78	0.2973	2.58%	-4.06%
CM_MC2	4	23.27	22.68	23.85	23.33	22.79	23.61	0.1846	1.59%	-4.86%
LC_SLC	4	23.04	22.38	23.7	23.13	22.53	23.38	0.2082	1.81%	-3.83%
LC_LCDSSLCC	4	22.69	20.98	24.4	22.65	21.63	23.84	0.5379	4.74%	-2.25%

Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	22.11	22.62	22.16	21.87
① GH_ER2	23.57	23.52	22.46	22.96
① CM_MC1	23.47	23.9	22.24	22.45
FR_FRCP1	22.32	23.2	21.61	23.28
GH_FR1	24.04	23.26	22.84	22.68
GH_ERC	23.52	22.61	22.82	22.88
EV_HC1	23.57	24.46	22.1	23.3
EV_MC2	23.27	23.78	22.36	22.95
CM_MC2	23.5	23.61	22.79	23.17
LC_SLC	23.38	23.38	22.53	22.87
LC_LCDSSLCC	21.93	23.84	21.63	23.36

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

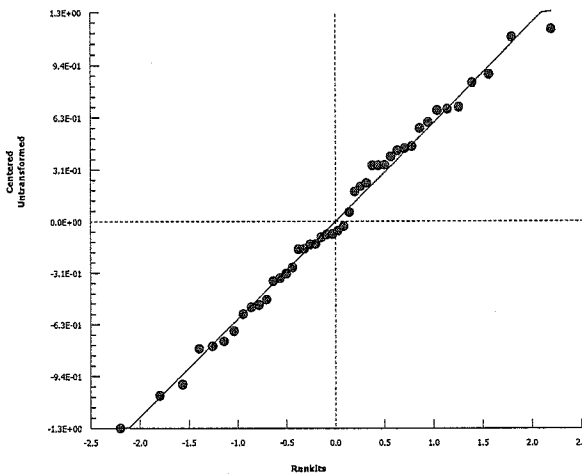
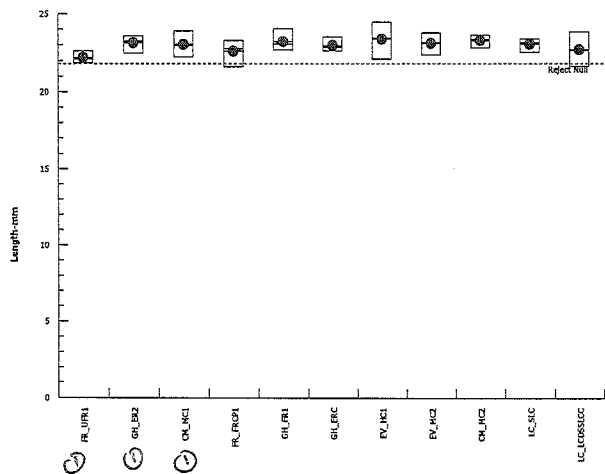
Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 15-7678-6982 Endpoint: Length-mm
 Analyzed: 26 Jun-18 10:35 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7
 Official Results: Yes

Graphics



① FR_UFRI, GH_ER2 & CM_MCI
 are reference sites.

CETIS Analytical Report

Report Date: 10 Oct-18 12:46 (p 1 of 5)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 17-5122-7005	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 10 Oct-18 12:43	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 00-9484-6412	Test Type: Survival-Development-Growth	Analyst: Jill Sones
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 15h	Taxon: Actinopterygii	Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	11-9385-1829	08 May-18	09 May-18	43h		Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	43h		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	5.26%
		GH_ER2 passed length-mm	5.26%
		CM_MC1 passed length-mm	5.26%
		FR_FRCP1 passed length-mm	5.26%
		GH_FR1 passed length-mm	5.26%
		GH_ERC passed length-mm	5.26%
		EV_HC1 passed length-mm	5.26%
		EV_MC2 passed length-mm	5.26%
		CM_MC2 passed length-mm	5.26%
		LC_LCDSSLCC passed length-mm	5.26%

① LC_SLC = site control

Dunnnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	1.796	2.56	1.212	6	CDF	0.2057	Non-Significant Effect
		GH_ER2	-0.1849	2.56	1.212	6	CDF	0.9410	Non-Significant Effect
		CM_MC1	0.05281	2.56	1.212	6	CDF	0.8979	Non-Significant Effect
		FR_FRCP1	0.9243	2.56	1.212	6	CDF	0.5788	Non-Significant Effect
		GH_FR1	-0.3486	2.56	1.212	6	CDF	0.9612	Non-Significant Effect
		GH_ERC	0.1743	2.56	1.212	6	CDF	0.8685	Non-Significant Effect
		EV_HC1	-0.6707	2.56	1.212	6	CDF	0.9845	Non-Significant Effect
		EV_MC2	-0.1056	2.56	1.212	6	CDF	0.9286	Non-Significant Effect
		CM_MC2	-0.4806	2.56	1.212	6	CDF	0.9730	Non-Significant Effect
		LC_LCDSSLCC	0.7394	2.56	1.212	6	CDF	0.6640	Non-Significant Effect

CETIS Analytical Report

Report Date: 10 Oct-18 12:46 (p 2 of 5)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 17-5122-7005 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 10 Oct-18 12:43 Analysis: Parametric-Control vs Treatments Status Level: 1

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.64221	0.464221	10	1.036	0.4364	Non-Significant Effect
Error	14.7882	0.448126	33			
Total	19.4304		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	8.721	23.21	0.5588	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9868	0.9295	0.8889	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		4	22.19	21.69	22.69	22.14	21.87	22.62	0.1567	1.41%	0.00%
GH_ER2		4	23.13	22.29	23.96	23.24	22.46	23.57	0.262	2.27%	-4.22%
CM_MC1		4	23.01	21.75	24.28	22.96	22.24	23.9	0.399	3.47%	-3.72%
FR_FRCP1		4	22.6	21.34	23.86	22.76	21.61	23.28	0.3959	3.50%	-1.86%
GH_FR1		4	23.21	22.24	24.17	23.05	22.68	24.04	0.304	2.62%	-4.57%
GH_ERC		4	22.96	22.33	23.58	22.85	22.61	23.52	0.1962	1.71%	-3.46%
EV_HC1		4	23.36	21.81	24.91	23.43	22.1	24.46	0.4869	4.17%	-5.26%
EV_MC2		4	23.09	22.14	24.04	23.11	22.36	23.78	0.2973	2.58%	-4.06%
CM_MC2		4	23.27	22.68	23.85	23.33	22.79	23.61	0.1846	1.59%	-4.86%
LC_SLC	XC	4	23.04	22.38	23.7	23.12	22.53	23.38	0.2082	1.81%	-3.83%
LC_LCDSSLCC		4	22.69	20.98	24.4	22.65	21.63	23.84	0.5379	4.74%	-2.25%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		22.11	22.62	22.16	21.87
GH_ER2		23.57	23.52	22.46	22.96
CM_MC1		23.47	23.9	22.24	22.45
FR_FRCP1		22.32	23.2	21.61	23.28
GH_FR1		24.04	23.26	22.84	22.68
GH_ERC		23.52	22.61	22.82	22.88
EV_HC1		23.57	24.46	22.1	23.3
EV_MC2		23.27	23.78	22.36	22.95
CM_MC2		23.5	23.61	22.79	23.17
LC_SLC	XC	23.38	23.38	22.53	22.87
LC_LCDSSLCC		21.93	23.84	21.63	23.36

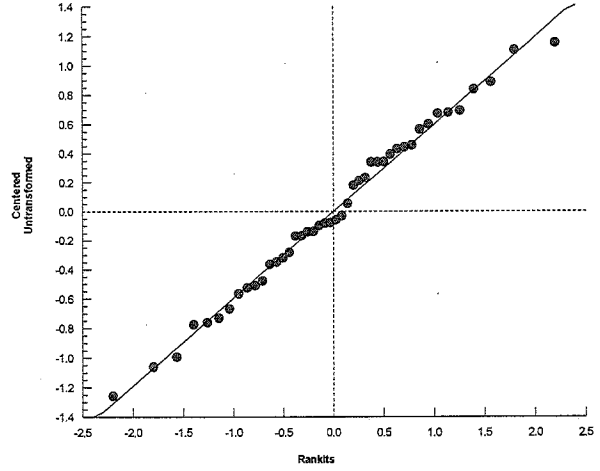
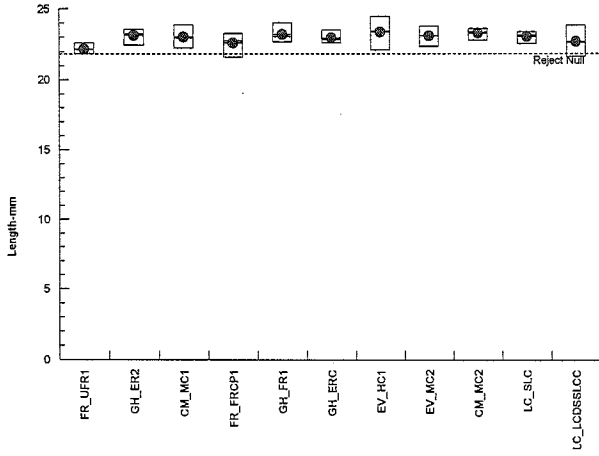
Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 17-5122-7005 Endpoint: Length-mm
Analyzed: 10 Oct-18 12:43 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test			Nautilus Environmental		
Analysis ID: 07-6421-7638	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7			
Analyzed: 26 Jun-18 10:23	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes			
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam			
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water			
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:			
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-5424-1506	09 May-18	09 May-18	19h	Teck Coal	
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)		
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Lab Control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

Dunn/Bonferroni Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	①	FR_UFR1	-0.1389	2.609	6	1.0000	Asymp		Non-Significant Effect
	①	GH_ER2	-0.5303	2.609	6	1.0000	Asymp		Non-Significant Effect
	①	CM_MC1	-0.5556	2.609	6	1.0000	Asymp		Non-Significant Effect
		FR_FRCP1	-0.8334	2.609	6	1.0000	Asymp		Non-Significant Effect
		GH_FR1	-1.578	2.609	6	1.0000	Asymp		Non-Significant Effect
		GH_ERC	-0.7324	2.609	6	1.0000	Asymp		Non-Significant Effect
		EV_HC1	-1.237	2.609	6	1.0000	Asymp		Non-Significant Effect
		EV_MC2	-0.9597	2.609	6	1.0000	Asymp		Non-Significant Effect
		CM_MC2	-1.187	2.609	6	1.0000	Asymp		Non-Significant Effect
		LC_SLC	-0.8081	2.609	6	1.0000	Asymp		Non-Significant Effect
		LC_LCDSSLCC	-1.086	2.609	6	1.0000	Asymp		Non-Significant Effect

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 07-6421-7638 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:23 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1317.315	119.7559	11	0.2415	0.9923	Non-Significant Effect
Error	17850.3	495.8417	36			
Total	19167.62		47			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.557	24.72	0.9995	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9021	0.9345	0.0007	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	4	114.8	83	146.6	108.1	99.64	143.4	9.995	17.41%	0.0%
① FR_UFR1	4	115.2	83.94	146.5	109.7	98.93	142.5	9.829	17.06%	-0.36%
① GH_ER2	4	120.1	87.04	153.2	116.6	98.85	148.6	10.4	17.31%	-4.65%
① CM_MC1	4	120.3	77.06	163.5	115.9	93.79	155.5	13.57	22.57%	-4.75%
FR_FRCP1	4	123.7	89.99	157.5	124	99.29	147.6	10.6	17.14%	-7.78%
GH_FR1	4	132.4	106.8	157.9	132.3	115.7	149.3	8.025	12.13%	-15.3%
GH_ERC	4	122.5	88.55	156.4	116.5	104	152.9	10.66	17.41%	-6.69%
EV_HC1	4	129.2	91.33	167.1	122.5	109.6	162.3	11.91	18.43%	-12.57%
EV_MC2	4	127	87.08	166.9	120.9	104.8	161.4	12.55	19.76%	-10.63%
CM_MC2	4	129.4	84.61	174.3	122.5	104.3	168.5	14.09	21.77%	-12.75%
LC_SLC	4	124.2	88.05	160.3	120	102.1	154.6	11.36	18.29%	-8.18%
LC_LCDSSLCC	4	125.3	96.56	153.9	120.5	109.3	150.7	9.015	14.39%	-9.1%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	113.4	143.4	102.7	99.64
① FR_UFR1	116.4	142.5	98.93	103
① GH_ER2	118.9	148.6	98.85	114.2
① CM_MC1	126.6	155.5	93.79	105.2
FR_FRCP1	133.6	147.6	99.29	114.5
GH_FR1	142.5	149.3	115.7	122
GH_ERC	120.4	152.9	104	112.7
EV_HC1	130.7	162.3	109.6	114.3
EV_MC2	129.3	161.4	104.8	112.5
CM_MC2	130.4	168.5	104.3	114.6
LC_SLC	127	154.6	102.1	113.1
LC_LCDSSLCC	116.9	150.7	109.3	124.1

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

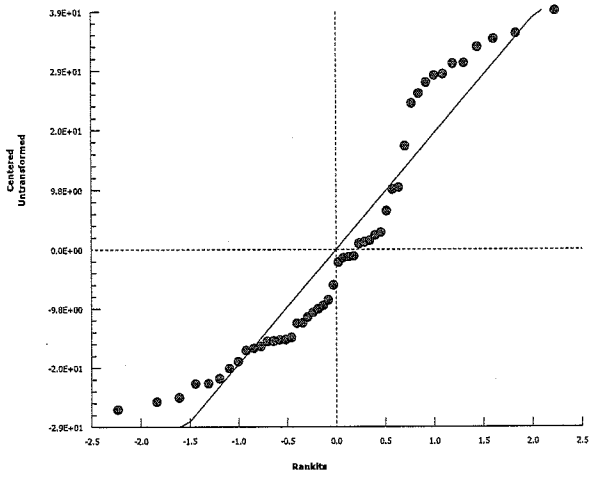
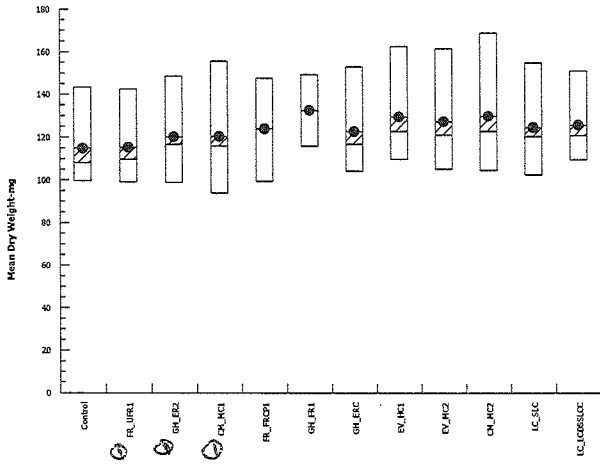
Nautilus Environmental

Analysis ID: 07-6421-7638
Analyzed: 26 Jun-18 10:23

Endpoint: Mean Dry Weight-mg
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFR1, GH_ER2 + CA_MCI
are reference sites.

CETIS Analytical Report

Report Date: 27 Jun-18 13:26 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 20-0244-1639	Endpoint: Mean Day Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 27 Jun-18 13:26	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
GH_ER2	Water Sample	Teck Coal	GH_ER2		
CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

Dunn/Bonferroni Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	0.2753	2.576		6	1.0000	Asymp	Non-Significant Effect
		CM_MC1	0.06881	2.576		6	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	-0.1789	2.576		6	1.0000	Asymp	Non-Significant Effect
		GH_FR1	-0.9221	2.576		6	1.0000	Asymp	Non-Significant Effect
		GH_ERC	-0.04129	2.576		6	1.0000	Asymp	Non-Significant Effect
		EV_HC1	-0.5918	2.576		6	1.0000	Asymp	Non-Significant Effect
		EV_MC2	-0.3165	2.576		6	1.0000	Asymp	Non-Significant Effect
		CM_MC2	-0.5092	2.576		6	1.0000	Asymp	Non-Significant Effect
		LC_SLC	-0.2064	2.576		6	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	-0.3991	2.576		6	1.0000	Asymp	Non-Significant Effect

FR_UFR1, GH_ER2 & CM_MC1
 are reference sites

CETIS Analytical Report

Report Date: 27 Jun-18 13:26 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 20-0244-1639 Endpoint: Mean ^{Wet} Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 27 Jun-18 13:26 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	755.5367	75.55367	10	0.1463	0.9986	Non-Significant Effect
Error	17039.59	516.3511	33			
Total	17795.12		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.378	23.21	0.9993	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9088	0.9295	0.0021	Non-normal Distribution

Mean ^{Wet} Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	120.7	85.95	155.4	119.4	95.36	148.6	10.92	18.09%	0.0%
GH_ER2	4	118.4	83.84	153	113.1	98.85	148.6	10.86	18.35%	1.88%
CM_MC1	4	120.3	77.06	163.5	115.9	93.79	155.5	13.57	22.57%	0.35%
FR_FRCP1	4	123.7	89.99	157.5	124	99.29	147.6	10.6	17.14%	-2.53%
GH_FR1	4	132.4	106.8	157.9	132.3	115.7	149.3	8.025	12.13%	-9.68%
GH_ERC	4	122.5	88.55	156.4	116.5	104	152.9	10.66	17.41%	-1.49%
EV_HC1	4	129.2	91.33	167.1	122.5	109.6	162.3	11.91	18.43%	-7.09%
EV_MC2	4	127	87.08	166.9	120.9	104.8	161.4	12.55	19.76%	-5.24%
CM_MC2	4	129.4	84.61	174.3	122.5	104.3	168.5	14.09	21.77%	-7.26%
LC_SLC	4	124.2	88.05	160.3	120	102.1	154.6	11.36	18.29%	-2.91%
LC_LCDSSLCC	4	125.3	96.56	153.9	120.5	109.3	150.7	9.015	14.39%	-3.79%

Mean ^{Wet} Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	117.5	148.6	95.36	121.3
GH_ER2	118.9	148.6	98.85	107.3
CM_MC1	126.6	155.5	93.79	105.2
FR_FRCP1	133.6	147.6	99.29	114.5
GH_FR1	142.5	149.3	115.7	122
GH_ERC	120.4	152.9	104	112.7
EV_HC1	130.7	162.3	109.6	114.3
EV_MC2	129.3	161.4	104.8	112.5
CM_MC2	130.4	168.5	104.3	114.6
LC_SLC	127	154.6	102.1	113.1
LC_LCDSSLCC	116.9	150.7	109.3	124.1

① FR_UFR1, GH_ER2 & CM_MC1
are reference sites.

Salmonid Embryo-Alevin Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-0244-1639

Endpoint: Mean Dry Weight-mg

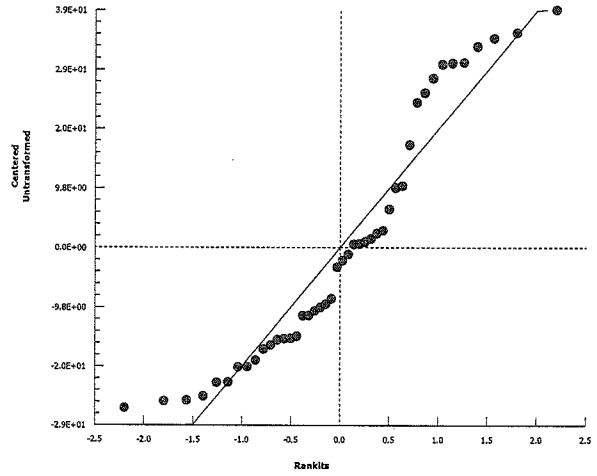
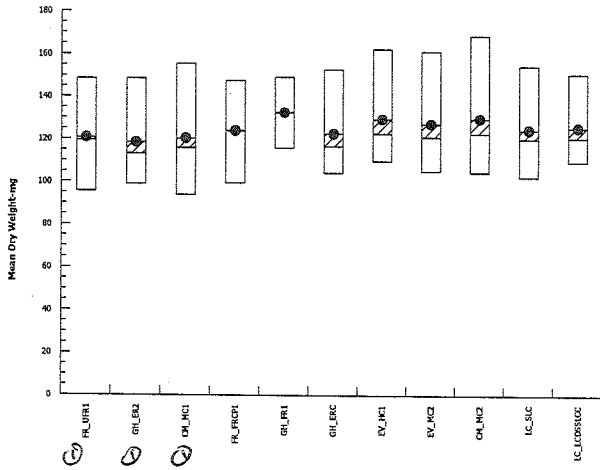
CETIS Version: CETISv1.8.7

Analyzed: 27 Jun-18 13:26

Analysis: Nonparametric-Control vs Treatments

Official Results: Yes

Graphics



① FR_UFRI, GL_ER2 + CM_MCI
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 06-9289-1090 **Endpoint:** Mean ~~Dry~~ Weight-mg **CETIS Version:** CETISv1.8.7
 Analyzed: 26 Jun-18 10:32 **Analysis:** Nonparametric-Control vs Treatments **Official Results:** Yes

Batch ID: 18-2713-2560 **Test Type:** Survival-Development-Growth **Analyst:** Yvonne Lam
 Start Date: 09 May-18 18:45 **Protocol:** EC/EPS 1/RM/28 **Diluent:** Dechlorinated Tap Water
 Ending Date: 08 Jun-18 09:30 **Species:** Oncorhynchus mykiss **Brine:**
 Duration: 29d 15h **Source:** Ted's Trout, Campbell Lake **Age:**

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
⑤ FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

Dunn/Bonferroni Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
① GH_ER2	⑤	FR_UFR1	0.3165	2.576		6	1.0000	Asymp	Non-Significant Effect
	①	CM_MC1	-0.1101	2.576		6	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	-0.3854	2.576		6	1.0000	Asymp	Non-Significant Effect
		GH_FR1	-1.115	2.576		6	1.0000	Asymp	Non-Significant Effect
		GH_ERC	-0.2477	2.576		6	1.0000	Asymp	Non-Significant Effect
		EV_HC1	-0.7707	2.576		6	1.0000	Asymp	Non-Significant Effect
		EV_MC2	-0.4955	2.576		6	1.0000	Asymp	Non-Significant Effect
		CM_MC2	-0.7157	2.576		6	1.0000	Asymp	Non-Significant Effect
		LC_SLC	-0.3578	2.576		6	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	-0.6056	2.576		6	1.0000	Asymp	Non-Significant Effect

⑤ FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 06-9289-1090 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:32 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	973.7509	97.37509	10	0.193	0.9956	Non-Significant Effect
Error	16651.42	504.5884	33			
Total	17625.17		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.493	23.21	0.9990	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9065	0.9295	0.0017	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	115.2	83.94	146.5	109.7	98.93	142.5	9.829	17.06%	0.0%
GH_ER2	4	120.1	87.04	153.2	116.6	98.85	148.6	10.4	17.31%	-4.27%
CM_MC1	4	120.3	77.06	163.5	115.9	93.79	155.5	13.57	22.57%	-4.37%
FR_FRCP1	4	123.7	89.99	157.5	124	99.29	147.6	10.6	17.14%	-7.39%
GH_FR1	4	132.4	106.8	157.9	132.3	115.7	149.3	8.025	12.13%	-14.88%
GH_ERC	4	122.5	88.55	156.4	116.5	104	152.9	10.66	17.41%	-6.3%
EV_HC1	4	129.2	91.33	167.1	122.5	109.6	162.3	11.91	18.43%	-12.16%
EV_MC2	4	127	87.08	166.9	120.9	104.8	161.4	12.55	19.76%	-10.23%
CM_MC2	4	129.4	84.61	174.3	122.5	104.3	168.5	14.09	21.77%	-12.34%
LC_SLC	4	124.2	88.05	160.3	120	102.1	154.6	11.36	18.29%	-7.79%
LC_LCDSSLCC	4	125.3	96.56	153.9	120.5	109.3	150.7	9.015	14.39%	-8.7%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	116.4	142.5	98.93	103
GH_ER2	118.9	148.6	98.85	114.2
CM_MC1	126.6	155.5	93.79	105.2
FR_FRCP1	133.6	147.6	99.29	114.5
GH_FR1	142.5	149.3	115.7	122
GH_ERC	120.4	152.9	104	112.7
EV_HC1	130.7	162.3	109.6	114.3
EV_MC2	129.3	161.4	104.8	112.5
CM_MC2	130.4	168.5	104.3	114.6
LC_SLC	127	154.6	102.1	113.1
LC_LCDSSLCC	116.9	150.7	109.3	124.1

FR_UFR1, GH_ER2 + CM_MC1
 are reference sites

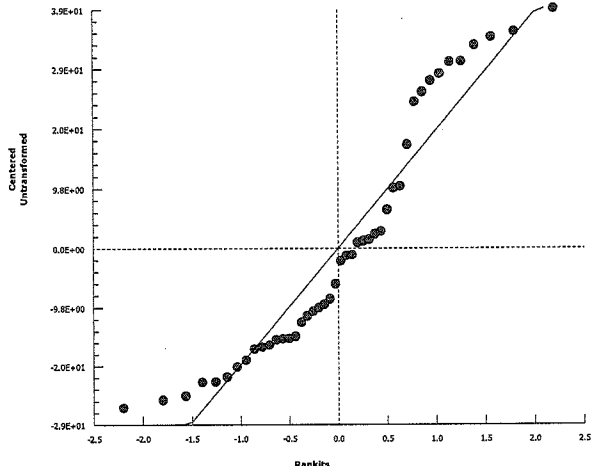
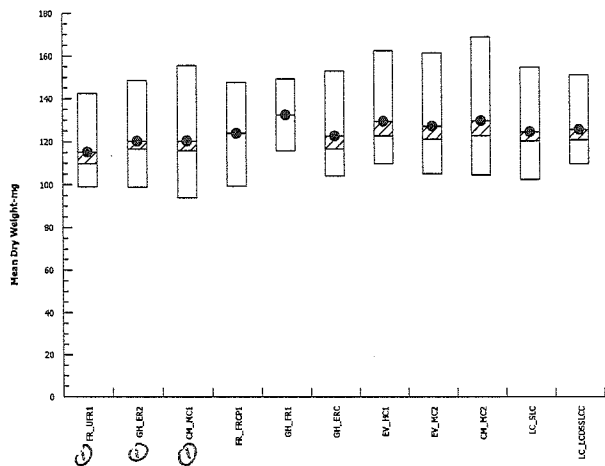
Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 06-9289-1090 Endpoint: Mean Dry Weight-mg
Analyzed: 26 Jun-18 10:32 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_VFR1, GH_ER2 + CM_MCI
are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 1 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test			Nautilus Environmental
Analysis ID: 07-9332-3695	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7	
Analyzed: 26 Jun-18 10:36	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes	
Batch ID: 18-2713-2560	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam	
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water	
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:	
Duration: 29d 15h	Source: Ted's Trout, Campbell Lake	Age:	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
① GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
① CM_MC1	19-7677-7969	08 May-18 12:05	09 May-18 10:30	31h (8.1 °C)		
FR_FRCP1	15-3661-2922	08 May-18 09:19	09 May-18 10:30	33h (9.8 °C)		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1		
① GH_ER2	Water Sample	Teck Coal	GH_ER2		
① CM_MC1	Water Sample	Teck Coal	CM_MC1		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1		
GH_FR1	Water Sample	Teck Coal	GH_FR1		
GH_ERC	Water Sample	Teck Coal	GH_ERC		
EV_HC1	Water Sample	Teck Coal	EV_HC1		
EV_MC2	Water Sample	Teck Coal	EV_MC2		
CM_MC2	Water Sample	Teck Coal	CM_MC2		
LC_SLC	Water Sample	Teck Coal	LC_SLC		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

Dunn/Bonferroni Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
① CM_MC1	①	FR_UFR1	0.3716	2.576	6	1.0000	Asymp	Non-Significant Effect	
		GH_ER2	0	2.576	6	1.0000	Asymp	Non-Significant Effect	
		FR_FRCP1	-0.3303	2.576	6	1.0000	Asymp	Non-Significant Effect	
		GH_FR1	-1.06	2.576	6	1.0000	Asymp	Non-Significant Effect	
		GH_ERC	-0.1927	2.576	6	1.0000	Asymp	Non-Significant Effect	
		EV_HC1	-0.7157	2.576	6	1.0000	Asymp	Non-Significant Effect	
		EV_MC2	-0.4404	2.576	6	1.0000	Asymp	Non-Significant Effect	
		CM_MC2	-0.6606	2.576	6	1.0000	Asymp	Non-Significant Effect	
		LC_SLC	-0.3028	2.576	6	1.0000	Asymp	Non-Significant Effect	
		LC_LCDSSLCC	-0.5505	2.576	6	1.0000	Asymp	Non-Significant Effect	

① FR_UFR1, GH_ER2 + CM_MC1
 are reference sites.

CETIS Analytical Report

Report Date: 26 Jun-18 10:49 (p 2 of 3)
 Test Code: 180712b | 05-3969-7862

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-9332-3695 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.8.7
 Analyzed: 26 Jun-18 10:36 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	973.7509	97.37509	10	0.193	0.9956	Non-Significant Effect
Error	16651.42	504.5884	33			
Total	17625.17		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.493	23.21	0.9990	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9065	0.9295	0.0017	Non-normal Distribution

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	115.2	83.94	146.5	109.7	98.93	142.5	9.829	17.06%	0.0%
GH_ER2	4	120.1	87.04	153.2	116.6	98.85	148.6	10.4	17.31%	-4.27%
CM_MC1	4	120.3	77.06	163.5	115.9	93.79	155.5	13.57	22.57%	-4.37%
FR_FRCP1	4	123.7	89.99	157.5	124	99.29	147.6	10.6	17.14%	-7.39%
GH_FR1	4	132.4	106.8	157.9	132.3	115.7	149.3	8.025	12.13%	-14.88%
GH_ERC	4	122.5	88.55	156.4	116.5	104	152.9	10.66	17.41%	-6.3%
EV_HC1	4	129.2	91.33	167.1	122.5	109.6	162.3	11.91	18.43%	-12.16%
EV_MC2	4	127	87.08	166.9	120.9	104.8	161.4	12.55	19.76%	-10.23%
CM_MC2	4	129.4	84.61	174.3	122.5	104.3	168.5	14.09	21.77%	-12.34%
LC_SLC	4	124.2	88.05	160.3	120	102.1	154.6	11.36	18.29%	-7.79%
LC_LCDSSLCC	4	125.3	96.56	153.9	120.5	109.3	150.7	9.015	14.39%	-8.7%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	116.4	142.5	98.93	103
GH_ER2	118.9	148.6	98.85	114.2
CM_MC1	126.6	155.5	93.79	105.2
FR_FRCP1	133.6	147.6	99.29	114.5
GH_FR1	142.5	149.3	115.7	122
GH_ERC	120.4	152.9	104	112.7
EV_HC1	130.7	162.3	109.6	114.3
EV_MC2	129.3	161.4	104.8	112.5
CM_MC2	130.4	168.5	104.3	114.6
LC_SLC	127	154.6	102.1	113.1
LC_LCDSSLCC	116.9	150.7	109.3	124.1

*FR_UFR1, GH_ER2 + CM_MC1
are reference sites.*

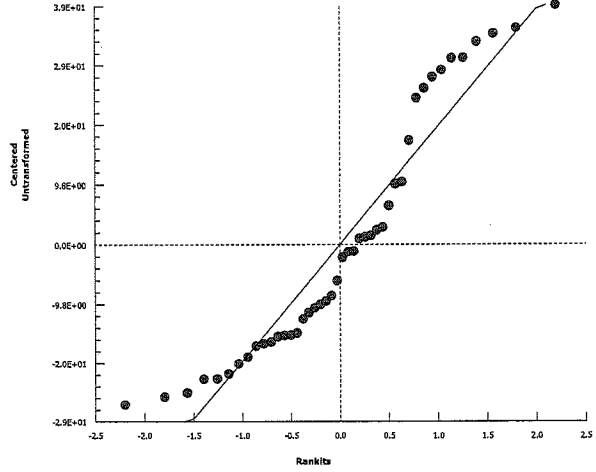
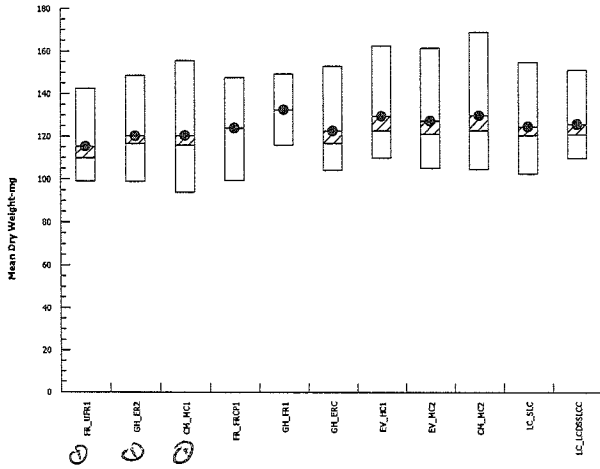
Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-9332-3695 Endpoint: Mean ~~Day~~ Weight-mg
Analyzed: 26 Jun-18 10:36 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① FR_UFRI, GH_ER2 + GH_MCI
are reference sites

CETIS Analytical Report

Report Date: 29 Oct-18 15:55 (p 1 of 3)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 18-8791-0063	Endpoint: Mean ^{wet wt} Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 29 Oct-18 15:54	Analysis: Nonparametric-Two Sample	Status Level: 1
Batch ID: 00-9484-6412	Test Type: Survival-Development-Growth	Analyst: Jill Sones
Start Date: 09 May-18 18:45	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 08 Jun-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 15h	Taxon: Actinopterygii	Source: Ted's Trout, Campbell Lake Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	13-0044-7091	08 May-18 11:07	09 May-18 10:30	32h (9.4 °C)	Teck Coal	
GH_ER2	02-7584-0638	08 May-18 11:49	09 May-18 10:30	31h (10.8 °C)		
CM_MC1	11-9385-1829	08 May-18	09 May-18	43h		Teck Coal Q2 2018
FR_FRCP1	08-9940-3747	08 May-18	09 May-18	43h		
GH_FR1	18-6228-9442	08 May-18 09:20	09 May-18 10:30	33h (12.1 °C)		
GH_ERC	14-1979-4247	08 May-18 13:42	09 May-18 10:30	29h (9.8 °C)		
EV_HC1	08-7779-1283	08 May-18 08:20	09 May-18 10:30	34h (10.1 °C)		
EV_MC2	17-2540-9979	08 May-18 09:20	09 May-18 10:30	33h (9.4 °C)		
CM_MC2	08-2839-9547	08 May-18 11:19	09 May-18 10:30	31h (9.6 °C)		
LC_SLC	16-9367-2923	08 May-18 08:59	09 May-18 10:30	34h (10.3 °C)		
LC_LCDSSLCC	07-0934-9746	08 May-18 10:05	09 May-18 10:30	33h (10.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_ERC	Water Sample	Teck Coal	GH_ERC	
EV_HC1	Water Sample	Teck Coal	EV_HC1	
EV_MC2	Water Sample	Teck Coal	EV_MC2	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
LC_SLC	Water Sample	Teck Coal	LC_SLC	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	24.85%
		GH_ER2 passed mean dry weight-mg	24.85%
		CM_MC1 passed mean dry weight-mg	24.85%
		FR_FRCP1 passed mean dry weight-mg	24.85%
		GH_FR1 passed mean dry weight-mg	24.85%
		GH_ERC passed mean dry weight-mg	24.85%
		EV_HC1 passed mean dry weight-mg	24.85%
		EV_MC2 passed mean dry weight-mg	24.85%
		CM_MC2 passed mean dry weight-mg	24.85%
		LC_LCDSSLCC passed mean dry weight-mg	24.85%

① LC_SLC = site control.

Wilcoxon Rank Sum Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
① Site Control		FR_UFR1	16	n/a	0	6	Exact	0.3429	Non-Significant Effect
		GH_ER2	17	n/a	0	6	Exact	0.4429	Non-Significant Effect
		CM_MC1	17	n/a	0	6	Exact	0.4429	Non-Significant Effect
		FR_FRCP1	18	n/a	0	6	Exact	0.5571	Non-Significant Effect
		GH_FR1	20	n/a	0	6	Exact	0.7571	Non-Significant Effect
		GH_ERC	17	n/a	0	6	Exact	0.4429	Non-Significant Effect
		EV_HC1	20	n/a	0	6	Exact	0.7571	Non-Significant Effect
		EV_MC2	19	n/a	0	6	Exact	0.6571	Non-Significant Effect
		CM_MC2	20	n/a	0	6	Exact	0.7571	Non-Significant Effect
		LC_LCDSSLCC	18	n/a	0	6	Exact	0.5571	Non-Significant Effect

CETIS Analytical Report

Report Date: 29 Oct-18 15:55 (p 2 of 3)
 Test Code/ID: 180712e / 20-0967-3141

Salmonid Embryo-Alevin Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 18-8791-0063 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 29 Oct-18 15:54 Analysis: Nonparametric-Two Sample Status Level: 1

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	973.751	97.3751	10	0.193	0.9956	Non-Significant Effect
Error	16651.4	504.588	33			
Total	17625.2		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.493	23.21	0.9990	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9065	0.9295	0.0017	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		4	115.2	83.94	146.5	109.7	98.93	142.5	9.829	17.06%	0.00%
GH_ER2		4	120.1	87.04	153.2	116.6	98.85	148.6	10.4	17.31%	-4.27%
CM_MC1		4	120.3	77.06	163.5	115.9	93.79	155.5	13.57	22.57%	-4.37%
FR_FRCP1		4	123.7	89.99	157.5	124	99.29	147.6	10.6	17.14%	-7.39%
GH_FR1		4	132.4	106.8	157.9	132.2	115.7	149.3	8.025	12.13%	-14.88%
GH_ERC		4	122.5	88.55	156.4	116.5	104	152.9	10.66	17.41%	-6.30%
EV_HC1		4	129.2	91.33	167.1	122.5	109.6	162.3	11.91	18.43%	-12.16%
EV_MC2		4	127	87.08	166.9	120.9	104.8	161.4	12.55	19.76%	-10.23%
CM_MC2		4	129.4	84.61	174.3	122.5	104.3	168.5	14.09	21.77%	-12.34%
LC_SLC	XC	4	124.2	88.05	160.3	120	102.1	154.6	11.36	18.29%	-7.79%
LC_LCDSSLCC		4	125.3	96.56	153.9	120.5	109.3	150.7	9.015	14.39%	-8.70%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1		116.4	142.5	98.93	103
GH_ER2		118.9	148.6	98.85	114.2
CM_MC1		126.6	155.5	93.79	105.2
FR_FRCP1		133.6	147.6	99.29	114.5
GH_FR1		142.5	149.3	115.7	122
GH_ERC		120.4	152.9	104	112.7
EV_HC1		130.7	162.3	109.6	114.3
EV_MC2		129.3	161.4	104.8	112.5
CM_MC2		130.4	168.5	104.3	114.6
LC_SLC	XC	127	154.6	102.1	113.1
LC_LCDSSLCC		116.9	150.7	109.3	124.1

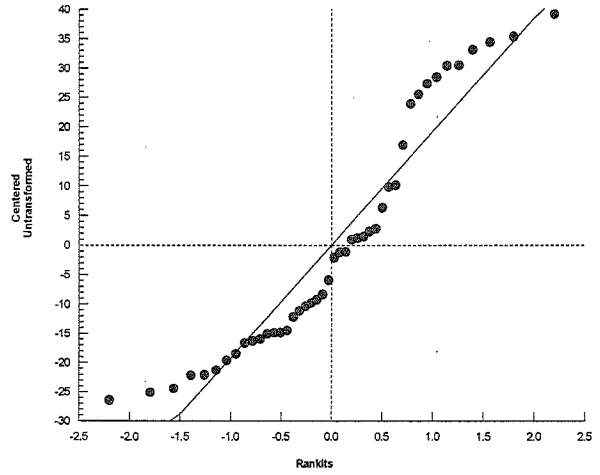
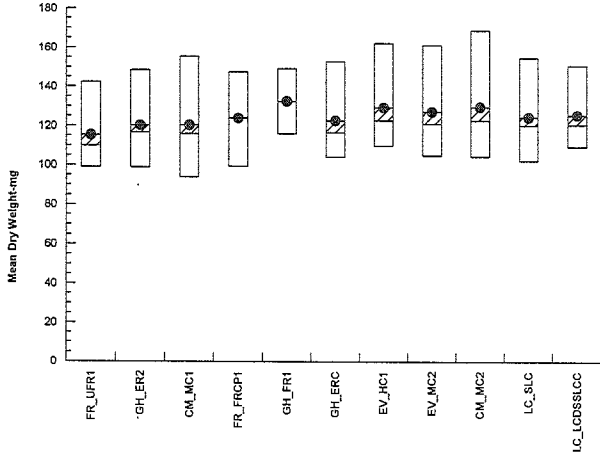
Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 18-8791-0063 Endpoint: Mean Dry Weight-mg
Analyzed: 29 Oct-18 15:54 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



Client: Teck

W.O.#: 180712_{q.6}

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
Dechlor	May 16/18	May 16/18	100	1.4	1.5	13	100	1.0	10	WML
FR_UFRI			50	4.7	4.9	90	100	1.9	190	MB
GH_ER2			50	6.5	6.6	128	100	2.2	220	MB
CM_MCI			50	4.4	4.5	86	50	5.4	108	MB
FR_FRCPI			50	6.6	6.7	130	100	3.7	370	MB
GH_FRI			50	6.9	7.0	136	100	3.9	390	MB
GH-ERC			50	6.7	6.8	132	50	8.5	170	MB
EV_HCI			50	7.4	7.5	146	100	3.6	360	MB
EV_MC2			50	4.3	4.4	84	50	6.6	132	MB
CM_MC2			50	6.4	6.5	126	100	3.4	340	MB
LC_SLC			50	5.2	5.3	102	50	6.5	130	MB
LC_LCDSSLC			50	6.6	6.7	130	100	3.2	320	MB

Notes: ¹ Dilute up to 100 mL with DI water

Reviewed by: JOU

Date Reviewed: July 5/18

Client: Teck

W.O.#: 180712-25

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
Dechlor	May 23/18	May 23/18	100	1.3	1.4	12	100 100	1.7 1.1	11	JWL
FR_UFRI			50	5.2 5.1	5.2	100	100	1.7	170	MS
GH_ER2			50	6.3	6.4	124	100	1.9	190	MS
CM-MCI			50	4.3	4.4	84	50	5.2	104	MS
FR-FRCPI			50	7.1	7.3	138	100	4.1	410	MS
GH-FRI			50	7.4	7.5	146	100	3.8	380	MS
GH-ERC			50	6.9	7.0	136	50	8.0	160	MS
EV-HCI			50	7.7	7.9	150	100	3.0	300	MS
EV-MC2			50	4.3	4.5	82	50	7.0	140	MS
CM-MC2			50	6.7	6.8	132	100	3.1	310	MS
LC-SLC			50	5.1	5.2	100	50	6.2	124	MS
LC-LCDSSLCC			50	6.9	7.0	136	100	3.0	300	MS

Notes: ① diluted up to 100 ml with DI water.

Reviewed by: JWL

Date Reviewed: July 5/18

Client: Teck

W.O.#: 180712a,b

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Dochlor	June 6/18	June 6/18	100	1.4	1.5	13	100	1.3	13	MM
FR_UFRI			50	5.9	6.0	116	100	1.9	190	MB
GH_ER2			50	6.4	6.5	126	100	1.8	180	MB
CM_MCI			50	4.2	4.3	82	50	5.5	110	MB
FR_FRCPI			50	8.5	8.6	168	100	3.5	350	MB
GH_FRI			50	7.6	7.7	150	100	3.6	360	MB
GH_ERC			50	6.7 6.5	6.7	120 6	50	7.8	156	MB
EV_HCI			50	8.7	8.8	172	100	3.2	320	MB
EV_MCZ			50	4.5	4.6	88	50	8.2	164	MB
CM_MCZ			50	6.4	6.6	124	100	3.0	300	MB
LG_SLC			50	5.3	5.5	102	50	6.5	130	MB
LL_LCDSSLCC			50	8.0 7.9	8.1 8.0	156	100	3.1	310	MB

Notes: _____

Reviewed by: JG Date Reviewed: July 9/18

APPENDIX F – Chain-of-Custody Forms

COC ID: **20180430-1411** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental			Report Format / Distribution			Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X	
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.begin@teck.com	X	X	X	
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	bryan.odgen@teck.com	X	X	X	
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X	
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@egulisonline.com	X	X	X	
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number					

SAMPLE DETAILS							ANALYSIS REQUESTED													
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h P. subcapitata P/F	7d C.dubia P/F	28 d Hyallella P/F	30 d rainbow trout early life stage P/F	7 day Rainbow trout P/F	30d EA Rainbow Trout Microbial Testing	7d C.dubia P/F with EDTA	28 d Hyallella P/F with EDTA	48 hr Single Concentration -Daphnia m.	96hr Single Concentration - R.Trout	32d FHM P/F - 10mg/L Cu	32d FHM P/F - 20mg/L Cu	
FR_FRCP1-WS-201804300956 ①	FR_FRCP1	WS		2018/04/30	9:56	G	1 X 20L	X	X	X	X			X	X		X	X	X	X
FR_LMP1-WS-201804301320	FR_LMP1	WS		2018/04/30	13:20	G	1 X 20L									X	X			
FR_UFR1-WS-201804301224 ①	FR_UFR1	WS		2018/04/30	12:24	G	1 X 20L 2 X 20L	X	X	X	X	X	X (4 Tests)					X	X	X
sample description: ① clear, colourless, odourless, some brown particulates																				
							W07	180711	180710	180713	180712	180717	180716	180710	180713	180718	180719	180714	180715	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Dylan Begin	4/30	ANDREA WEISNIK AW NAUTILUS BURNABY	MAY 1/18 @ 11:05

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Dylan Begin	865 5273
	Signature	Date/Time
		April 30, 2018

Teck

COC ID: 20180430Naut		TURNAROUND TIME:				RUSH:											
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO									
Facility Name / Job#		Elkview Operations		Lab Name		Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD					
Job Description		Q2 Chronic Toxicity Sampling - Week 1		Lab Contact		Emma Marus		Email 1:		Cameron.Griffin@teck.com	X	X	X				
Project Manager		Cameron Griffin		Email		Emma@nautilusenvironmental.ca		Email 2:		teckcoal@equisonline.com	X	X	X				
Email		Cameron.Griffin@teck.com		Address		8664 Commerce Court		Email 3:		James.Boidt@teck.com	X	X	X				
Address		RR#1 HWY# 3		City		Imperial Square, Lake City		Email 4:		Bryan.Ogden@Teck.com	X	X	X				
City		Sparwood		Province		BC		Email 6:		Teck.Lab.Results@sharepoint.teck.com	X	X	X				
Postal Code		V0B 2G1		Country		Canada		PO number		538700							
Phone Number		1-250-425-8137		City		Burnaby		Province		BC							
				Postal Code		V5A 4N7		Country		Canada							
				Phone Number		604-420-8773											
SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	C=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail				
EV_HC1_WS_2018-04-30_N①	EV_HC1	WS	N	4/30/2018	9:40	G	4	X 20L	X	X	X						
EV_MC2_WS_2018-04-30_N①	EV_MC2	WS	N	4/30/2018	12:10	G	4	X 20L	X	X	X						
								WCH	180712	180711	180710						
					Total		8										
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION				DATE/TIME		ACCEPTED BY/AFFILIATION				DATE/TIME			
trout early life stage P/F				Bryan Ogden				April 30, 2018		ANEREA WELSK AW				MAY 1/18 @ 11:05			
										NAUTILUS BURBARY							
Regular (default)		X		Sampler's Name		Bryan Ogden		Mobile #		250 425 3629							
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time		April 30, 2018							
Emergency (1 Business Day) - 100% surcharge																	
For Emergency <1 Day, ASAP or Weekend - Contact ALS																	

sample description: ① clear, colourless, odourless, some brown particulates.

COC ID: WEEKLY_CHRONIC_04302018_1		TURNAROUND TIME: Regular		RUSH:							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental		Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Jay Jones			Lab Contact	Emma Marus		Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
							Email 3:	Karen.Hannan@teck.com	X	X	X
							Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	8664 commerce Court		Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	478075		
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada				
Phone Number	1-250-425-7321			Phone Number	604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED								Filtered - F: Field, L: Lab, FL: Field & Lab, N: None					
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h P. subcapitata P/F	7d C.dubia P/F	28 d Hyalella P/F	30 d rainbow trout early life stage P/F	Rainbow Trout Microbial Testing	32d FHM P/F-10	32d FHM P/F-20							
CM_MC1_Q2_WS_20180430_N ①	CM_MC1	WS	n	4/30/2018	12:06	G	5 x 20L	X	X	X	X		X								5.0
CM_MC2_Q2_WS_20180430_N ②	CM_MC2	WS	n	4/30/2018	11:16	G	8 x 20L	X	X	X	X		X	X							5.0
CM_MC2 - EDTA									X	X											
CM_MC3_Q2_WS_20180430_N ②	CM_MC3	WS	n	4/30/2018	12:17	G	5 x 20L		X	X											4.4
								180711	180710	180713	180712		180714	180715							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
sample description: ① clear, colourless, odourless, no particulate						ANDREA WELSNIK AW		MAY 1/18 @ 11:05	
② clear, colourless, odourless, some brown particulate						NAUTILUS BURNABY			
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Mobile #		Date/Time			
Regular (default) X		Scott Holmgren/Don Sacino		250 425 7518					
Priority (2-3 business days) - 50% surcharge		Sampler's Signature							
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS								04/30/2018 14:00:00	

COC ID: 20180508-1241		TURNAROUND TIME:			RUSH:				
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO		
Facility Name / Job# Fording River Operation				Lab Name Nautilus Environmental			Report Format / Distribution		
Project Manager Neil MacDonald				Lab Contact			Email 1: neil.macdonald@teck.com		
Email Neil.MacDonald@teck.com				Email			Email 2: gylan.begin@teck.com		
Address PO Box 100				Address 8664 Commerce Court			Email 3: chelsea.jensen@teck.com		
City Elkford Province BC				City Burnaby Province BC			Email 4: jason.gravelle@teck.com		
Postal Code V0B 1H0 Country Canada				Postal Code V5A 4N7 Country Canada			Email 5: teckcoal@equisonline.com		
Phone Number 1-250-865-5204				Phone Number 604-420-8773			PO number		

SAMPLE DETAILS							ANALYSIS REQUESTED							
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 Day H. azteca P/F	30 Day Rainbow Trout embryo alevin P/F	Rainbow Trout Microbial Testing	28 d Hyalella P/F with EDTA	32d FHM P/F 10µg/L Cu - Calgary	32d FHM P/F 20µg/L Cu - Calgary	Temp °C
FR_FRCPI_MON_2018-05-07_N	FR_FRCPI	WS		2018/05/08	09:19	G	7 x 20L	X	X		X	X	X	9.8
FR_UFRI_MON_2018-05-07_N	FR_UFRI	WS		2018/05/08	11:07	G	8 x 20L	X	X	X (4 tests)		X	X	9.4
FR-FRCPI-EDTA														
								X						
								X						
								X						
								X						
								X						
								X						
								X						
								X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
All metals samples must be shipped to ALS Burnaby for analysis		Jason Gravelle		05/08/18		Nautilus - Burnaby Jayme Bucarey JB		May 09/18 @ 10:30	
SERVICE REQUEST (rush - subject to availability)						refresh sample - Q2 - week 2			
Regular (default) X		Sampler's Name		Jason Gravelle		Mobile #		250 425 4729	
Priority (2-3 business days) - 50% surcharge		Sampler's Signature				Date/Time		May 8, 2018	
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

sample desc: ① slightly turbid, light brown, no odour, some particulates
 ② clear, light yellowish-brown, no odour, some particulates

COC ID:		Q2 Chronic TOX May8_Naut		TURNAROUND TIME:		regular		RUSH:													
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO													
Facility Name: Greenhills Operations				Lab Name: Nautilus Environmental				EQuIS: GHO													
Project Manager: Leigh Stickney				Lab Contact: Emma Marus				Site: leigh.stickney@teck.com		EQuIS: GHO											
Email: leigh.stickney@teck.com				Email:				Report Format / Distribution													
Address: PO Box 5000				Address: 8664 Commence Court				Yes		PDF		Excel									
City: Elkford				Province: BC		City: Burnaby				Province: BC		Email 1: leigh.stickney@teck.com									
Postal Code: V0B 1H0				Country: Canada		Postal Code: V5A 4N7				Country: Can		Email 2: jennifer.kropp@teck.com									
Phone Number: 250 865 3274				Phone Number:				PO number:													
SAMPLE DETAILS						ANALYSIS REQUESTED															
						Please indicate below Filtered, Preserved or both (F, P, F/P)															
						#N/A #N/A #N/A #N/A #N/A None #N/A #N/A #N/A #N/A #N/A #N/A															
						72h P. subcapitata P/F															
						7d C. dubia P/F															
						28 d Hyalella P/F															
						30 d rainbow trout early life stage P/F															
						7 day Rainbow trout P/F															
						30d Rainbow Trout Microbial Testing															
						32d FHM P/F - 10ug/L Cu - Calgary															
						52d FHM P/F - 20ug/L Cu - Calgary															
						TEMP															
Sample ID		Sample Location		Field Matrix		Hazardous Material (Yes/No)		Date		Time (24hr)		G=Grab C=Comp		# Of Cont.							
GH_FR1_WS_2018-04-30_N		GH_FR1		WS		N		8-5-2018		9:20		G		2 x 20L						12.1	
GH_ER2_WS_2018-04-30_N		GH_ER2		WS		N		8-5-2018		11:49		G		4 x 20L						10.8	
GH_ERC_WS_2018-04_30_N		GH_ERC		WS		N		8-5-2018		13:42		G		3 x 20L						9.8	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS						RELINQUISHED BY/AFFILIATION						Date		Time		Accepted By/Affiliation		Date		Time	
2 barrels from FR1, 4 totes from ER2, and 3 totes from ERC																Nautilus - Burnaby		May 09/18		10:50	
																Jayme Bucaney JB					
																refuse sample - Q2 - week 2					
SERVICE REQUEST (rush - subject to availability)												Regular (default) X		Sampler's Name		Mobile #					
Priority (2-3 business days) - 50% surcharge																					
Emergency (1 Business Day) - 100% surcharge																					
For Emergency <1 Day, ASAP or Weekend - Contact ALS														Sampler's Signature		Date/Time					

sample desc: ① slightly turbid, light brown, no odour, some particulates

COC ID: WEEKLY_CHRONIC_05082018_1		TURNAROUND TIME: Regular		RUSH:			
PROJECT/CLIENT INFO				LABORATORY			
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental		Report Format / Distribution	
Project Manager Jay Jones				Lab Contact Emma Marus		Excel	PDF
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca		EDD	
Address PO Box 3000				Address 8664 commerce Court		Email 1: Scott.Holmgren@teck.com	X
City Sparwood		Province BC	City Burnaby	Province BC	Email 2: teckcoal@equisonline.com	X	X
Postal Code V0B 2G0		Country Canada	Postal Code V5A 4N7	Country Canada	Email 3: Karen.Hannan@teck.com	X	X
Phone Number 1-250-425-7321			Phone Number 604-420-8773		Email 4: Don.Sacino@teck.com	X	X
						Email 5: Jay.jones@teck.com	X
						PO number 478075	


SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	REL.	PRESERV.	ANALYSIS	REL.	PRESERV.	ANALYSIS	REL.	PRESERV.	ANALYSIS	
CM_MC1_Q2_WS_20180508_N	CM_MC1	WS	n	5/8/2018	12:05	G	4			28 d Hyalalella P/F 30 d rainbow trout early life stage P/F			28 d Hyalalella P/F with EDTA 32d FHM P/F 10µg/L Cu - Calgary			32d FHM P/F 20 µg/L Cu - Calgary	Temp 8.1
CM_MC2_Q2_WS_20180508_N	CM_MC2	WS	n	5/8/2018	11:19	G	7										9.0
CM_MC3_Q2_WS_20180508_N	CM_MC3	WS	n	5/8/2018	11:45	G	2										8.6

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME
					Nautilus - Burnaby Jayme Beancey JB		May 09/18 @ 10:30
					refresh sample - Q2 - week 2		
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Sampler's Signature		Mobile #	
Regular (default) X		Scott Holmgren/Don Sacino				250 425 7518	
Priority (2-3 business days) - 50% surcharge							
Emergency (1 Business Day) - 100% surcharge							
For Emergency <1 Day, ASAP or Weekend - Contact ALS							5/8/2018 14:00:00

sample desc: ① slightly turbid, light brown, no odour, some particulates

COC ID: 20180508-1241		TURNAROUND TIME:		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job# Fording River Operation				Lab Name HydroQual Laboratories Ltd.		Report Format / Distribution	
Project Manager Neil MacDonald				Lab Contact Jacklyn Pool		Excel PDF EDD	
Email Neil.MacDonald@teck.com				Email		Email 1: neil.macdonald@teck.com X X X	
Address PO Box 100				Address #4 6125-12th St. S.E.		Email 2: dylan.begin@teck.com X X X	
City Elford Province BC				City Calgary Province AB		Email 3: chelsea.jensen@teck.com X X X	
Postal Code V0B 1H0 Country Canada				Postal Code T2H 2K1 Country Canada		Email 4: jason.gravelle@teck.com X X X	
Phone Number 1-250-865-5204				Phone Number		Email 5: teckcoal@equisonline.com X	

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30d early life stage fathead minnow P/F (10ug/l CU Treated)	30d early life stage fathead minnow P/F (20ug/l CU Treated)	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None									
1718-1023	FR_FRCP1	WS		2018/05/08	09:19	G	4	X	X	2018/05/09 12:00 J.C. Drop off 6x 20L carboys No S/No I. Good condition									
FR_FRCP1_MON_2018-05-07_N																			
13.5°C	FR_UFR1	WS		2018/05/08	11:07	G	2	X											
FR_UFR1_MON_2018-05-07_N																			
1718-1024																			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
All metals samples must be shipped to ALS Burnaby for analysis		Jason Gravelle		05/08/18					
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		Sampler's Signature		Mobile #		Date/Time	
Regular (default) X		Jason Gravelle				250 425 4729		May 8, 2018	
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

COC ID: **WEEKLY_CHRONIC_05082018_2**

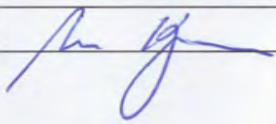
TURNAROUND TIME: **Regular**

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Claudio Quinteros			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com				Jessica Wang			Email 2:	teckcoal@equisonline.com			X
				Email	claudio@nautilusenvironmental.ca			Email 3:	Karen.Hannan@teck.com	X	X	X
					jessica@nautilusenvironmental.ca			Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	#4, 6125-12th Street S.E.			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	478075			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESERV.	ANALYSIS						
1718-1026 CM_MC1_Q2_WS_20180508_N	12.0°C CM_MC1	WS	n	5/8/2018	12:05	G	2			30 d early life stage fathead minnow P/F (10 ug/l CU Treated)						
CM_MC2_Q2_WS_20180508_N	11.8°C CM_MC2	WS	n	5/8/2018	11:19	G	4			30 d early life stage fathead minnow P/F (20 ug/l CU Treated)						
1718-1019																

J.C.
2018/05/09
12:00
Dropoff
5x 20 L carboys
NoS/NoE
Good condition

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
NB OF BOTTLES RETURNED/DESCRIPTION				
Regular (default)	X	Sampler's Name	Scott Holmgren/Don Sacino	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time
Emergency (1 Business Day) - 100% surcharge				250 425 7518
For Emergency <1 Day, ASAP or Weekend - Contact ALS				5/8/2018 14:00:00

COC ID: **20180515-1147** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 Day H. azteca	30 d rainbow trout early life stage P/F	Rainbow Trout Microbial Testing	RBT 2-5-5-10 7d P/F						
① FR_UFRI_WS_201805150915_N	FR_UFRI	WS		2018/05/15	09:15	G	10 x 20L	X	X	X	X						
② FR_FRCPI_WEK_2018-05-14-N 201805151045-N	FR_FRCPI	WS		2018/05/15	10:45	G	5 x 20L	X	X	X							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/ Jason Gravelle	15-May-18	NAUTILUS BURNABY ANDREA WELSMAN AW	MAY 16/18 @ 9:20
SERVICE REQUEST (rush - subject to availability)			Q2-WEEK3	
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name	Chelsea Jensen/ Jason Gravelle	Mobile #	250 425 4729
	Sampler's Signature	<i>Jason Gravelle</i>	Date/Time	May 15, 2018

sample desc: ① clear, light yellowish-brown, no odour, some particulates
 ② slightly turbid, light brown, no odour, some particulates

Teck

COC ID:	20180515Naut			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		Report Format / Distribution
Job Description	Q2 Chronic Toxicity Sampling - Week 3			Lab Contact	Emma Marus		Excel
Project Manager	Cameron Griffin			Email	Emma@nautilusenvironmental.ca		PDF
Email	Cameron.Griffin@teck.com			Address	8664 Commerce Court		EDD
Address	RR#1 HWY# 3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Bumaby	Province	BC
Postal Code	V0B 2G1	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8137			Phone Number	604-420-8773		PO number

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G-Grab C-Comp	# Of Cont.	ANALYSES	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail				
EV_HC1_WS_2018-05-15_N	EV_HC1	WS	N	5/15/2018	9:20	G	3	EMM	3								13.5
EV_MC2_WS_2018-05-15_N	EV_MC2	WS	N	5/15/2018	12:15	G	3	EMM	3								12.0
Total							6										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
trout early life stage P/F 30d rainbow	James Boldt	May 15, 2018	NAUTILUS BUMABY ANDREA WELSNK Au	MAY 16/18 @9:20
			Q2-week3	

Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	James Boldt	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 15, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc? ① slightly turbid, light brown, no odour some particulates

COC ID: WEEKLY_CHRONIC_05152018_1		TURNAROUND TIME: Regular		RUSH:				
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO		
Facility Name / Job# Coal Mountain Operations		Lab Name Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD
Project Manager Jay Jones		Lab Contact Emma Marus		Email 1:	Scott.Holmgren@teck.com	X	X	X
Email Jay.Jones@teck.com		Email emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
				Email 3:	Karen.Hannan@teck.com	X	X	X
				Email 4:	Don.Sacino@teck.com	X	X	X
Address PO Box 3000		Address 8664 commerce Court		Email 5:	Jay.jones@teck.com	X	X	X
City Sparwood	Province BC	City Burnaby	Province BC	PO number	478075			
Postal Code V0B 2G0	Country Canada	Postal Code V5A 4N7	Country Canada					
Phone Number 1-250-425-7321	Phone Number 604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field; L: Lab; FL: Field & Lab; N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 d Hyallemella P/F	30 d rainbow trout early life stage P/F	Rainbow Trout Microbial Testing							
CM_MC1_Q2_WS_20180515_N	CM_MC1	WS	n	5/15/2018	9:45	G	4 X 20	X	X								9.0
CM_MC2_Q2_WS_20180515_N	CM_MC2	WS	n	5/15/2018	11:12	G	6 X 20	X	X	X							10.5
CM_MC3_Q2_WS_20180515_N	CM_MC3	WS	n	5/15/2018	11:50	G	2 X 20	X									10.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION			DATE/TIME		
								NAUTILUS BURNABY ANDREA WEISINK AW			MAY 16/18 @ 9:20		
								Q2 - WEEK 3					
NB OF BOTTLES RETURNED/DESCRIPTION			Regular (default) X			Priority (2-3 business days) - 50% surcharge		Emergency (1 Business Day) - 100% surcharge		For Emergency <1 Day, ASAP or Weekend - Contact ALS			
			Sampler's Name			Scott Holmgren/Don Sacino			Mobile #		250 425 7518		
			Sampler's Signature						Date/Time		5/15/2018 14:00:00		

sample desc: ① slightly turbid, light brown, no odour, some particulates

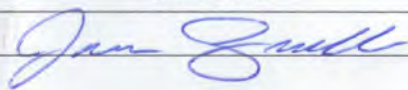
COC ID: **20180515-1206** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	HydroQual Laboratories Ltd.			Report Format / Distribution				
Project Manager	Neil MacDonald			Lab Contact	Jacklyn Pool			Email 1:	neil.macdonald@teck.com	Excel	PDF	EDD
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.bogin@teck.com	X	X	X
Address	PO Box 100			Address	#4 6125-12th St S E			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number				PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PREP.	ANALYSIS							
FR_FRCPI_WEK_2018-05-14_N	1718-1023	FR_FRCPI	WS	2018/05/15	10:45	G	4			30d early life stage fathead minnow P/F (10ug/l CU Treated)							
FR_UFR1_WS_201805150915_N	1718-1024	FR_UFR1	WS	2018/05/15	09:15	G	2			30d early life stage fathead minnow P/F (20ug/l CU Treated)							

2018/05/16
12:30
DU
8x 20L Carboys
Drop off
10c
NOS/I
good

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Jason Gravelle	15-May-18		

SERVICE REQUEST (rush - subject to availability)				
Regular (default)	X	Sampler's Name	Jason Gravelle	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time
Emergency (1 Business Day) - 100% surcharge				250 425 4729
For Emergency <1 Day, ASAP or Weekend - Contact ALS				May 15, 2018

COC ID: Q2 Chronic TOX May8_Hyd		TURNAROUND TIME: regular				RUSH:								
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO						
Facility Name: Greenhills Operations		Lab Name: Hydroqual Laboratories Ltd		EDD delivery:										
Project Manager: Leigh Stickney		Lab Contact: Jacklyn Pool		Site:	leigh.stickney@teck.com		EQuIS:	GHO						
Email: leigh.stickney@teck.com		Email:		Report Format / Distribution										
Address: PO Box 5000		Address: #4, 6125 - 12th Street S.E.		Yes	PDF	Yes	Excel							
City: Elkford		Province:	BC	City: Calgary		Province:	AB	Email 1: leigh.stickney@teck.com						
Postal Code: V0B 1H0		Country:	Canada	Postal Code: T2H 2K1		Country:	Can	Email 2: jennifer.kropp@teck.com						
Phone Number: 250 865 3274		Phone Number: 403.253.7121		Phone Number:		PO number:								
SAMPLE DETAILS				ANALYSIS REQUESTED										
				Please indicate below Filtered, Preserved or both (F, P, F/P)										
				#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
				30 d early life stage fathead minnow P/F (10 ug/ CU Treated)	30 d early life stage fathead minnow P/F (20 ug/ CU Treated)									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.							
GH_FR1_WS_2018-05-15_N	1718-1022 GH_FR1	WS	N	8-May-18	9:20	G	4	x	x					
GH_ER2_WS_2018-05-15_N	1718-1021 GH_ER2	WS	N	8-May-18	11:40	G	2	x						
2018/05/16 12:30 DU 6x20L carboys Drop off 98 NOS/I good														
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		Date	Time	Accepted By/Affiliation		Date	Time			
						2/19/2018								
SERVICE REQUEST (rush - subject to availability)														
Regular (default) <input checked="" type="checkbox"/>				Sampler's Name				Mobile #						
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time						
Emergency (1 Business Day) - 100% surcharge														
For Emergency <1 Day, ASAP or Weekend - Contact ALS														

COC ID:	WEEKLY_CHRONIC_05152018_2			TURNAROUND TIME:	Regular			RUSH:				
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Claudio Quinteros			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com				Jessica Wang			Email 2:	teckcoal@equisonline.com			X
					Email			Email 3:	Karen.Hannan@teck.com	X	X	X
					Email			Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000				Address			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC		City		Calgary	Province	AB	PO number 478075		
Postal Code	V0B 2G0	Country	Canada		Postal Code		T2H 2K1	Country	Canada			
Phone Number	1-250-425-7321				Phone Number		403-253-7121					

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F, Field; L, Lab; FL, Field & Lab; N, None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)						
CM_MC1_Q2_WS_20180515_N 1718-1020	CM_MC1	WS	n	5/15/2018	9:45	G	2	X							
CM_MC2_Q2_WS_20180515_N 1718-1019	CM_MC2	WS	n	5/15/2018	11:12	G	4	X	X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Scott Holmgren/Don Sacino	250 425 7518
Priority (2-3 business days) - 50% surcharge		
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Signature	Date/Time
		5/15/2018 14:00:00

2018/05/16 Drop OFF
 12:30
 D4
 5x20L carboys good
 82
 NOS/I

Q2 week 3 refresh

COC ID: WEEKLY_CHRONIC_05222018_1		TURNAROUND TIME: Regular		RUSH:				
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO		
Facility Name / Job# Coal Mountain Operations		Lab Name Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD
Project Manager Jay Jones		Lab Contact Emma Marus		Email 1:	Scott.Holmgren@teck.com	X	X	X
Email Jay.Jones@teck.com		Email emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
Address PO Box 3000		Address 8664 commerce Court		Email 3:	Karen.Hannan@teck.com	X	X	X
City Sparwood		Province BC	City Burnaby	Province BC	Email 4:	Don.Sacino@teck.com	X	X
Postal Code V0B 2G0		Country Canada	Postal Code V5A 4N7	Country Canada	Email 5:	Jay.jones@teck.com	X	X
Phone Number 1-250-425-7321		Phone Number 604-420-8773		PO number		478075		

SAMPLE DETAILS								ANALYSIS REQUESTED						Filtered: F: Field, L: Lab, P: Field & Lab, N: None	
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 d Hyallicella P/F	30 d rainbow trout early life stage P/F	28 d Hyallicella P/F with EDTA	32d FIM 10µM Cu Calgary	32d FIM 20µM Cu Calgary			
CM_MC1_Q2_WS_20180522_N	CM_MC1	WS	n	5/22/2018	1200	G	4 x 20L	X	X		X				9.5
CM_MC2_Q2_WS_20180522_N	CM_MC2	WS	n	5/22/2018	1115	G	6 x 20L	X	X	X	X	X			11.8
CM_MC3_Q2_WS_20180522_N	CM_MC3	WS	n	5/22/2018	1020	G	2 x 20L	X							9.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME
					ANDREA WELSIK AW NAUTILUS (BURNABY)		MAY 23/18 930
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Sampler's Signature		Mobile #	Date/Time
Regular (default) X		Scott Holmgren/Don Sacino				250 425 7518	5/22/2018 14:00:00
Priority (2-3 business days) - 50% surcharge							
Emergency (1 Business Day) - 100% surcharge							
For Emergency <1 Day, ASAP or Weekend - Contact ALS							

sample desc: ① slightly turbid, light brown, no odour, some particulates

Q2 week 3 refresh

COC ID: **20180522-1332** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	HydroQual Laboratories Lt.			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.beggs@teck.com	X	X	X
Address	PO Box 100			Address	#4 6125-12th Street S.E.			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			
Phone Number	1-250-865-5204			Phone Number				PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 Day Fathead Minnow P/F (10ug/l CU Treated)	30 Day Fathead Minnow P/F (20ug/l CU Treated)	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None								
FR_FRCPI_WEK_2018-05-21_N 1718-1023	FR_FRCPI	WS	16.3°C	2018/05/22	09:56	G	4	X	X									
FR_UFRI_WEK_2018-05-21_N 1718-1024	FR_UFRI	WS	17.0°C	2018/05/22	11:30	G	2	X										
2018/05/23 11:00 5L box 20L carboys No S/No L Good condition Dropoff																		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis				

SERVICE REQUEST (rush - subject to availability)		Sampler's Name	Mobile #
Regular (default) X		Chelsea Jensen	2504254729
Priority (2-3 business days) - 50% surcharge			
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Sampler's Signature	Date/Time
			May 22, 2018

Teck

COC ID: **Q2 Chronic TOX May22_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:					
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com		EQUIS:	GHO	
Email	leigh.stickney@teck.com			Email				Report Format / Distribution					
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel		
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com					
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com					
Phone Number	250 865 3274			Phone Number	403.253.7121			Email 3: jeremy.enns@teck.com					
								PO number					

SAMPLE DETAILS **ANALYSIS REQUESTED**

SAMPLE DETAILS								ANALYSIS REQUESTED																	
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																	
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A				
								30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)																
GH_FR1_WS_2018-05-28_N	1718-1022 GH_FR1	WS	N	28-May-18	10:50	G	4	x	x																
GH_ER2_WS_2018-05-28_N	1718-1021 GH_ER2	WS	N	28-May-18		G	2	x																	
2018/05/30 10:50 Du 6x 20L carboys Drop off NOS/I good 11.9c																									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: WEEKLY_CHRONIC_05222018_2		TURNAROUND TIME: Regular			RUSH:														
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO												
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories			Report Format / Distribution												
Project Manager Jay Jones				Lab Contact Claudio Quinteros			Email 1:	Scott.Holmgren@teck.com	Excel	PDF	EDD								
Email Jay.Jones@teck.com				Jessica Wang			Email 2:	teckcoal@equisonline.com											
				Email claudio@nautilusenvironmental.ca			Email 3:	Karen.Hannan@teck.com	X	X	X								
				Email jessica@nautilusenvironmental.ca			Email 4:	Don.Sacino@teck.com	X	X	X								
Address PO Box 3000				Address #4, 6125-12th Street S.E.			Email 5:	Jay.jones@teck.com	X	X	X								
City Sparwood		Province BC	City Calgary		Province AB	PO number 478075													
Postal Code V0B 2G0		Country Canada	Postal Code T2H 2K1		Country Canada														
Phone Number 1-250-425-7321		Phone Number 403-253-7121																	
SAMPLE DETAILS							ANALYSIS REQUESTED				<small>Filtered - F; Field, L; Lab, FL; Field & Lab, N; None</small>								
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PHIL	PHSTREV	ANALYSIS									
CM_MC1_Q2_WS_20180522_N 1718-1020	CM_MC1	WS	n	5/22/2018		G	2			30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	X	14.8°C							
CM_MC2_Q2_WS_20180522_N 1718-1019	CM_MC2	WS	n	5/22/2018		G	4			30 d early life stage fathead minnow P/F (20 ug/l CU Treated)	X	15.3°C	X						
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION				DATE/TIME	ACCEPTED BY/AFFILIATION			DATE/TIME								
NB OF BOTTLES RETURNED/DESCRIPTION																			
Regular (default) X			Sampler's Name		Scott Holmgren/Don Sacino			Mobile #		250 425 7518									
Priority (2-3 business days) - 50% surcharge			Sampler's Signature					Date/Time		5/22/2018 14:00:00									
Emergency (1 Business Day) - 100% surcharge																			
For Emergency <1 Day, ASAP or Weekend - Contact ALS																			

2018/05/23
11:00
JC
6x 20L carbonyl

Dropoff
NoS/NoI
Good condition

COC ID: 20180529-1420

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0		Country	Canada	Postal Code	V5A 4N7		Country	Canada	Email 5:	teckcoal@equisonline.com	X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 Day Rainbow Trout early life stage P/F	30 Day Rainbow Trout Microbial Testing	300 FHM P/F 10 mg/L Cu (Calogec)	320 FHM P/F 20 mg/L Cu (Calogec)						
① FR_FRCPI_WEK_2018-05-28_N	FR_FRCPI	WS		2018/05/29	10:10	G	5	X	X	X	X						10.5
② FR_UFR1_WEK_2018-05-28_N	FR_UFR1	WS		2018/05/29	13:00	G	1	X	X	X	X						11.5
								2	6	4	5						
								7	7	7	7						
								0	0	0	0						
								1	1	1	1						
								#	#	#	#						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	28-May-18	ANDREA WELSKAW NAUTILUS BURNABY Q2 - WEEK 5	MAY 30/18 @ 9:15
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 29/18
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc: ① slightly turbid, light brown, no odour, some particulates
 ② clear, light yellowish brown, no odour, some particulates

Teck

Q2-week 5

COC ID: 20180529Naut		TURNAROUND TIME:		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job# Elkview Operations				Lab Name Nautilus Environmental		Report Format / Distribution	
Job Description Q2 Chronic Toxicity Sampling - Week 4				Lab Contact Emma Marus		Excel	PDF
Project Manager Cameron Griffin				Email Emma@nautilusenvironmental.ca		Excel	PDF
Email Cameron.Griffin@teck.com				Address 8664 Commerce Court		Excel	PDF
Address RR#1 HWY# 3				Imperial Square, Lake City		Excel	PDF
City Sparwood Province BC				City Burnaby Province BC		Excel	PDF
Postal Code V0B 2G1 Country Canada				Postal Code V5A 4N7 Country Canada		Excel	PDF
Phone Number 1-250-425-8137				Phone Number 604-420-8773		Excel	PDF

SAMPLE DETAILS								ANALYSIS REQUESTED													
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail								
EV_HCI_WS_2018-05-29_N	EV_HCI	WS	N	5/29/2018	10:45	G	3	col	3								PC				
EV_MC2_WS_2018-05-29_N	EV_MC2	WS	N	5/29/2018	12:15	G	3	col	3								8.8				
Total							6		W07/180712 30d Rbt EA P/F												8.8

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
trout early life stage P/F	Bryan Ogden	May 29, 2018	Nautilus - Burnaby Janyne Burgess Q2-week 5	May 30/18 @ 09:15

Regular (default) X	Sampler's Name	Bryan Ogden	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 29, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

W07 180712 - 30d Rbt EA P/F

sample desc: slightly turbid, light brown, no odour, some particulates

Temp: EV_MC2 8.8°C
EV_HCI 8.8°C

COC ID: WEEKLY_CHRONIC_05292018_1		TURNAROUND TIME:		REGULAR		RUSH:	NO				
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO				
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental			Report Format / Distribution				
Project Manager Jay Jones				Lab Contact Emma Marus			Email 1:	Scott.Holmgren@teck.com	Excel X	PDF X	EDD X
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
Address PO Box 3000				Address 8664 commerce Court			Email 3:	Karen.Hannan@teck.com	X	X	X
City Sparwood		Province BC	City Burnaby	Province BC	Postal Code V5A 4N7	Country Canada	Email 4:	Don.Sacino@teck.com	X	X	X
Postal Code V0B 2G0		Country Canada	Postal Code V5A 4N7	Country Canada			Email 5:	Jay.jones@teck.com	X	X	X
Phone Number 1-250-425-7321		Phone Number 604-420-8773				PO number		478075			

SAMPLE DETAILS								ANALYSIS REQUESTED								Filtered: F: Field; L: Lab; FL: Field & Lab; N: None		
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS										
CM_MC1_Q2_WS_20180529_N	CM_MC1	WS	n	5/29/2018	10:05	G	3	30 d rainbow trout early life stage P/F	X	X								7.0
CM_MC2_Q2_WS_20180529_N	CM_MC2	WS	n	5/29/2018	10:46	G	6	30d FHM P/F 10.2g/L Cr (Calgary)	X	X	X							9.0
CM_MC3_Q2_WS_20180529_N	CM_MC3	WS	n	5/29/2018	11:22	G	2	30d FHM P/F 20 ug/L Cr (Calgary)	X									8.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION			DATE/TIME	
								AUDREA WELSHAK AW NAUTILUS BURNABY Q2 WEEK 5			MAY 30/18 @ 9:15	
NB OF BOTTLES RETURNED/DESCRIPTION			Sampler's Name			Scott Holmgren/Don Sacino		Mobile #		250 425 7518		
Regular (default) X			Sampler's Signature					Date/Time		5/29/2018 14:00:00		
Priority (2-3 business days) - 50% surcharge												
Emergency (1 Business Day) - 100% surcharge												
For Emergency <1 Day, ASAP or Weekend - Contact ALS												

sample desc: ① slightly turbid, light brown, no odour some - particulates.

- W0# 180712 - 30d Rbt EA P/F
- W0# 180714 - 32d FHM P/F 10 ug/L Cr (Calgary)
- W0# 180715 - 32d FHM P/F 20 ug/L Cr (Calgary)

COC ID: **20180529-0916**

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x
Address	Box 2003			Address	8664 Commerce Court			Email 3:	heidi.mettler@teck.com	x	x
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com		X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	VP000432106		
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada				
Phone Number	250-425-3196			Phone Number	604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED																
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28 Day H. azteca	30 d rainbow trout early life stage P/F															
① LC_LCDSSLCC_WS_2018-05-28_N	LC_LCDSSLCC	WS	N	2018/05/29	09:10	G	3 X20L	X	x															9.3
① LC_SLC_WS_2018-05-28_N	LC_SLC	WS	N	2018/05/29	08:11	G	3 X20L	X	x															8.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	D.Tymstra/H.Mettler/T. Phillips	May 29, 2018	ANDREA WELSH NAUTILUS BURNABY @ 2 weeks	MAY 30 / 18 @ 9:15
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	H. Mettler/ T. Phillips/D. Tymstra	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 29, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc: ① clear, no colour, no odour some particulates.

COC ID: 201805229-1430

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	HydroQual Laboratories Lt			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4 6125-12th Street S E			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number				PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED																
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FR	PRESERV.	ANALYSIS														
FR_FRCP1_WEK_2018-05-28_N	1718-1023	FR_FRCP1	WS	2018/05/29	10:10	G	4			30 Day Fathead Minnow P/F (10ug/l CU Treated)	X													
FR_UFR1_WEK_2018-05-28_N	1718-1024	FR_UFR1	WS	2018/05/29	13:00	G	2			30 Day Fathead Minnow P/F (20ug/l CU Treated)	X													
<p>2018/05/30 10:50 DU 8x20L carboys DROP OFF 10.6°C NCS/I good</p>																								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	May 29, 2018		
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 29, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Teck

COC ID: **Q2 Chronic TOX May22_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:					
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com		EQUIS:	GHO	
Email	leigh.stickney@teck.com			Email				Report Format / Distribution					
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel		
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com					
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com					
Phone Number	250 865 3274			Phone Number	403.253.7121			Email 3: jeremy.enns@teck.com					
								PO number					

SAMPLE DETAILS **ANALYSIS REQUESTED**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)															
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A				
GH_FR1_WS_2018-05-28_N	1718-1022 GH_FR1	WS	N	28-May-18	10:50	G	4	x	x														
GH_ER2_WS_2018-05-28_N	1718-1021 GH_ER2	WS	N	28-May-18		G	2	x															
2018/05/30 10:50 Du 6x 20L carboys Drop off NOS/I good 11.92																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default) X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name		Mobile #	
Sampler's Signature		Date/Time	

COC ID: **WEEKLY_CHRONIC_05292018_2** TURNAROUND TIME: **REGULAR** RUSH: **NO**

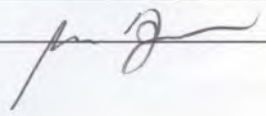
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories			Report Format / Distribution				
Project Manager	Jay Jones			Lab Contact	Claudio Quinteros			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com				Jacklyn Poole			Email 2:	teckcoal@equisonline.com			X
				Email	claudio@nautilusenvironmental.ca			Email 3:	Karen.Hannan@teck.com	X	X	X
					jacklyn@nautilusenvironmental.ca			Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	#4, 6125-12th Street S.E.			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	478075			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PHL									
CM_MC1_Q2_WS_20180529_N 1718-1020	CM_MC1	WS	n	5/29/2018	10:05	G	2										
CM_MC2_Q2_WS_20180529_N 1718-1019	CM_MC2	WS	n	5/29/2018	10:46	G	4										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default)	X	Scott Holmgren/Don Sacino	250 425 7518
Priority (2-3 business days) - 50% surcharge			
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

2018/05/30 Drop off
 10:50 10.12
 DU NOS/I
 6x20L carbonyls good



COC ID: 20180605-1412

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Burnaby Nautilus			Report Format / Distribution				
Project Manager	Neil MacDonald			Lab Contact	Neil MacDonald			Email 1:	neil.macdonald@teck.com	Excel	PDF	EDD
Email	Neil.MacDonald@teck.com			Email	neil.macdonald@teck.com			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	2084 Inglewood Hwy			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 1W9	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-233-3333			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	48 hr Single Concentration -Daphnia m.	96hr Single Concentration - R.Trout	30 Day Rainbow Trout early life stage P/F	Rainbow Trout Microbial Testing (4 tests)	32d FHM P/F - 10µg/L Cu conducted in Calgary	32d FHM P/F - 20µg/L Cu conducted in Calgary							
FR_ECI_MON_2018-06-04_N	FR_ECI	WS		2018/06/05	11:49	G	1 x 20L	X	X											13.0
FR_FRCP1_MON_2018-06-04_N	FR_FRCP1	WS		2018/06/05	09:20	G	5 x 20L			X	X	X								10.3
FR_LP1_MON_2018-06-04_N	FR_LP1	WS		2018/06/05	12:34	G	1 x 20L	X	X											12.3
FR_UFR1_MON_2018-06-04_N	FR_UFR1	WS		2018/06/05	11:44	G	1 barrel			X	X	X								10.3
								180719	180723	180712	180716	180714	180715							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	05-May-18 05-June-18	ANDREA WELSH/KM NAUTILUS BURNABY Q2 - week 6	JUN 6/18 @ 8:30
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	May 05, 2018
Emergency (1 Business Day) - 100% surcharge				June 05, 2018
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc: ① slightly turbid, light brown, no odour, some particulates
 ② clear light yellowish-brown, no odour, some particulates

May 05, 2018
 June 05, 2018

Teck

COC ID:	20180605Naut			TURNAROUND TIME:		RUSH:						
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD	
Job Description	Q2 Chronic Toxicity Sampling			Lab Contact	Emma Marus			Email 1:	Cameron.Griffin@teck.com	X	X	X
Project Manager	Cameron Griffin			Email	Emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
Email	Cameron.Griffin@teck.com			Address	8664 Commerce Court			Email 3:	James.Boldt@teck.com	X	X	X
Address	RR#1 HWY# 3				Imperial Square, Lake City			Email 4:	Bryan.Ogden@Teck.com	X	X	X
								Email 6:	Teck.Lab.Results@sharepoint.teck.com	X	X	X
City	Sparwood		Province	BC	City	Burnaby	Province	BC	PO number			
Postal Code	VOB 2G1		Country	Canada	Postal Code	V5A 4N7	Country	Canada				
Phone Number	1-250-425-8137			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail				
EV_HC1_WS_2018-06-05_N	EV_HC1	WS	N	6/5/2018	7:50	G	2 X20L		2								TC
EV_MC2_WS_2018-06-05_N	EV_MC2	WS	N	6/5/2018	9:15	G	2 X20L		2								2.0
							Total	4									

wo# 180712

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
30d rainbow trout early life stage P/F	Bryan Ogden	June 5, 2018	ANDREA WELSHAW Aw NAUTILUS ENVIRONMENTAL 07- W00K6	JUN 6/18 @ 8:30
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Bryan Ogden	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	June 5, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc: ① slightly turbid, light brown, no odour, some particulates

COC ID:	20180605-1009			TURNAROUND TIME:		RUSH:					
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x
Address	Box 2003			Address	8664 Commerce Court			Email 3:	heid.mettler@teck.com	x	x
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com		x
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	FPO00432106		
Postal Code	VOB 2G0		Country	Canada	Postal Code	V5A 4N7	Country	Canada			
Phone Number	250-425-3196			Phone Number	604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED														
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS
								28 Day H. azteca	30 d rainbow trout early life stage P/F													
LC_LCDSSLCC_MNT_2018-06-05_N	LC_LCDSSLCC	WS	N	2018/06/05	09:35	G	2 X20L	X	X													50
LC_SLC_MNT_2018-06-05_N	LC_SLC	WS	N	2018/06/05	09:02	G	2 X20L	X	X													10.5
																						8.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	D.Tymstra/H.Mettler/T. Phillips	June 5, 2018	ANDREA WELSNIK AW NAUTILUS BURNABY Q2 - W0K6	JUN 6 10 @ 8:30
SERVICE REQUEST (rush - subject to availability)				
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	H. Mettler/ T. Phillips/D. Tymstra		Mobile #
Priority (2-3 business days) - 50% surcharge	Sampler's Signature			Date/Time
Emergency (1 Business Day) - 100% surcharge				June 5, 2018
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

sample desc: clear, no colour, no odour, no particulates

COC ID: 20180605-1423

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	HydroQual Laboratories Ltd			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Jacklyn Pool			Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email				Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4 6125-12th st SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	VOB 1H0		Country	Canada	Postal Code	T2H 2K1		Email 5:	teck.coi@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number				PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G-Grab C-Comp	# Of Cont.	30 Day early life stage Fathead Minnow P/F (10ug/l CU Treated)	30 Day early life stage Fathead Minnow P/F (20ug/l CU Treated)	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None		
FR_FRCPI_MON_2018-06-04_N 1718-1023	FR_FRCPI	WS		2018/06/05	09:20	G	4	X	X			
FR_UFRI_MON_2018-06-04_N 1718-1024	FR_UFRI	WS		2018/06/05	11:44	G	2	X				

2018/06/06
11:15
DU
8x20L carboys
Drop off
9:02
NOS/I
good

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	05-Jun-18		

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Chelsea Jensen/Jason Gravelle		250 425 4729	June 5, 2018

COC ID: **Q2 Chronic TOX May22_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name: Greenhills Operations				Lab Name: Hydroqual Laboratories Ltd				EDD delivery:					
Project Manager: Leigh Stickney				Lab Contact: Jacklyn Pool				Site: leigh.stickney@teck.com		EQuIS: GHO			
Email: leigh.stickney@teck.com				Email:				Report Format / Distribution					
Address: PO Box 5000				Address: #4, 6125 - 12th Street S.E.				Yes		PDF		Yes	
City: Elkford				Province: BC		City: Calgary		Province: AB		Email 1: leigh.stickney@teck.com			
Postal Code: V0B 1H0				Country: Canada		Postal Code: T2H 2K1		Country: Can		Email 2: jennifer.kropp@teck.com			
Phone Number: 250 865 3274				Phone Number: 403.253.7121				PO number:					

SAMPLE DETAILS **ANALYSIS REQUESTED**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)															
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A				
GH_FR1_WS_2018-06-04_N	1718-1022 GH_FR1	WS	N	09 4-Jun-18	9:40	G	3	x	x														
GH_ER2_WS_2018-06-04_N	1718-1021 GH_ER2	WS	N	05 4-Jun-18	11:40	G	4	x															
<p>2018/06/06 11:15 DU 6x20L carboys Drop OFF NOS/I good 8.12</p>																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	Date/Time	
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: **WEEKLY_CHRONIC_06052018_2**

TURNAROUND TIME:

REGULAR

RUSH:

NO

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Jay Jones			Lab Contact	Claudio Quintros			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com				Jacklyn Poole			Email 2:	teckcoal@equisonline.com			X
					claudio@nautilusenvironmental.ca			Email 3:	Karen.Hannan@teck.com	X	X	X
					jacklyn@nautilusenvironmental.ca			Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	#4, 6125-12th Street S.E.			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	478075			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F, Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)						
CM_MC1_Q2_WS_20180605_N 1718-1020	CM_MC1	WS	n	6/5/2018	10:06	G	2	X							
CM_MC2_Q2_WS_20180605_N 1718-1019	CM_MC2	WS	n	6/5/2018	10:32	G	4	X	X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Scott Holmgren/Don Sacino	Mobile #	250 425 7518
Regular (default)	X	Sampler's Signature		Date/Time	6/5/2018 14:00:00
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

2018/06/06 Drop off
11:15 6.6°C
D4 NO S/I
6x20 carboys good

END OF REPORT

Appendix B-3
Third Quarter 2018 Results: Toxicity testing on
Elk Valley samples with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata, *Hyalella azteca* and
Pimephales promelas



**Toxicity testing on Elk Valley samples
with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata,
Hyalella azteca and *Pimephales
promelas***

Third Quarter 2018 Results

Final Report

January 30, 2019

Submitted to: **Teck Coal Ltd.**
Sparwood, BC

TABLE OF CONTENTS

	Page
Signature Page.....	iii
Summary	iv
1.0 Introduction	1
2.0 Methods.....	4
3.0 Results.....	9
3.1 <i>Ceriodaphnia dubia</i>	9
3.2 <i>Pseudokirchneriella subcapitata</i>	9
3.3 <i>Hyalella azteca</i>	9
3.4 <i>Pimephales promelas</i>	10
4.0 QA/QC.....	17
5.0 References.....	18

List of Tables

Table 1.	Summary of toxicity testing program.....	2
Table 2.	Test conditions: <i>Ceriodaphnia dubia</i> survival and reproduction test.	5
Table 3.	Test conditions: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	6
Table 4.	Test conditions: <i>Hyalella azteca</i> survival and growth test.	7
Table 5.	Test conditions: <i>Pimephales promelas</i> survival and growth test.	8
Table 6.	Results: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	11
Table 7.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	12
Table 8.	Results: <i>Hyalella azteca</i> survival and growth test.....	13
Table 9.	Results: <i>Pimephales promelas</i> survival and growth test.....	16
Table 10.	Reference toxicant test results.	17

List of Figures

Figure 1.	Chronic toxicity monitoring locations.	3
-----------	---	---

List of Appendices

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data

APPENDIX C – *Hyalella azteca* Toxicity Test Data

APPENDIX D – *Pimephales promelas* Toxicity Test Data

APPENDIX E – Chain-of-Custody Forms

SIGNATURE PAGE



Report By:
Jacklyn Poole, B.Sc.
Laboratory Biologist



Reviewed By:
James Elphick, R.P.Bio.
Environmental Toxicologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Summaries of sample information and test results from the toxicity tests conducted on samples collected from the Elk Valley to meet requirements of the quarterly toxicity testing program required under BC Ministry of Environment and Sustainability permit number 107517 in the third quarter of 2018 are provided in the tables below.

Sample and Test Type Information

Sample IDs	FR_UFR1 (site control), GH_ER2 (site control), CM_MC1 (site control), LC_SLC (site control) [†] , FR_FRCP1, GH_FR1, GH_ERC [*] , EV_MC2 [*] , EV_HC1 [*] , CM_MC2, CM_CM3 [†] and LC_LCDSSLCC [*]
Sample collection dates	August 7, 14, 15, 21, 28 and September 4, 2018
Sample receipt dates	August 8, 15, 16, 22, 29 and September 5, 2018
Sample receipt temperatures	Ranged from 9.3 to 19.0°C
Test types	<i>Ceriodaphnia dubia</i> 7-d survival and reproduction
	<i>Pseudokirchneriella subcapitata</i> 72-h growth inhibition
	<i>Hyalella azteca</i> 28-d survival and growth
	<i>Pimephales promelas</i> 32-d survival and growth

* Tested with *C. dubia* and *P. subcapitata* only

† Tested with *C. dubia*, *P. subcapitata* and *H. azteca* only

Summary of Results

Endpoint	Mean ± SD						
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	LC_SLC (Site Control)	FR_FRCP1	GH_FR1
<i>C. dubia</i>							
Survival (%)	100	90	100	80	100	80	90
Reproduction	18.3 ± 3.8	20.3 ± 7.1	17.5 ± 5.0	17.7 ± 9.7	19.5 ± 3.5	8.4 ± 5.1 ^{*αβ†‡}	18.3 ± 3.3
<i>P. subcapitata</i>							
Cell Yield (x 10 ⁴ cells/mL)	29.6 ± 2.3	100.4 ± 6.9	104.9 ± 8.9	99.9 ± 8.6	106.2 ± 8.1	113.0 ± 5.9	108.8 ± 9.8
<i>H. azteca</i>							
Survival (%)	88.0 ± 8.4	94.0 ± 5.5	94.0 ± 5.5	84.0 ± 19.5	62.0 ± 32.7 ^{αβ}	98.0 ± 4.5	96.0 ± 5.5
Dry weight (mg)	0.30 ± 0.08	0.54 ± 0.08	0.43 ± 0.03	0.41 ± 0.14	0.35 ± 0.27	0.43 ± 0.05	0.39 ± 0.08

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

[‡] Results was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD					
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	CM_MC3	LC_LCDSSLCC
<i>C. dubia</i>						
Survival (%)	90	100	100	90	100	100
Reproduction	19.5 ± 7.2	16.3 ± 4.7	22.8 ± 6.1	5.4 ± 2.1 ^{*αβ†‡}	14.1 ± 4.0 ^{α‡}	19.4 ± 3.3
<i>P. subcapitata</i>						
Cell Yield (x 10 ⁴ cells/mL)	108.8 ± 6.8	106.5 ± 4.2	98.5 ± 12.4	93.0 ± 6.6	95.8 ± 7.4	97.0 ± 12.2
<i>H. azteca</i>						
Survival (%)	NT	NT	NT	26.0 ± 11.4 ^{*αβ†‡}	68.0 ± 32.7 ^{αβ}	96.0 ± 8.9
Dry weight (mg)	NT	NT	NT	0.03 ± 0.02 ^{*αβ†}	0.07 ± 0.02 ^{*αβ†}	0.45 ± 0.09

SD = Standard Deviation, NT=Not Tested

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

[‡] Results was significantly greater than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD						
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1	CM_MC2
<i>P. promelas</i>							
10 µg/L Cu							
Hatch (%)	98.3 ± 3.3	100 ± 0.0	96.7 ± 6.7	96.7 ± 6.7	95.0 ± 6.4	100 ± 0.0	100 ± 0.0
Survival (%)	86.7 ± 5.4	88.3 ± 11.4	59.9 ± 42.4 *	91.7 ± 6.4	8.3 ± 6.4 * ^{αβ†}	68.3 ± 29.5 * ^{α†}	35.0 ± 32.8 * ^{αβ†}
Biomass (mg)	3.63 ± 0.58	3.17 ± 0.26	1.97 ± 0.56 *	3.36 ± 0.34	0.92 ± 0.65 * ^{αβ†}	2.54 ± 0.49 * ^{α†}	1.63 ± 1.13 * ^{α†}
Length (mm)	12.3 ± 0.4	12.0 ± 0.6	11.6 ± 1.8	11.4 ± 0.5 *	17.5 ± 1.3	12.1 ± 0.7	12.5 ± 1.2
Normal devt. (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0
20 µg/L Cu							
Hatch (%)	100 ± 0.0	NT	NT	NT	100 ± 0.0	95.0 ± 3.3	100 ± 0
Survival (%)	93.3 ± 0.0	NT	NT	NT	1.7 ± 3.3 [§]	86.2 ± 8.0	41.7 ± 14.8 [§]
Biomass (mg)	4.00 ± 0.24	NT	NT	NT	0.23 ± 0.45 [§]	3.57 ± 0.19 [§]	2.46 ± 0.50 [§]
Length (mm)	12.1 ± 0.4	NT	NT	NT	17.0 ± 0.0	12.5 ± 0.3	13.8 ± 1.0
Normal devt. (%)	100 ± 0.0	NT	NT	NT	100 ± 0.0	100 ± 0.0	100 ± 0.0

SD = Standard Deviation, NT=Not Tested

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

^β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

[†] Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

[§] Result was significantly lower than the 20 µg/L copper-treated laboratory control

1.0 INTRODUCTION

Nautilus Environmental conducted toxicity tests for Teck Coal Ltd. on samples collected from various locations in the Elk Valley as part of a quarterly toxicity testing program required under BC Ministry of Environment and Climate Change Strategy permit number 107517. Test species required to be tested quarterly include a cladoceran (*Ceriodaphnia dubia*), a unicellular green alga (*Pseudokirchneriella subcapitata*), an amphipod (*Hyalella azteca*), and the fathead minnow (*Pimephales promelas*).

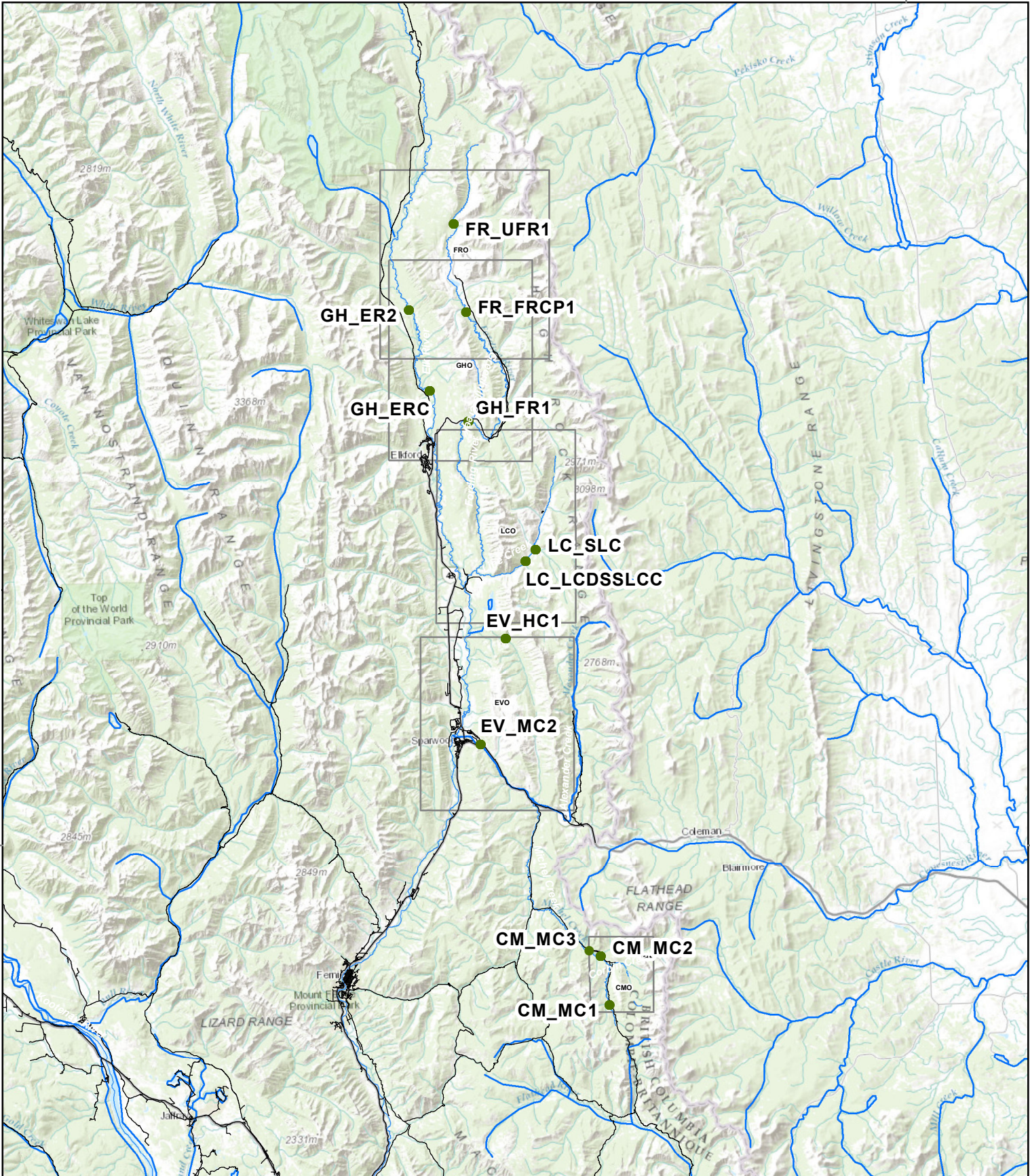
Water samples used for testing were transported in 20-L plastic containers in coolers containing ice packs, or in 200-L plastic drums. Samples were received at temperatures ranging from 9.3 to 19.0°C and were stored in the dark at $4 \pm 2^\circ\text{C}$ prior to testing. Table 1 summarizes the toxicity tests that were conducted on each sample, as well as sample collection dates. Samples were collected weekly on the dates shown in Table 1 for the duration of the *H. azteca* and *P. promelas* tests. The *P. promelas* test was conducted at the Nautilus Environmental laboratory in Calgary, AB; all other toxicity tests were conducted at the Burnaby, BC location.

This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through D. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management System database. These samples were collected by Teck personnel at the same time the samples were collected for toxicity testing. The chain-of-custody forms are provided in Appendix E.

Table 1. Summary of toxicity testing program.

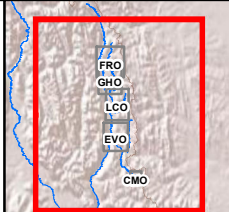
Sample ID	EMS Location ID	Species Tested	Sample Collection Dates
FR_UFR1 *	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 14, 21, 28 and September 4, 2018
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 14, 21, 28 and September 4, 2018
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 15, 21, 28 and September 4, 2018
LC_SLC *		<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i>	August 7, 14, 21, 28, 2018
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 14, 21, 28 and September 4, 2018
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 14, 21, 28 and September 4, 2018
GH_ERC	E300090	<i>C. dubia</i> and <i>P. subcapitata</i>	August 7, 2018
EV_MC2	E300091	<i>C. dubia</i> and <i>P. subcapitata</i>	August 7, 2018
EV_HC1	E102682	<i>C. dubia</i> and <i>P. subcapitata</i>	August 7, 2018
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i>	August 7, 15, 21, 28 and September 4, 2018
CM_MC3		<i>C. dubia</i> , <i>P. subcapitata</i> and <i>H.</i> <i>azteca</i>	August 7, 15, 21, 28, 2018
LC_LCDSSLCC	E297110	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i>	August 7, 14, 21, 28, 2018

* Site water controls



Teck

The maps and map data are provided 'as is' without any guarantee, representation, condition or warranty of any kind, either express, implied, or statutory. Teck Resources Limited assumes no liability with respect to any reliance the user places in the maps and map data, and the user assumes the entire risk as to the truth, accuracy, currency, or completeness of the information contained in the maps and map data.



Chronic Toxicity Monitoring Locations

- Roads
- Rivers
- Monitoring Locations

DATE: 1/24/2019	MINE OPERATION: Elk Valley
SCALE: 1:550,000	COORDINATE SYSTEM: NAD 1983 UTM Zone 11N

2.0 METHODS

Methods for the toxicity tests using *C. dubia*, *P. subcapitata*, *H. azteca* and *P. promelas* are summarized in Tables 2 through 5. Laboratory control water was 20% Perrier water prepared with deionized water for *C. dubia*; dechlorinated City of Calgary municipal tap water with the addition of 4 mg/L potassium chloride (KCl) for *P. promelas*; reconstituted water prepared by addition of reagent grade salts to dechlorinated Metro Vancouver municipal tap water for *H. azteca* according to a recipe provided in Environment Canada (2013), and deionized water with supplemented nutrients for *P. subcapitata*.

For the *H. azteca* tests, all of the site waters were supplemented with 25 mg/L chloride and 0.02 mg/L bromide using NaCl and NaBr, respectively, according to recommendations of the *Hyaella* Advisory Group (chaired by Chris Ingersoll, USGS) (Norberg-King et al., 2014), since low concentrations of these halides are known to impair growth of this species. The laboratory control water contained approximately 75 mg/L chloride and 0.8 mg/L bromide, respectively.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Kszos et al., 1997; Downey et al. 2000). Results of toxicity tests and Toxicity Identification Evaluation efforts conducted in 2015 indicated that artefactual toxicity (i.e., adverse effects that were not associated with toxicants in the sample) had occurred in fathead minnow tests using ambient water samples from the Elk Valley and amendment of the samples with a low dose of copper appeared to counteract the adverse effect. Consequently, the *P. promelas* tests were tested on the samples with addition of 10 µg/L copper, in order to reduce the potential adverse effects caused by fungi and microbes in the samples. Three of the site waters (FR_FRCP1, GH_FR1 and CM_MC2) were also tested using 20 µg/L copper to evaluate whether higher concentration of copper was necessary to control microbial growth in these samples, which contained a higher hardness than the other samples. Copper-amended control water treatments using the same concentrations were also evaluated to test whether copper itself caused any adverse response.

Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013), and involved comparison of results to both the laboratory and site water controls.

Table 2. Test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	<i>Ceriodaphnia dubia</i>
Organism source	In-house culture
Organism age	<24 hour old neonates, produced within a 12 hour window
Test type	Static-renewal
Test duration	7 ± 1 day
Test vessel	20-mL glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Control water	20% Perrier water and 80% deionized water + 5 µg/L Se and 2 µg/L vitamin B12
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with <i>Pseudokirchneriella subcapitata</i> and YCT (3:1 ratio)
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival and reproduction checked daily
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and reproduction
Test acceptability criteria for controls	≥80% survival; ≥15 young per surviving control producing three broods; ≥60% of controls producing three or more broods; no ephippia present
Reference toxicant	Sodium chloride (NaCl)

Table 3. Test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	<i>Pseudokirchneriella subcapitata</i> , strain CPCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Full strength sample diluted to 95.2% (v/v) by addition of nutrients, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control and site control
Number of organisms	10,000 cells/mL
Control water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007b), EPS 1/RM/25
Statistical software	CETIS Version 1.8.7
Test endpoints	Algal cell growth inhibition
Test acceptability criteria for controls	> 16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as ZnSO ₄)

Table 4. Test conditions: *Hyalella azteca* survival and growth test.

Test species	<i>Hyalella azteca</i>
Organism source	Aquatic Research Organisms, NH
Organism age	7- to 8-days old
Test type	Static-renewal
Test duration	28 days
Test vessel	375-mL glass container
Test volume	300 mL
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	5 per treatment
Number of organisms	10 per replicate
Control water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples were supplemented with 25 mg/L Cl and 0.02 mg/L Br.
Test solution renewal	Twice daily (~80% renewal)
Test temperature	23 ± 1°C
Feeding	1 mL of YCT daily to each container. Tetramin daily, with amounts increasing weekly: Week 1: 0.25 mg, Week 2: 0.5 mg, Week 3: 1 mg, Week 4: 1.5 mg in each test container.
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; hardness and alkalinity measured at test termination; total ammonia measured at test initiation and termination
Test protocol	Modified from US EPA (2000), as described in Norberg-King et al. (2014)
Statistical software	CETIS Version 1.8.7
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	Mean control survival of ≥80% survival
Reference toxicant	Sodium chloride (NaCl)

Table 5. Test conditions: *Pimephales promelas* survival and growth test.

Test species	<i>Pimephales promelas</i>
Organism source	Aquatox, Hot Springs, AR
Organism age	<24 hours
Test type	Static-renewal
Test duration	From egg stage until 28 days post hatch
Test vessel	1-L glass jar
Test volume	1 L
Test concentrations	100% (undiluted) sample amended with 10 or 20 µg/L Cu, plus laboratory control and control amended with 10 or 20 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control water	Dechlorinated City of Calgary municipal tapwater
Test solution renewal	Daily (80% renewal)
Test temperature	25 ± 1°C
Feeding	Twice a day, after hatch, with newly hatched brine shrimp (<i>Artemia nauplii</i>)
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None unless dissolved oxygen fell to less than 60% saturation
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; survival checked daily
Test protocol	US EPA (1996) and ASTM (2013)
Statistical software	CETIS Version 1.8.7
Test endpoints	Hatch, survival, length, biomass, normal development (which assesses incidence of deformities)
Test acceptability criteria for controls	>66% hatch, ≥70% post-hatch survival
Reference toxicant	Sodium chloride (NaCl)

3.0 RESULTS

3.1 *Ceriodaphnia dubia*

Results of the toxicity tests using *C. dubia* are provided in Table 6. The Fording River (FR_UFR1), Elk River (GH_ER2), Michel Creek (CM_MC1) and South Line Creek (LC_SLC) site water controls performed similarly to the laboratory controls for this species, indicating that there were no adverse effects associated with the upstream Fording River, Elk River, Michel Creek and South Line Creek stations.

There were no adverse effects on survival in the samples; survival ranged from 80 to 100. Reproduction was significantly reduced in two samples, FR_FRCP1 and CM_MC2, compared to the laboratory control and all three site water controls. The reproduction in sample CM_MC3 was significantly reduced compared to the laboratory control and FR_UFR1. Sample CM_MC2 produced the greatest reduction in reproduction, with a 70% reduction of reproduction relative to the laboratory control.

3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 7. In these tests, the four site water controls produced 3.4 to 3.6-fold greater growth than the laboratory control. This finding is not unusual, since the higher ionic strength associated with the site water controls would be expected to stimulate cell growth of this species relative to the very low ionic strength associated with the laboratory control water.

There were no adverse effects on cell yield in any of the samples compared to the laboratory control; stimulation ranged between 213.9 to 281.4%. There was no significant reduction in growth between any of the site controls and the samples.

3.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 8. Survival in the site water controls FR_UFR1, GH_ER2, and CM_MC1 were similar to the laboratory control, indicating that there was no adverse effect associated with these upstream sites for this endpoint. Survival in site water LC_SLC was significantly lower when compared to the control, with 62% survival in this site control. One replicate of the test with this site water performed particularly poorly, with only 10% survival; survival in the other four replicates averaged 75%. Dry weight for all four site

water controls were not statistically different compared to the laboratory control; dry weight ranged from 0.35 mg to 0.54 mg in the site waters, with the laboratory control dry weight measuring 0.30 mg.

There were no adverse effects on survival or dry weight associated with samples FR_FRCP1, GH_FR1, and LC_LCDSSLCC relative to any of the control treatments, including the laboratory control. There was a significant effect observed for survival in sample CM_MC2 compared to the laboratory control and site control FR_UFR1, GH_ER2 and CM_MC1. Sample CM_MC3 showed a significant effect on survival compared to site controls FR_UFR1 and GH_ER2. Samples CM_MC2 and CM_MC3 produced dry weight results that were statistically lower than the laboratory control and site controls FR_UFR1, GH_ER2, and CM_MC1. CM_MC2 was also statistically lower than the LC_SLC site control.

3.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 9. There were no adverse effects associated with upstream site controls FR_UFR1 and CM_MC1 as results for survival, hatch, biomass and normal development (i.e., incidence of deformities) were similar between these two site waters and the laboratory control. CM_MC1 produced a small, but statistically significant decrease in length compared to the laboratory control treatment. Site control GH_ER2 produced a significantly lower survival and biomass when compared to the laboratory control.

Site waters FR_FRCP1, GH_FR1 and CM_MC2 showed no adverse effects for hatch, length and normal development when compared to the laboratory control and the site controls; these samples did however show significant effects on survival when compared to the laboratory control and site water controls FR_UFR1 and CM_MC1. In addition, FR_FRCP1 and CM_MC2 showed significant reduction of biomass compared to the laboratory control and all four site controls; whereas sample GH_FR1 showed significant effects in survival and biomass when compared with the laboratory control and site controls FR_UFR1 and CM_MC1. Microbial growth was observed in some treatments, and likely contributed to the adverse responses on survival and biomass, indicating that 10 µg/L copper may not have been sufficient to curtail microbial growth in some cases.

The samples that were amended with 20 µg/L copper performed similarly to control treatments for hatch, length and normal development. Sample GH_FR1 with 20 µg/L copper showed no significant effect on survival when compared to the laboratory control treated with 20 µg/L

copper; however, an effect was observed in GH_FR1 water for biomass. Site waters FR_FRCP1 and CM_MC2 amended with 20 µg/L copper showed a significant effect on survival and biomass when compared with the laboratory control, but had no evidence of microbial growth, indicating that other toxicants may have contributed to the adverse effects observed in these samples.

Table 6. Results: *Ceriodaphnia dubia* survival and reproduction test.

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	18.3 ± 3.8
FR_UFR1 (Site Control)	90	20.3 ± 7.1
GH_ER2 (Site Control)	100	17.5 ± 5.0
CM_MC1 (Site Control)	80	17.7 ± 9.7
LC_SLC (Site Control)	100	19.5 ± 3.5
FR_FRCP1	80	8.4 ± 5.1 * ^α β [†] [‡]
GH_FR1	90	18.3 ± 3.3
GH_ERC	90	19.5 ± 7.2
EV_MC2	100	16.3 ± 4.7
EV_HC1	100	22.8 ± 6.1
CM_MC2	90	5.4 ± 2.1 * ^α β [†] [‡]
CM_MC3	100	14.1 ± 4.0 ^α [‡]
LC_LCDSSLCC	100	19.4 ± 3.3

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[†] Result was significantly lower than the site control CM_MC1

[‡] Results was significantly lower than the site control LC_SLC

Table 7. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Sample ID	Cell Yield (x 10⁴ cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
Laboratory Control	29.6 ± 2.3	-
FR_UFR1 (Site Control)	100.4 ± 6.9 [§]	238.8
GH_ER2 (Site Control)	104.9 ± 8.9 [§]	254.0
CM_MC1 (Site Control)	99.9 ± 8.6 [§]	237.1
LC_SLC (Site Control)	106.2 ± 8.1 [§]	258.7
FR_FRCP1	113.0 ± 5.9 [§]	281.4
GH_FR1	108.8 ± 9.8 [§]	267.1
GH_ERC	108.8 ± 6.8 [§]	267.1
EV_MC2	106.5 ± 4.2 [§]	259.5
EV_HC1	98.5 ± 12.4 [§]	232.5
CM_MC2	93.0 ± 6.6 [§]	213.9
CM_MC3	95.8 ± 7.4 [§]	223.2
LC_LCDSSLCC	97.0 ± 12.2 [§]	227.4

SD = Standard Deviation

[§] Result was significantly greater than the laboratory control

Table 8. Results: *Hyaella azteca* survival and growth test.

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	88.0 ± 8.4	0.30 ± 0.08
FR_UFR1 (Site Control)	94.0 ± 5.5	0.54 ± 0.08
GH_ER2 (Site Control)	94.0 ± 5.5	0.43 ± 0.03
CM_MC1 (Site Control)	84.0 ± 19.5	0.41 ± 0.14
LC_SLC (Site Control)	62.0 ± 32.7 ^{αβ}	0.35 ± 0.27
FR_FRCP1	98.0 ± 4.5	0.43 ± 0.05
GH_FR1	96.0 ± 5.5	0.39 ± 0.08
CM_MC2	26.0 ± 11.4 ^{*αβ†}	0.03 ± 0.02 ^{*αβ†}
CM_MC3	68.0 ± 32.7 ^{αβ}	0.07 ± 0.02 ^{*αβ†}
LC_LCDSSLCC	96.0 ± 8.9	0.45 ± 0.09

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

^θ Results was significantly lower than the site control LC_SLC

[†] Result was significantly lower than the site control CM_MC1

Table 9. Results: *Pimephales promelas* survival and growth test.

Sample ID	(Mean ± SD)				
	Hatch (%)	Survival (%)	Biomass (mg)	Length (mm)	Normal development (%)
Laboratory Control	98.3 ± 3.3	85.0 ± 12.6	3.33 ± 0.16	11.9 ± 0.8	100 ± 0.0
10 µg/L Cu treatment					
Laboratory Control [+Cu]	98.3 ± 3.3	86.7 ± 5.4	3.63 ± 0.58	12.3 ± 0.4	100 ± 0.0
FR_UFR1 (Site Control) [+Cu]	100 ± 0.0	88.3 ± 11.4	3.17 ± 0.26	12.0 ± 0.6	100 ± 0.0
GH_ER2 (Site Control) [+Cu]	96.7 ± 6.7	59.9 ± 42.4 *	1.97 ± 0.56 *	11.6 ± 1.8	100 ± 0.0
CM_MC1 (Site Control) [+Cu]	96.7 ± 6.7	91.7 ± 6.4	3.36 ± 0.34	11.4 ± 0.5*	100 ± 0.0
FR_FRCP1 [+Cu]	95.0 ± 6.4	8.3 ± 6.4 * αβ†	0.92 ± 0.65* αβ†	17.5 ± 1.3	100 ± 0.0
GH_FR1 [+Cu]	100 ± 0.0	68.3 ± 29.5 * α†	2.54 ± 0.49 * α†	12.1 ± 0.7	100 ± 0.0
CM_MC2 [+Cu]	100 ± 0.0	35.0 ± 32.8 * αβ†	1.63 ± 1.13* α†	12.5 ± 1.2	100 ± 0.0
20 µg/L Cu treatment					
Laboratory Control [+Cu]	100 ± 0.0	93.3 ± 0.0	4.00 ± 0.24	12.1 ± 0.4	100 ± 0.0
FR_FRCP1 [+Cu]	100 ± 0.0	1.7 ± 3.3 [§]	0.23 ± 0.45 [§]	17.0 ± 0.0	100 ± 0.0
GH_FR1 [+Cu]	95.0 ± 3.3	86.2 ± 8.0	3.57 ± 0.19 [§]	12.5 ± 0.3	100 ± 0.0
CM_MC2 [+Cu]	100 ± 0.0	41.7 ± 14.8 [§]	2.46 ± 0.50 [§]	13.8 ± 1.0	100 ± 0.0

SD = Standard Deviation

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

† Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

§ Result was significantly lower than the 20 µg/L copper-treated laboratory control

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the test protocols. The tests met all control acceptability criteria and water quality parameters remained within the ranges specified in the protocols throughout the tests. Uncertainty associated with these tests is best described by the standard deviations around the means.

There were no deviations from test methodologies, other than the planned modification to the *H. azteca* method and addition of copper in the *P. promelas* tests, as described in Section 2.0. Results of the reference toxicant tests conducted during the testing program are summarized in Table 10. Results for these tests fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate. The reference toxicant tests were performed under the same conditions as those used for the samples.

Table 10. Reference toxicant test results.

Test species	Endpoint	Historical mean (2 SD Range)	CV (%)	Test date
<i>C. dubia</i>	Survival (LC50): 1.8 g/L NaCl	2.0 (1.8 – 2.2)	5	August 8, 2018
	Reproduction (IC50): 1.6 g/L NaCl	1.3 (0.8– 1.9)	20	
<i>P. subcapitata</i>	Growth (IC50): 27.8 µg/L Zn	31.4 (26.2 – 37.6)	9	August 24, 2018
<i>H. azteca</i>	Survival (LC50): 6.0 g/L NaCl	5.8 (5.0 – 6.8)	8	August 9, 2018
<i>P. promelas</i>	Survival (LC50): 6.5 g/L NaCl	6.2 (3.0 – 12.9)	25	August 14, 2018
	Biomass (IC25): 4.5 g/L NaCl	2.7 (1.3 – 5.7)	25	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration

5.0 REFERENCES

- ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 p.
- ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates and amphibians. E729-80, 25p
- Downey PJ, Flemmin K, Guinn R, Chapman N, Varner P, Cooney JD. 2000. Sporadic mortality in chronic toxicity tests using *Pimephales promelas* (Rafinesque): Cases of characterization and control. *Environ Toxicol Chem* 19:248-255.
- Environment Canada. 2013. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyaella azteca*. EPS 1/RM/33, Second Edition, January 2013.
- Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.
- Environment Canada. 2007b. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.
- Grothe DR, Johnson DE. 1996. Bacterial interference in whole-effluent toxicity tests. *Environ Toxicol Chem* 15:761-764.
- Kszos LA, Stewart AJ, Sumner JR. 1997. Evidence that variability in ambient fathead minnow short-term chronic tests is due to pathogenic infection. *Environ Toxicol Chem* 6:351-356
- Norberg-King TJ, Hockett R, Mount DR, Ivey C, Ingersoll C, Kemble N, Brumbaugh B, Hammer E, Soucek D, Taylor L. 2014. Inter-lab testing of *Hyaella azteca* water and sediment methods: 3. Results from 10- to 42-d tests conducted with the new water-only method. Proceedings of SETAC, Vancouver, BC, Canada, November 09 - 13, 2014.
- Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.8.7.16 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

USEPA. 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. EPA 600/R-99/064. March 2000.

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client: Teck
 Work Order No.: 181276

Start Date/Time: Aug 9/18 8:00h
 Set up by: KL/NB

Sample Information:

Sample ID: Various (see below)
 Sample Date: Aug 7/18
 Date Received: Aug 8/18
 Sample Volume: (1-4) X 20L

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: B3080118A & B
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 19
 Mortality (%) in previous 7 d: 2.5
 Individual female # used ≥ 8 young on test day: 11, 13-A, 19, 21-30

NaCl Reference Toxicant Results:

Reference Toxicant ID: CA194
 Stock Solution ID: 18 NaCl (100 g/L NaCl)
 Date Initiated: Aug 8/18

7-d LC50 (95% CL): 1.8 (1.5 - 2.2) g/L NaCl
 7-d IC50 (95% CL): 1.6 (1.1 - 1.9) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.2) g/L NaCl CV (%): 5
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.3 (0.8 - 1.9) g/L NaCl CV (%): 20

Test Results:

* indicates that reproduction is significantly lower than laboratory control

Site control
 Site control
 Site control

	Survival (%)	Reproduction (Mean \pm SD)
Negative Control	100	18.3 \pm 3.8
FRUPP1_MON_2018-06-06_N	90	20.3 \pm 7.1
GHLEP2_WS_2018-08-07_N	100	17.5 \pm 5.0
CM_MCI_03_WS_20180807_N	80	17.7 \pm 9.7
FR-FRCP1_MON_2018-08-06_N	80	8.4 \pm 5.1 *abc
GH-FP1_WS_2018-08-07_N	90	18.3 \pm 3.3
GH-FRC_WS_2018-08-07_N	90	19.5 \pm 7.2
EV-MCI_WS_2018-08-07_N	100	22.8 \pm 6.1
EV-MCI_WS_2018-08-07_N	100	16.3 \pm 4.7

a. reproduction significantly lower than site control FR-UFEP1.
 b. reproduction significantly lower than site control GHLEP2
 c. reproduction significantly lower than site control
 d. SLC

Reviewed by: JGU

Date reviewed: Aug 28/18

Ceriodaphnia dubia Summary Sheet

Client: TECK
 Work Order No.: 181276

Start Date/Time: Aug 9/18 1300h.
 Set up by: KL/AB

Sample Information:

Sample ID: Various (see below)
 Sample Date: Aug 7/18
 Date Received: Aug 8/18.
 Sample Volume: (1-4) X 20L

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: BB080118A & B
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 19
 Mortality (%) in previous 7 d: 2.5
 Individual female # used ≥ 8 young on test day: 11, 13-A, 19, 21-30.

NaCl Reference Toxicant Results:

Reference Toxicant ID: Ca194
 Stock Solution ID: 18 NaCl (100 g/L NaCl)
 Date Initiated: Aug 8/18

7-d LC50 (95% CL): 1.8 (1.5 - 2.2) g/L NaCl
 7-d IC50 (95% CL): 1.6 (1.1 - 1.9) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.2) g/L NaCl CV (%): 5
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.3 (0.8 - 1.9) g/L NaCl CV (%): 20

Test Results:

* Indicates reproduction is significantly lower than laboratory control

Site Control

	Survival (%)	Reproduction (Mean \pm SD)
<u>Negative Control</u> \checkmark	<u>94</u>	<u>\pm \checkmark</u>
<u>CM M2 Q3 WS 20180807 N</u>	<u>90</u>	<u>5.4 \pm 2.1 *abc</u>
<u>LC SLC WS 2018-08-07 N</u>	<u>100</u>	<u>19.4 \pm 3.3</u>
<u>LC M3 Q3 WS 20180807 NP</u>	<u>100</u>	<u>14.1 \pm 4.0 ac</u>
<u>LC SLC WS 2018-08-07 N</u>	<u>100</u>	<u>19.5 \pm 3.5</u>
		<u>\pm</u>
		<u>\pm</u>
		<u>\pm</u>
		<u>\pm</u>

a. reproduction significantly lower than site control FR MFF1.
 b. reproduction significantly lower than site control CH ERZ
 c. reproduction significantly lower than site control
 LC SLC

Reviewed by: Jan

Date reviewed: Aug. 28/18

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK
 Sample ID: see below (various)
 Work Order #: 18276

Start Date & Time: Aug 9/18 0800h
 Stop Date & Time: Aug 15/18 1630h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration <i>CONTROL</i>	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	25.0	25.0	25.0	24.0	25.0	24.0	24.0	25.5	24.0	25.0	25.0		
DO (mg/L)	7.9	7.8	8.1	7.5	8.1	7.5	8.1	7.2	7.7	7.9	7.7	7.0		
pH	8.0	7.8	7.9	7.7	7.9	7.7	7.9	7.6	7.9	7.9	7.7	7.6		
Cond. (µS/cm)	213	214		217		217		219		217		220		
Initials	AW	K		A		A		JB / K		JB		K		

Concentration <i>FRUFF1</i>	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0		
DO (mg/L)	7.9	7.8	8.4	7.5	8.2	7.2	8.1	7.3	7.7	7.8	7.8	7.0		
pH	8.0	8.0	8.2	7.8	8.1	7.9	8.1	7.9	7.9	7.6	7.9	7.7		
Cond. (µS/cm)	329	328		322		325		331		330		325		
Initials	AW	K		A		A		JB / K		JB		K		

Concentration <i>ALP2</i>	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	25.0	25.0		
DO (mg/L)	8.0	7.8	8.4	7.5	8.2	7.5	8.1	7.3	7.7	7.8	7.8	7.0		
pH	7.8	7.9	7.8	7.9	8.0	7.8	8.0	7.9	7.7	7.5	7.8	7.7		
Cond. (µS/cm)	275	274		273		272		276		276		270		
Initials	AW	K		A		A		JB / K		JB		K		

Concentration <i>AMM1</i>	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.5	24.0	24.5	25.0	25.0		
DO (mg/L)	8.0	7.8	8.4	7.6	8.1	7.4	8.1	7.3	7.7	7.8	7.8	7.0		
pH	7.7	7.9	7.9	7.9	8.0	7.9	8.0	8.0	7.7	7.8	7.8	7.7		
Cond. (µS/cm)	287	285		280		279		289		289		283		
Initials	AW	K		A		A		JB / K		JB		K		

Thermometer: 4 DO meter/probe: 1/1 pH meter/probe: 1/1 Conductivity meter/probe: 1/1

	Control	FRUFF1	ALP2	AMM1
Hardness*	100	200	148	158
Alkalinity*	93	136	130	136

Analysts: AW, K, AW, JB

Reviewed by: John

Date reviewed: Aug 28/18

* mg/L as CaCO3

AMM1: clear, colourless, odourless, no particulates.

Sample Description: *FRUFF1 & ALP2*: clear, colourless, odourless, some particulates.

Comments: Broodboard Used: 88080118A & B (11, 13-17, 19, 21-30)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Telle Start Date & Time: Aug 9/18 @ 1300h
 Sample ID: Various (see below) Stop Date & Time: Aug 15/18 @ 1630h
 Work Order #: 181276 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration <u>FR-FRCP1</u>	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0			
DO (mg/L)	7.8	7.8	8.4	7.5	7.1	7.4	7.0	7.3	7.7	7.3	7.8	7.0			
pH	7.9	8.0	8.1	7.0	7.0	7.8	7.0	8.0	7.7	7.7	7.7	7.8			
Cond. (µS/cm)	950	946	967		960		956		966	949	944		911		
Initials	AW								JB/K		JB				

Concentration <u>GH-FP1</u>	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.5	24.0	24.5	24.0	24.5	25.0			
DO (mg/L)	7.9	7.8	8.4	7.5	7.0	7.4	7.1	7.3	7.7	7.3	7.7	7.0			
pH	7.9	8.2	8.0	7.9	7.9	8.1	7.0	8.2	7.8	7.7	7.9	7.9			
Cond. (µS/cm)	806		800		808		809		812		809		791		
Initials	AW								JB/K		JB				

Concentration <u>GH-FRC</u>	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0			
DO (mg/L)	8.0	7.8	8.4	7.4	7.0	7.4	7.0	7.3	7.7	7.3	7.7	7.0			
pH	7.8	8.1	7.8	7.0	7.9	8.0	7.0	8.1	7.7	7.7	7.7	7.9			
Cond. (µS/cm)	300	306	306		306		308		310		312		310		
Initials	AW								JB/K		JB				

Concentration <u>EV-HCI</u>	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0			
DO (mg/L)	8.0	7.8	8.4	7.5	7.1	7.3	7.1	7.3	7.7	7.4	7.8	7.0			
pH	8.0	8.2	8.1	7.1	7.0	8.1	7.0	8.2	7.9	7.8	8.0	7.9			
Cond. (µS/cm)	657		659		660		665		686		661		652		
Initials	AW								JB/K		JB				

Thermometer: 4 DO meter/probe: 1/1/1 pH meter/probe: 1/1/1 Conductivity meter/probe: 1/1/1

	Control	GH-FP1	GH-FRC	EV-HCI
Hardness*	630	540	196	400
Alkalinity*	192	180	134	182

Analysts: AW, K, AW, JB

Reviewed by: Joke

Date reviewed: Aug-28/18

* mg/L as CaCO3

Sample Description: all samples: clear, colourless, odourless, some particulates.

Comments: Broodboard Used: 60080118A&B (11, 13-17, 19, 21-30)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teche
 Sample ID: Various (see below)
 Work Order #: 081276

Start Date & Time: Aug 9/18 @ 1:30h
 Stop Date & Time: Aug 15/18 @ 1630h
 CER #: 4
 Test Species: Ceriodaphnia dubia

100 % MW

Concentration EV.MCZ	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0		
DO (mg/L)	7.8	7.8	8.4	7.5	8.0	7.4	8.1	7.3	7.7	7.4	7.8	7.0		
pH	7.9	8.2	8.0	8.1	8.0	8.1	8.0	8.2	7.8	7.8	7.7	7.9		
Cond. (µS/cm)	651		663		670		668		673		668		658	
Initials	AW		W		A		A		JB/W		JB		W	

①20

100

Concentration CM.MCZ	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0		
DO (mg/L)	7.9	7.8	8.4	7.5	8.1	7.1	8.1	7.3	7.7	7.3	7.8	7.0		
pH	7.8	8.0	8.0	8.0	8.0	7.9	8.0	8.0	7.8	7.7	7.8	7.9		
Cond. (µS/cm)	1091		1096		1109		1108		1103	1104	1095		1068	
Initials	AW		W		A		A		JB/W		JB		W	

100

Concentration W.L.CROSSLEE	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	25.0	24.5	25.0		
DO (mg/L)	8.0	7.8	8.4	7.5	8.1	7.6	8.1	7.4	7.7	7.0	7.8	7.0		
pH	7.9	8.2	8.0	8.0	8.0	8.0	8.0	8.0	7.8	7.8	7.8	8.0		
Cond. (µS/cm)	806		805		834		808		811		816		802	789
Initials	AW		W		A		A		JB/W		JB		W	

100

Concentration CM.MCZ	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.5	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0		
DO (mg/L)	8.0	7.8	8.4	7.5	8.0	7.3	8.0	7.3	7.7	7.0	7.8	7.0		
pH	7.9	8.2	8.0	8.1	7.9	8.0	8.0	8.1	7.8	7.8	7.8	8.0		
Cond. (µS/cm)	682		676		674		676		685		682		669	
Initials	AW		W		A		A		JB/W		JB		W	

①25.0

Thermometer: 4 DO meter/probe: 1/1 pH meter/probe: 1/1 Conductivity meter/probe: 1/1

	Control	CM.MCZ	W.L.CROSSLEE	CM.MCZ
Hardness*	460	730	520	430
Alkalinity*	174	172	182	160

Analysts: AW, AW, W, JB

Reviewed by: JOE

Date reviewed: Aug. 28/18

Sample Description: all samples: clear, colourless, odourless, some particulates.

Comments: Broodboard Used: 6608048A & B (11, 13-17, 19, 21-30)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Tede.
 Sample ID: various (see below)
 Work Order #: 181276

Start Date & Time: Aug 9 / 13 C 1300h
 Stop Date & Time: Aug 15 / 13 C 1630h
 CER #: 4
 Test Species: Ceriodaphnia dubia

%W/V) 100 Concentration LC50	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	24.0	25.0	24.0	25.0	24.0	24.0	24.5	24.0	24.5	25.0			
DO (mg/L)	8.0	7.8	8.4	7.5	8.1	7.4	8.0	7.3	7.7	7.0	7.7	7.0			
pH	7.8	8.2	7.9	8.1	7.9	8.0	8.0	7.9	7.8	7.7	7.8	7.9			
Cond. (µS/cm)	350		349		350		352		353		353		351		
Initials	AW		h		a		a		JB/h		JB		h		

5 mg/L EDTA Concentration Control + EDTA	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	24.5	25.0	24.0	25.0	24.0	24.0	24.5	25.0	24.5	25.0			
DO (mg/L)	7.9	7.8	8.0	7.6	8.1	7.1	8.1	7.2	7.7	7.0	7.6	7.0			
pH	7.9	8.0	7.8	8.0	7.9	7.7	8.0	8.0	7.7	7.5	7.7	7.6			
Cond. (µS/cm)	214		215		218		217		239		251		203		
Initials	A		h		a		a		JB/h		JB		h		

Single EDTA Concentration FR, FRCH & EDTA	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	24.5	25.0	24.0	25.0	24.0	24.0	24.5	25.0	24.5	25.0			
DO (mg/L)	7.9	7.8	8.0	7.5	8.0	6.4	8.1	7.2	7.7	7.0	7.6	7.0			
pH	7.9	8.0	8.0	8.0	7.9	7.8	8.0	8.0	7.8	7.5	7.7	7.5			
Cond. (µS/cm)	957		944		956		961		957		966		941		
Initials	A		h		a		a		JB/h		JB		h		

Single EDTA Concentration DM, MCL & EDTA	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	24.5	25.0	24.0	25.0	24.0	25.0	24.5	25.0	24.5	25.0			
DO (mg/L)	7.9	7.8	8.0	7.5	8.0	6.8	8.1	7.1	7.7	7.0	7.6	7.0			
pH	8.0	8.0	8.0	8.1	8.0	7.9	8.0	8.0	7.8	7.7	7.8	7.7			
Cond. (µS/cm)	1096		1087		1100		1103		1121		1143		1119		
Initials	A		h		a		a		JB/h		JB		h		

Thermometer: 4 DO meter/probe: 1 1 1 pH meter/probe: 1 1 1 Conductivity meter/probe: 1 1 1

	Control ^h	Control	FR, FRCH	DM, MCL
Hardness*	218	100	630	730
Alkalinity*	132	93	192	172

Analysts: AW, AW0, h, JB

Reviewed by: JOB
 Date reviewed: Aug 28/13

* mg/L as CaCO3

Sample Description: all samples: clear, colourless, odourless, some particulates.

Comments: Broodboard Used: BB080118A & B (11, 13-17, 19, 21-30);

pg 1/2

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

Client: Teck
Sample ID: Various (see below)
Work Order: 181276

Start Date & Time: Aug 9/18 @ 1300h
Stop Date & Time: Aug 15/18 @ 1630h
Set up by: K JB

Days	Concentration: <u>Control</u>											Concentration: <u>156 µg FR-WFR1</u>											Concentration: <u>312 µg CH-ER2</u>										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
4	2	3	2	3	4	4	2	3	2	JB	3	4	4	4	2X	4	4	2	4	✓	JB	3	2	4	2	4	4	2	✓	✓	✓	JB	
5	6	7	8	4	7	8	8	7	6	6	JB	8	9	5	9	✓	9	8	9	9	3	JB	9	8	8	8	8	7	8	5	4	✓	JB
6	7	9	9	6	9	10	12	9	10	✓	9	10	12	9	✓	13	11	14	12	13	✓	7	10	10	11	10	8	9	10	7	7	✓	
7																																	
8																																	
Total	15	19	19	10	19	22	24	18	19	18	✓	20	23	21	22	2X	26	23	25	25	16	✓	19	20	21	21	22	19	19	15	11	7	✓

Days	Concentration: <u>625 µg CM-MCI</u>											Concentration: <u>125 µg FR-FRCPI</u>											Concentration: <u>25 µg CH-FR</u>										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
3	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
4	4	2	2	3	3	3	3	2	✓	X	JB	2	X	✓	2	2	2	2	2	2	✓	JB	3	3	4	3	3	4	2	4	2	✓	JB
5	8	8	6	16	8	9	11	8	✓	✓	JB	5	✓	5	6	3	6	✓	7	6	2X	JB	7	7	8	7	7	6	8	6	9	9	JB
6	8	11	11	9	12	12	14	10	✓	✓	✓	3	✓	✓	5	8	8	4	✓	2	✓	✓	7	8	10	10	9	X	7	11	11	✓	✓
7																																	
8																																	
Total	20	21	19	22	23	24	28	20	0X	0X	✓	10	0X	5	13	13	16	6	9	10	2X	✓	18	17	20	20	20	19	10X	17	22	20	✓

Days	Concentration: <u>250 µg CH-ERC</u>											Concentration: <u>100 µg EV-HCI</u>											Concentration: <u>EV-MC2</u>										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
3	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CW
4	4	6	✓	3	4	2	2	2	✓	4	JB	4	3	✓	✓	2	5	3	3	4	3	JB	5	5	4	4	4	3	2	3	4	4	JB
5	7	9	✓	8	8	9	9	7	6	10	JB	7	9	10	2	8	9	8	10	7	7	JB	5	10	9	9	7	7	8	6	7	7	JB
6	12	11	✓	9	10	10	11	11	12	9	✓	14	12	14	4	13	12	14	13	16	14	✓	8	✓	10	✓	✓	9	✓	12	11	15	✓
7																																	
8																																	
Total	23	26	0X	20	22	21	22	20	18	23	✓	25	24	24	6	23	26	23	26	27	24	✓	13	15	23	13	11	19	10	21	22	16	✓

Notes: X = mortality.

Sample Description: see CW sheet.

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JG

Date reviewed: Aug 28/18

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

pg 2/2

Client: TECK
Sample ID: various (see below)
Work Order: 181276

Start Date & Time: Aug 9/18 eBook
Stop Date & Time: Aug 15/18 1630h
Set up by: K/JB

Days	Concentration: <u>control</u> CM-MC2											Concentration: <u>0.156</u> LC-LCDSSLC											Concentration: <u>3.125</u> CM-MC3										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	2	2	2	2	2	2	2	2	2	3	JB	4	3	4	3	3	2	3	2	3	5	JB	3	3	2	2	2	2	2	3	3	3	JB
5	✓	✓	5	7	5	6	3	4	4	4	JB	8	7	6	8	10	9	9	7	10	9	JB	7	8	8	8	9	6	7	6	8	10	JB
6	✓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	9	4	8	10	3	9	9	9	9	✓	8	9	2	10	4	5	6	✓	✓	✓	✓
7																																	
8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	15	14	14	10	7	6	3	4	6	6	✓	21	19	14	19	23	14	21	18	22	23	✓	18	20	12	20	13	13	13	8	11	13	✓

Days	Concentration: <u>0.156</u> LC-SLC											Concentration: <u>0.156</u> CTRL+EDTA											Concentration: <u>0.156</u> FR-FRCPI+EDTA										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	3	3	3	3	4	3	4	4	4	3	JB	3	2	3	4	4	4	4	4	2	2	JB	✓	✓	2	2	✓	2	2	2	✓	✓	JB
5	6	6	9	7	8	9	8	8	4	7	JB	7	3	10	7	7	9	10	4	6	6	JB	4	6	✓	7	5	5	6	4	2	6	✓
6	7	7	9	8	10	11	11	11	7	10	✓	9	6	9	7	7	7	10	10	7	9	✓	4	4	8	4	7	5	5	4	5	5	✓
7																																	
8																																	
Total	16	14	21	18	22	23	23	23	15	20	✓	19	11	22	18	16	20	14	18	15	17	✓	8	10	10	13	12	12	13	10	7	11	✓

Days	Concentration: <u>0.156</u> CM-CMC2+EDTA											Concentration: <u>0.156</u>											Concentration: <u>0.156</u>										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																						
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																						
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																						
4	✓	✓	3	✓	4	✓	2	2	2	2	JB																						
5	4	9	3	✓	7	3	6	5	6	6	✓																						
6	8	11	8	9	8	10	10	11	7	6	✓																						
7																																	
8																																	
Total	12	20	11	12	12	17	13	19	14	14	✓																						

Notes: X = mortality.

Sample Description: see CW sheet.

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JOB

Date reviewed: Aug 28/18

CETIS Summary Report

Report Date: 23 Aug-18 20:23 (p 30 of 30)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

6d Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_UFR1		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
GH_ER2		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC1		10	0.8000	0.4984	1.0000	0.0000	1.0000	0.1333	0.4216	52.70%	20.00%
FR_FRCP1		10	0.8000	0.4984	1.0000	0.0000	1.0000	0.1333	0.4216	52.70%	20.00%
GH_FR1		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
GH_ERC		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
EV_HC1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
EV_MC2		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC2		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
LC_LCDSSLCC		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC3		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
LC_SLC		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
Control+EDTA		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_FRCP1_EDTA		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC2_EDTA		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	10	18.3	15.6	21	10	24	1.193	3.773	20.62%	0.00%
FR_UFR1		10	20.3	15.25	25.35	2	26	2.231	7.056	34.76%	-10.93%
GH_ER2		10	17.5	13.93	21.07	7	22	1.579	4.994	28.54%	4.37%
CM_MC1		10	17.7	10.78	24.62	0	28	3.059	9.673	54.65%	3.28%
FR_FRCP1		10	8.4	4.749	12.05	0	16	1.614	5.103	60.75%	54.10%
GH_FR1		10	18.3	15.94	20.66	10	22	1.044	3.302	18.04%	0.00%
GH_ERC		10	19.5	14.36	24.64	0	26	2.272	7.184	36.84%	-6.56%
EV_HC1		10	22.8	18.47	27.13	6	27	1.914	6.052	26.54%	-24.59%
EV_MC2		10	16.3	12.94	19.66	10	23	1.484	4.692	28.78%	10.93%
CM_MC2		10	5.4	3.884	6.916	2	9	0.67	2.119	39.24%	70.49%
LC_LCDSSLCC		10	19.4	17.03	21.77	14	23	1.046	3.307	17.04%	-6.01%
CM_MC3		10	14.1	11.27	16.93	8	20	1.251	3.957	28.06%	22.95%
LC_SLC		10	19.5	16.99	22.01	14	23	1.108	3.504	17.97%	-6.56%
Control+EDTA		10	17	14.74	19.26	11	22	1	3.162	18.60%	7.10%
FR_FRCP1_EDTA		10	10.6	9.161	12.04	7	13	0.636	2.011	18.97%	42.08%
CM_MC2_EDTA		10	14.4	12.13	16.67	11	20	1.002	3.169	22.01%	21.31%

FR_UFR1, GH_ER2 & CM_MC1 are site control
Control+EDTA, FR_FRCP1+EDTA, CM_MC2+EDTA = lab water / samples spiked w/ single EDTA

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 05-4838-8615	Endpoint: Reproduction	CETIS Version: CETISv1.9.4			
Analyzed: 23 Aug-18 18:10	Analysis: Nonparametric-Control vs Treatments	Status Level: 1			
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	14-6970-5269	09 Aug-18	09 Aug-18	13h	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	20% Perrier Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Control - laboratory water

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 01-6141-4654	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 23 Aug-18 18:10	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	14-6970-5269	09 Aug-18	09 Aug-18	13h	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	20% Perrier Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.2368	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.2368	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect

Negative control = laboratory water's 20% perrier

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-6141-4654 Endpoint: 6d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:10 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control	N	10	0	10	1	0	0.0%
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1		8	2	10	0.8	0.2	20.0%
FR_FRCP1		8	2	10	0.8	0.2	20.0%
GH_FR1		9	1	10	0.9	0.1	10.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		9	1	10	0.9	0.1	10.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	N	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000
FR_FRCP1		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	N	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
FR_FRCP1		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
Test Code/ID: 181276 / 20-9326-4280

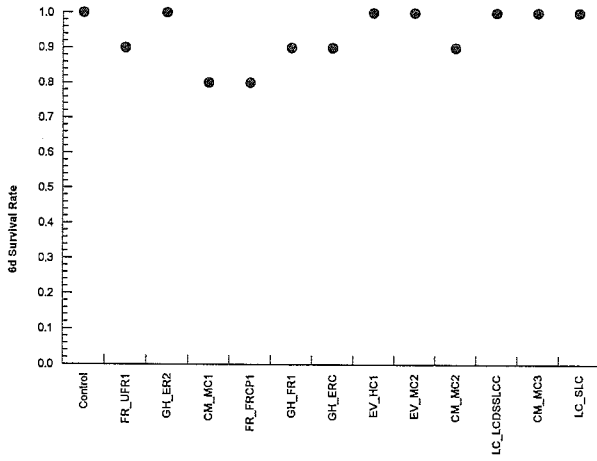
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-6141-4654 Endpoint: 6d Survival Rate
Analyzed: 23 Aug-18 18:10 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)

Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-1302-8539	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 23 Aug-18 18:11	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.7632	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.7632	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.7632	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect

*FR_UFR1 = upstream control;
SPE control*

*John
Aug. 28/18*

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-1302-8539 Endpoint: 6d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:11 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	U	9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1		8	2	10	0.8	0.2	20.0%
FR_FRCP1		8	2	10	0.8	0.2	20.0%
GH_FR1		9	1	10	0.9	0.1	10.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		9	1	10	0.9	0.1	10.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	U	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000
FR_FRCP1		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
FR_FRCP1		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
Test Code/ID: 181276 / 20-9326-4280

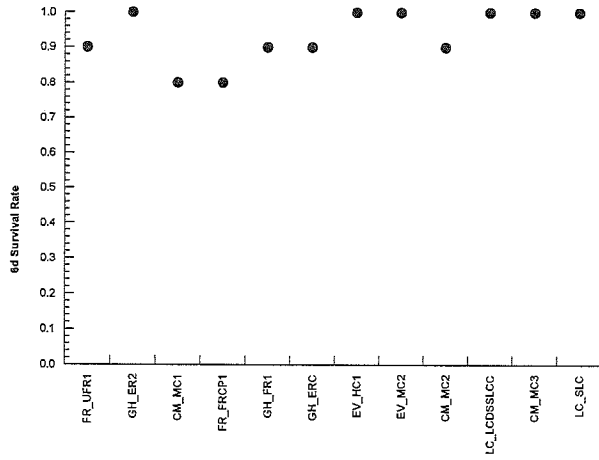
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-1302-8539 Endpoint: 6d Survival Rate
Analyzed: 23 Aug-18 18:11 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:29 (p 1 of 3)

Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-9496-4537	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 23 Aug-18 18:09	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.2368	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.2368	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect

GH_ER2 = receiving water's site control

Aug. 28/18

CETIS Analytical Report

Report Date: 23 Aug-18 18:29 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-9496-4537 Endpoint: 6d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:09 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2	R	10	0	10	1	0	0.0%
CM_MC1		8	2	10	0.8	0.2	20.0%
FR_FRCP1		8	2	10	0.8	0.2	20.0%
GH_FR1		9	1	10	0.9	0.1	10.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		9	1	10	0.9	0.1	10.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2	R	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000
FR_FRCP1		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
FR_FRCP1		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 23 Aug-18 18:29 (p 3 of 3)
Test Code/ID: 181276 / 20-9326-4280

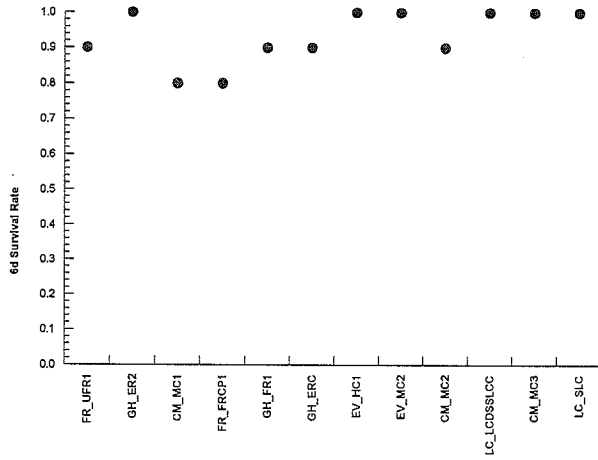
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-9496-4537 Endpoint: 6d Survival Rate
Analyzed: 23 Aug-18 18:09 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:31 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-8323-1181	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 23 Aug-18 18:13	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.8947	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.7090	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.8947	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.8947	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.8947	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect

CM_MC1 = site control

CETIS Analytical Report

Report Date: 23 Aug-18 18:31 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-8323-1181 Endpoint: 6d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:13 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1	XC	8	2	10	0.8	0.2	20.0%
FR_FRCP1		8	2	10	0.8	0.2	20.0%
GH_FR1		9	1	10	0.9	0.1	10.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		9	1	10	0.9	0.1	10.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000
FR_FRCP1		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 23 Aug-18 18:31 (p 3 of 3)

Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-8323-1181

Endpoint: 6d Survival Rate

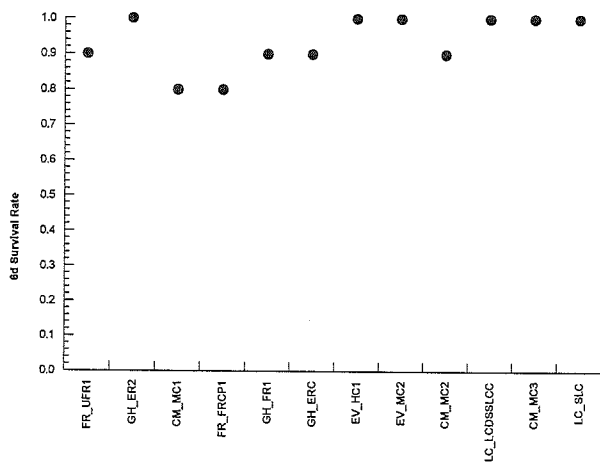
CETIS Version: CETISv1.9.4

Analyzed: 23 Aug-18 18:13

Analysis: STP 2xK Contingency Tables

Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 05-4838-8615 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:10 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	33.17%
		GH_ER2 passed reproduction	33.17%
		CM_MC1 passed reproduction	33.17%
		FR_FRCP1 failed reproduction	33.17%
		GH_FR1 passed reproduction	33.17%
		GH_ERC passed reproduction	33.17%
		EV_HC1 passed reproduction	33.17%
		EV_MC2 passed reproduction	33.17%
		CM_MC2 failed reproduction	33.17%
		LC_LCDSSLCC passed reproduction	33.17%
		CM_MC3 passed reproduction	33.17%
		LC_SLC passed reproduction	33.17%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	129.5	71	1	18	CDF	0.9999	Non-Significant Effect
		GH_ER2	108.5	71	3	18	CDF	0.9607	Non-Significant Effect
		CM_MC1	122	71	3	18	CDF	0.9989	Non-Significant Effect
		FR_FRCP1*	60	71	1	18	CDF	0.0035	Significant Effect
		GH_FR1	109	71	4	18	CDF	0.9646	Non-Significant Effect
		GH_ERC	127	71	2	18	CDF	0.9998	Non-Significant Effect
		EV_HC1	141.5	71	1	18	CDF	1.0000	Non-Significant Effect
		EV_MC2	93.5	71	4	18	CDF	0.6333	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	8.6E-04	Significant Effect
		LC_LCDSSLCC	114.5	71	3	18	CDF	0.9902	Non-Significant Effect
		CM_MC3	80	71	1	18	CDF	0.1814	Non-Significant Effect
		LC_SLC	114	71	3	18	CDF	0.9889	Non-Significant Effect

*Negative control =
 laboratory water;
 20% panner*

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2833.88	236.156	12	8.229	<1.0E-37	Significant Effect
Error	3357.7	28.6983	117			
Total	6191.58		129			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	33.61	26.22	7.8E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8557	0.9727	6.3E-10	Non-Normal Distribution

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	N	10	18.3	15.6	21	19	10	24	1.193	20.62%	0.00%
FR_UFR1		10	20.3	15.25	25.35	22.5	2	26	2.231	34.76%	-10.93%
GH_ER2		10	17.5	13.93	21.07	19	7	22	1.579	28.54%	4.37%
CM_MC1		10	17.7	10.78	24.62	20.5	0	28	3.059	54.65%	3.28%
FR_FRCP1		10	8.4	4.749	12.05	9.5	0	16	1.614	60.75%	54.10%
GH_FR1		10	18.3	15.94	20.66	19.5	10	22	1.044	18.04%	0.00%
GH_ERC		10	19.5	14.36	24.64	21.5	0	26	2.272	36.84%	-6.56%
EV_HC1		10	22.8	18.47	27.13	24	6	27	1.914	26.54%	-24.59%
EV_MC2		10	16.3	12.94	19.66	15.5	10	23	1.484	28.78%	10.93%
CM_MC2		10	5.4	3.884	6.916	6	2	9	0.67	39.24%	70.49%
LC_LCDSSLCC		10	19.4	17.03	21.77	20	14	23	1.046	17.04%	-6.01%
CM_MC3		10	14.1	11.27	16.93	13	8	20	1.251	28.06%	22.95%
LC_SLC		10	19.5	16.99	22.01	20.5	14	23	1.108	17.97%	-6.56%

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

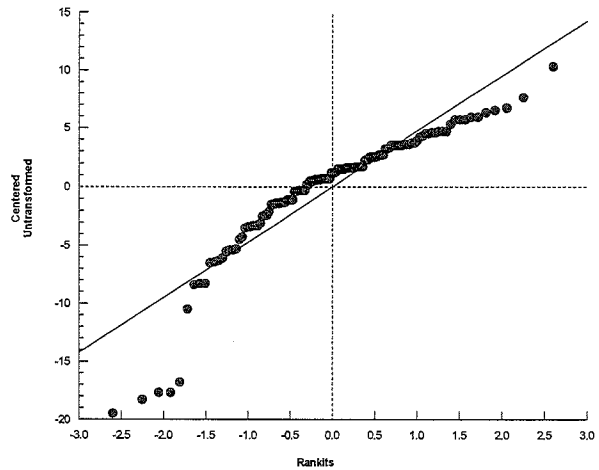
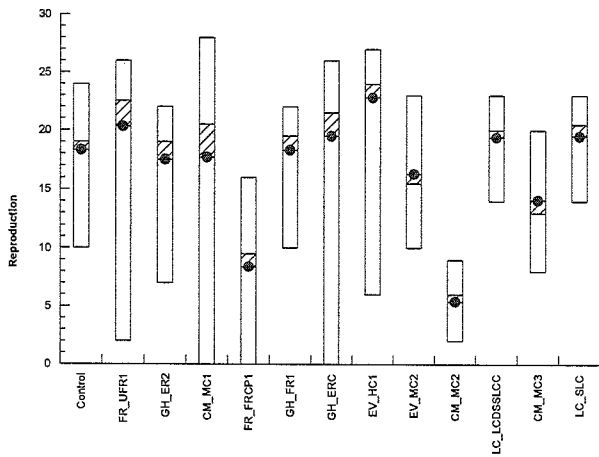
Nautilus Environmental

Analysis ID: 05-4838-8615 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:10 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	N	15	19	19	10	19	22	24	18	19	18
FR_UFR1		20	23	21	22	2	26	23	25	25	16
GH_ER2		19	20	22	21	22	19	19	15	11	7
CM_MC1		20	21	19	22	23	24	28	20	0	0
FR_FRCP1		10	0	5	13	13	16	6	9	10	2
GH_FR1		18	17	20	20	20	19	10	17	22	20
GH_ERC		23	26	0	20	22	21	22	20	18	23
EV_HC1		25	24	24	6	23	26	23	26	27	24
EV_MC2		13	15	23	13	11	19	10	21	22	16
CM_MC2		2	4	7	9	7	6	3	4	6	6
LC_LCDSSLCC		21	19	14	19	23	14	21	18	22	23
CM_MC3		18	20	12	20	13	13	13	8	11	13
LC_SLC		16	14	21	18	22	23	23	23	15	20

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 01-3695-6077	Endpoint: Reproduction	CETIS Version: CETISv1.9.4			
Analyzed: 23 Aug-18 18:11	Analysis: Nonparametric-Control vs Treatments	Status Level: 1			
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental**

Analysis ID: 01-3695-6077 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:11 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_ER2 passed reproduction	30.25%
		CM_MC1 passed reproduction	30.25%
		FR_FRCP1 failed reproduction	30.25%
		GH_FR1 passed reproduction	30.25%
		GH_ERC passed reproduction	30.25%
		EV_HC1 passed reproduction	30.25%
		EV_MC2 passed reproduction	30.25%
		CM_MC2 failed reproduction	30.25%
		LC_LCDSSLCC passed reproduction	30.25%
		CM_MC3 failed reproduction	30.25%
		LC_SLC passed reproduction	30.25%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	79	72	3	18	CDF	0.1505	Non-Significant Effect
		CM_MC1	93	72	4	18	CDF	0.6008	Non-Significant Effect
		FR_FRCP1*	64	72	2	18	CDF	0.0087	Significant Effect
		GH_FR1	78.5	72	2	18	CDF	0.1401	Non-Significant Effect
		GH_ERC	96	72	5	18	CDF	0.7039	Non-Significant Effect
		EV_HC1	126	72	3	18	CDF	0.9996	Non-Significant Effect
		EV_MC2	77.5	72	4	18	CDF	0.1209	Non-Significant Effect
		CM_MC2*	64.5	72	1	18	CDF	0.0098	Significant Effect
		LC_LCDSSLCC	86.5	72	3	18	CDF	0.3642	Non-Significant Effect
		CM_MC3*	69	72	1	18	CDF	0.0265	Significant Effect
		LC_SLC	89	72	5	18	CDF	0.4537	Non-Significant Effect

FR_UFR1 = Upstream Control Site Control

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2807.2	255.2	11	8.534	<1.0E-37	Significant Effect
Error	3229.6	29.9037	108			
Total	6036.8		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	31.81	24.72	8.2E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8511	0.9706	1.2E-09	Non-Normal Distribution

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	10	20.3	15.25	25.35	22.5	2	26	2.231	34.76%	0.00%
GH_ER2		10	17.5	13.93	21.07	19	7	22	1.579	28.54%	13.79%
CM_MC1		10	17.7	10.78	24.62	20.5	0	28	3.059	54.65%	12.81%
FR_FRCP1		10	8.4	4.749	12.05	9.5	0	16	1.614	60.75%	58.62%
GH_FR1		10	18.3	15.94	20.66	19.5	10	22	1.044	18.04%	9.85%
GH_ERC		10	19.5	14.36	24.64	21.5	0	26	2.272	36.84%	3.94%
EV_HC1		10	22.8	18.47	27.13	24	6	27	1.914	26.54%	-12.32%
EV_MC2		10	16.3	12.94	19.66	15.5	10	23	1.484	28.78%	19.70%
CM_MC2		10	5.4	3.884	6.916	6	2	9	0.67	39.24%	73.40%
LC_LCDSSLCC		10	19.4	17.03	21.77	20	14	23	1.046	17.04%	4.43%
CM_MC3		10	14.1	11.27	16.93	13	8	20	1.251	28.06%	30.54%
LC_SLC		10	19.5	16.99	22.01	20.5	14	23	1.108	17.97%	3.94%

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

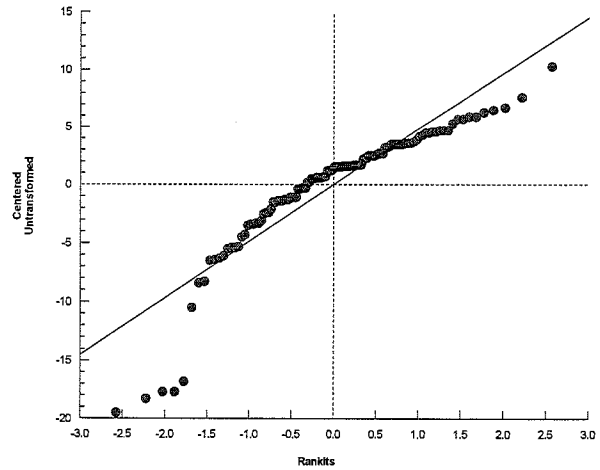
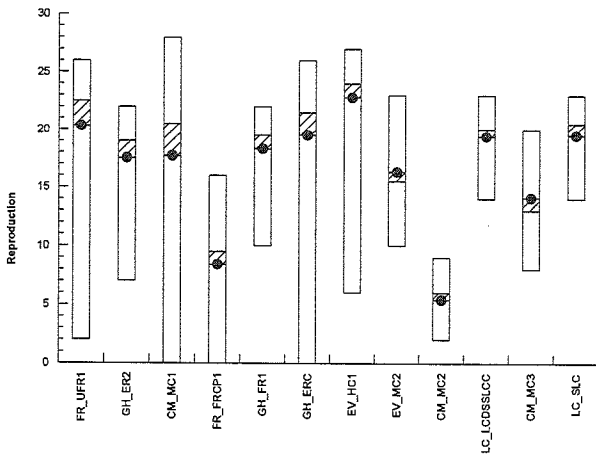
Analysis ID: 01-3695-6077 Endpoint: Reproduction
 Analyzed: 23 Aug-18 18:11 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	U	20	23	21	22	2	26	23	25	25	16
GH_ER2		19	20	22	21	22	19	19	15	11	7
CM_MC1		20	21	19	22	23	24	28	20	0	0
FR_FRCP1		10	0	5	13	13	16	6	9	10	2
GH_FR1		18	17	20	20	20	19	10	17	22	20
GH_ERC		23	26	0	20	22	21	22	20	18	23
EV_HC1		25	24	24	6	23	26	23	26	27	24
EV_MC2		13	15	23	13	11	19	10	21	22	16
CM_MC2		2	4	7	9	7	6	3	4	6	6
LC_LCDSSLCC		21	19	14	19	23	14	21	18	22	23
CM_MC3		18	20	12	20	13	13	13	8	11	13
LC_SLC		16	14	21	18	22	23	23	23	15	20

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-3984-4873	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 23 Aug-18 18:09	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-3984-4873 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:09 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	35.08%
		CM_MC1 passed reproduction	35.08%
		FR_FRCP1 failed reproduction	35.08%
		GH_FR1 passed reproduction	35.08%
		GH_ERC passed reproduction	35.08%
		EV_HC1 passed reproduction	35.08%
		EV_MC2 passed reproduction	35.08%
		CM_MC2 failed reproduction	35.08%
		LC_LCDSSLCC passed reproduction	35.08%
		CM_MC3 passed reproduction	35.08%
		LC_SLC passed reproduction	35.08%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	131	72	4	18	CDF	0.9999	Non-Significant Effect
		CM_MC1	119	72	5	18	CDF	0.9967	Non-Significant Effect
		FR_FRCP1*	65	72	0	18	CDF	0.0111	Significant Effect
		GH_FR1	104.5	72	4	18	CDF	0.9092	Non-Significant Effect
		GH_ERC	126.5	72	4	18	CDF	0.9997	Non-Significant Effect
		EV_HC1	145	72	0	18	CDF	1.0000	Non-Significant Effect
		EV_MC2	98	72	6	18	CDF	0.7652	Non-Significant Effect
		CM_MC2*	57	72	1	18	CDF	0.0014	Significant Effect
		LC_LCDSSLCC	115	72	4	18	CDF	0.9902	Non-Significant Effect
		CM_MC3	83.5	72	2	18	CDF	0.2666	Non-Significant Effect
		LC_SLC	118.5	72	5	18	CDF	0.9962	Non-Significant Effect

GH_ERC = receiving water site control

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2807.2	255.2	11	8.534	<1.0E-37	Significant Effect
Error	3229.6	29.9037	108			
Total	6036.8		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	31.81	24.72	8.2E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8511	0.9706	1.2E-09	Non-Normal Distribution

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	20.3	15.25	25.35	22.5	2	26	2.231	34.76%	0.00%
GH_ER2	R	10	17.5	13.93	21.07	19	7	22	1.579	28.54%	13.79%
CM_MC1		10	17.7	10.78	24.62	20.5	0	28	3.059	54.65%	12.81%
FR_FRCP1		10	8.4	4.749	12.05	9.5	0	16	1.614	60.75%	58.62%
GH_FR1		10	18.3	15.94	20.66	19.5	10	22	1.044	18.04%	9.85%
GH_ERC		10	19.5	14.36	24.64	21.5	0	26	2.272	36.84%	3.94%
EV_HC1		10	22.8	18.47	27.13	24	6	27	1.914	26.54%	-12.32%
EV_MC2		10	16.3	12.94	19.66	15.5	10	23	1.484	28.78%	19.70%
CM_MC2		10	5.4	3.884	6.916	6	2	9	0.67	39.24%	73.40%
LC_LCDSSLCC		10	19.4	17.03	21.77	20	14	23	1.046	17.04%	4.43%
CM_MC3		10	14.1	11.27	16.93	13	8	20	1.251	28.06%	30.54%
LC_SLC		10	19.5	16.99	22.01	20.5	14	23	1.108	17.97%	3.94%

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

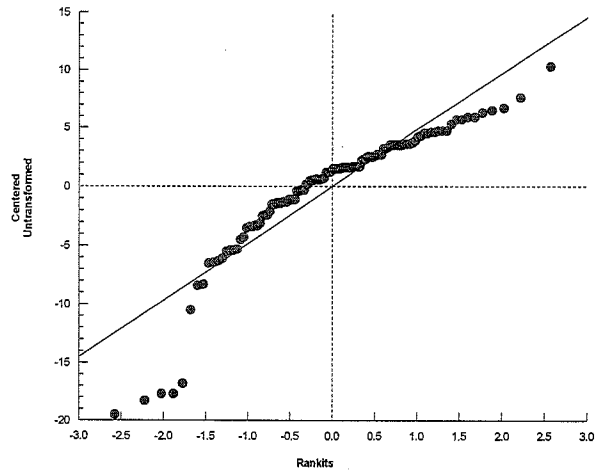
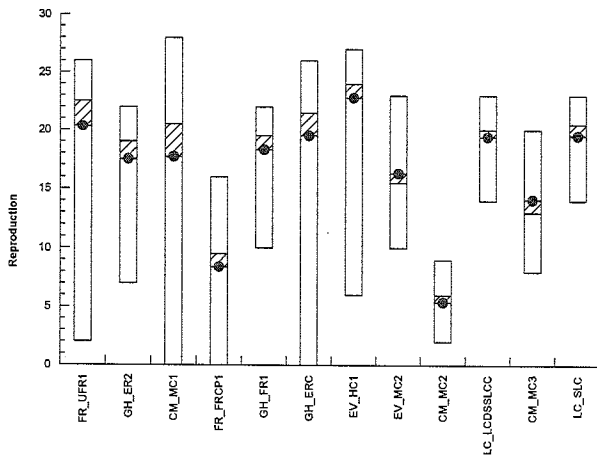
Analysis ID: 10-3984-4873 Endpoint: Reproduction
 Analyzed: 23 Aug-18 18:09 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		20	23	21	22	2	26	23	25	25	16
GH_ER2	R	19	20	22	21	22	19	19	15	11	7
CM_MC1		20	21	19	22	23	24	28	20	0	0
FR_FRCP1		10	0	5	13	13	16	6	9	10	2
GH_FR1		18	17	20	20	20	19	10	17	22	20
GH_ERC		23	26	0	20	22	21	22	20	18	23
EV_HC1		25	24	24	6	23	26	23	26	27	24
EV_MC2		13	15	23	13	11	19	10	21	22	16
CM_MC2		2	4	7	9	7	6	3	4	6	6
LC_LCDSSLCC		21	19	14	19	23	14	21	18	22	23
CM_MC3		18	20	12	20	13	13	13	8	11	13
LC_SLC		16	14	21	18	22	23	23	23	15	20

Graphics



CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-6400-5729	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 23 Aug-18 18:13	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-6400-5729 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 23 Aug-18 18:13 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	34.69%
		GH_ER2 passed reproduction	34.69%
		FR_FRCP1 passed reproduction	34.69%
		GH_FR1 passed reproduction	34.69%
		GH_ERC passed reproduction	34.69%
		EV_HC1 passed reproduction	34.69%
		EV_MC2 passed reproduction	34.69%
		CM_MC2 passed reproduction	34.69%
		LC_LCDSSLCC passed reproduction	34.69%
		CM_MC3 passed reproduction	34.69%
		LC_SLC passed reproduction	34.69%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	117	72	4	18	CDF	0.9942	Non-Significant Effect
		GH_ER2	91	72	4	18	CDF	0.5276	Non-Significant Effect
		FR_FRCP1	74	72	1	18	CDF	0.0685	Non-Significant Effect
		GH_FR1	88	72	3	18	CDF	0.4173	Non-Significant Effect
		GH_ERC	108.5	72	5	18	CDF	0.9568	Non-Significant Effect
		EV_HC1	133.5	72	2	18	CDF	1.0000	Non-Significant Effect
		EV_MC2	89	72	4	18	CDF	0.4537	Non-Significant Effect
		CM_MC2	75	72	0	18	CDF	0.0813	Non-Significant Effect
		LC_LCDSSLCC	98.5	72	4	18	CDF	0.7794	Non-Significant Effect
		CM_MC3	79	72	1	18	CDF	0.1505	Non-Significant Effect
		LC_SLC	101.5	72	4	18	CDF	0.8537	Non-Significant Effect

CM_MC2 = Site Control

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2807.2	255.2	11	8.534	<1.0E-37	Significant Effect
Error	3229.6	29.9037	108			
Total	6036.8		119			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	31.81	24.72	8.2E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8511	0.9706	1.2E-09	Non-Normal Distribution

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	20.3	15.25	25.35	22.5	2	26	2.231	34.76%	0.00%
GH_ER2		10	17.5	13.93	21.07	19	7	22	1.579	28.54%	13.79%
CM_MC1	XC	10	17.7	10.78	24.62	20.5	0	28	3.059	54.65%	12.81%
FR_FRCP1		10	8.4	4.749	12.05	9.5	0	16	1.614	60.75%	58.62%
GH_FR1		10	18.3	15.94	20.66	19.5	10	22	1.044	18.04%	9.85%
GH_ERC		10	19.5	14.36	24.64	21.5	0	26	2.272	36.84%	3.94%
EV_HC1		10	22.8	18.47	27.13	24	6	27	1.914	26.54%	-12.32%
EV_MC2		10	16.3	12.94	19.66	15.5	10	23	1.484	28.78%	19.70%
CM_MC2		10	5.4	3.884	6.916	6	2	9	0.67	39.24%	73.40%
LC_LCDSSLCC		10	19.4	17.03	21.77	20	14	23	1.046	17.04%	4.43%
CM_MC3		10	14.1	11.27	16.93	13	8	20	1.251	28.06%	30.54%
LC_SLC		10	19.5	16.99	22.01	20.5	14	23	1.108	17.97%	3.94%

CETIS Analytical Report

Report Date: 23 Aug-18 18:30 (p 3 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

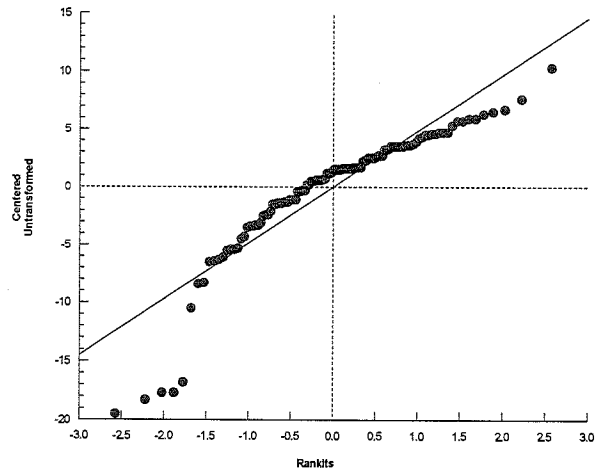
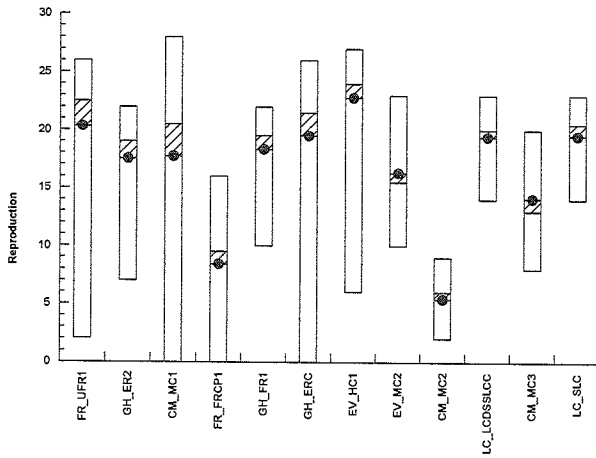
Analysis ID: 08-6400-5729 Endpoint: Reproduction
 Analyzed: 23 Aug-18 18:13 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		20	23	21	22	2	26	23	25	25	16
GH_ER2		19	20	22	21	22	19	19	15	11	7
CM_MC1	XC	20	21	19	22	23	24	28	20	0	0
FR_FRCP1		10	0	5	13	13	16	6	9	10	2
GH_FR1		18	17	20	20	20	19	10	17	22	20
GH_ERC		23	26	0	20	22	21	22	20	18	23
EV_HC1		25	24	24	6	23	26	23	26	27	24
EV_MC2		13	15	23	13	11	19	10	21	22	16
CM_MC2		2	4	7	9	7	6	3	4	6	6
LC_LCDSSLCC		21	19	14	19	23	14	21	18	22	23
CM_MC3		18	20	12	20	13	13	13	8	11	13
LC_SLC		16	14	21	18	22	23	23	23	15	20

Graphics



CETIS Analytical Report

Report Date: 31 Dec-18 08:05 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-4300-5700	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 31 Dec-18 8:04	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	13h		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Unamended Sample		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
<i>LC_SLC</i>		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
<i>= site control</i>		CM_MC1	0.2368	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.2368	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		Control+EDTA	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	1.0000	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 31 Dec-18 08:05 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-4300-5700 Endpoint: 6d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 31 Dec-18 8:04 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1		8	2	10	0.8	0.2	20.0%
FR_FRCP1		8	2	10	0.8	0.2	20.0%
GH_FR1		9	1	10	0.9	0.1	10.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		9	1	10	0.9	0.1	10.0%
LC_LCDSSLCC		10	0	10	1	0	0.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC	US	10	0	10	1	0	0.0%
Control+EDTA		10	0	10	1	0	0.0%
FR_FRCP1_EDTA		10	0	10	1	0	0.0%
CM_MC2_EDTA		10	0	10	1	0	0.0%

6d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000
FR_FRCP1		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC	US	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1_EDTA		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2_EDTA		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
FR_FRCP1		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC	US	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Control+EDTA		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1_EDTA		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2_EDTA		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Ceriodaphnia 7-d Survival and Reproduction Test

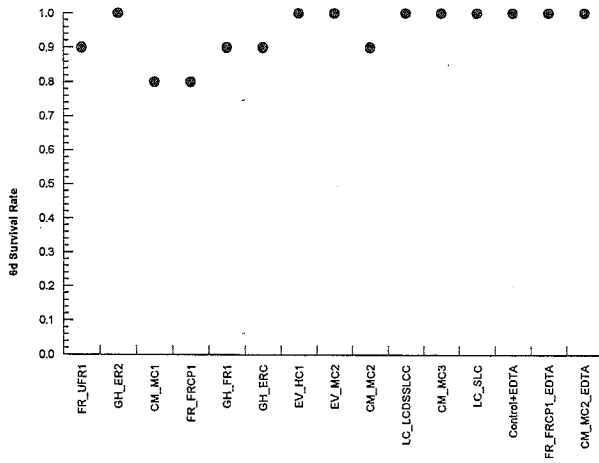
Nautilus Environmental

Analysis ID: 17-4300-5700
Analyzed: 31 Dec-18 8:04

Endpoint: 6d Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 31 Dec-18 08:08 (p 1 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-5445-4711	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 31 Dec-18 8:04	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 17-9015-3793	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 09 Aug-18 13:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 15 Aug-18 16:30	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 4h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	49h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	50h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	52h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	48h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	49h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	51h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	50h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	51h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	49h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	52h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	13h		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	51h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	50h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 31 Dec-18 08:08 (p 2 of 3)
 Test Code/ID: 181276 / 20-9326-4280

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-5445-4711 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 31 Dec-18 8:04 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	29.84%
		GH_ER2 passed reproduction	29.84%
		CM_MC1 passed reproduction	29.84%
		FR_FRCP1 failed reproduction	29.84%
		GH_FR1 passed reproduction	29.84%
		GH_ERC passed reproduction	29.84%
		EV_HC1 passed reproduction	29.84%
		EV_MC2 passed reproduction	29.84%
		CM_MC2 failed reproduction	29.84%
		LC_LCDSSLCC passed reproduction	29.84%
		CM_MC3 failed reproduction	29.84%
		Control+EDTA passed reproduction	29.84%
		FR_FRCP1_EDTA failed reproduction	29.84%
		CM_MC2_EDTA failed reproduction	29.84%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Unamended Sampl <i>LC-SLC = site control</i>		FR_UFR1	121	71	5	18	CDF	0.9988	Non-Significant Effect
		GH_ER2	91.5	71	4	18	CDF	0.5870	Non-Significant Effect
		CM_MC1	108.5	71	4	18	CDF	0.9669	Non-Significant Effect
		FR_FRCP1*	57.5	71	1	18	CDF	0.0020	Significant Effect
		GH_FR1	93	71	3	18	CDF	0.6410	Non-Significant Effect
		GH_ERC	113	71	5	18	CDF	0.9884	Non-Significant Effect
		EV_HC1	142	71	1	18	CDF	1.0000	Non-Significant Effect
		EV_MC2	83.5	71	5	18	CDF	0.2989	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	9.9E-04	Significant Effect
		LC_LCDSSLCC	102	71	5	18	CDF	0.8877	Non-Significant Effect
		CM_MC3*	67.5	71	2	18	CDF	0.0233	Significant Effect
		Control+EDTA	84.5	71	6	18	CDF	0.3319	Non-Significant Effect
		FR_FRCP1_EDTA*	55	71	0	18	CDF	9.9E-04	Significant Effect
		CM_MC2_EDTA*	67.5	71	2	18	CDF	0.0233	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3176.64	226.903	14	8.888	<1.0E-37	Significant Effect
Error	3446.4	25.5289	135			
Total	6623.04		149			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	47.54	29.14	1.6E-05	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8615	0.976	1.5E-10	Non-Normal Distribution

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-5445-4711 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 31 Dec-18 8:04 Analysis: Nonparametric-Control vs Treatments Status Level: 1

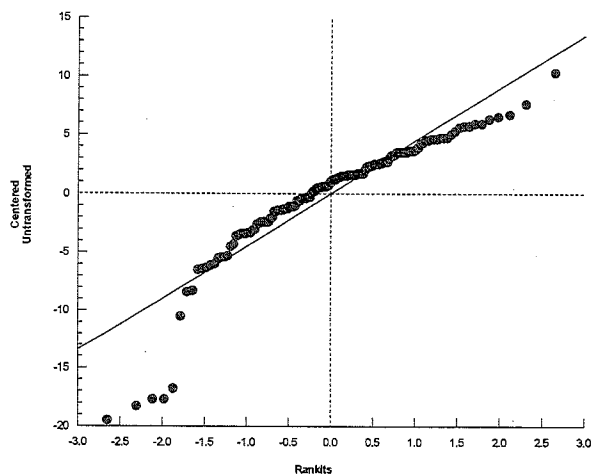
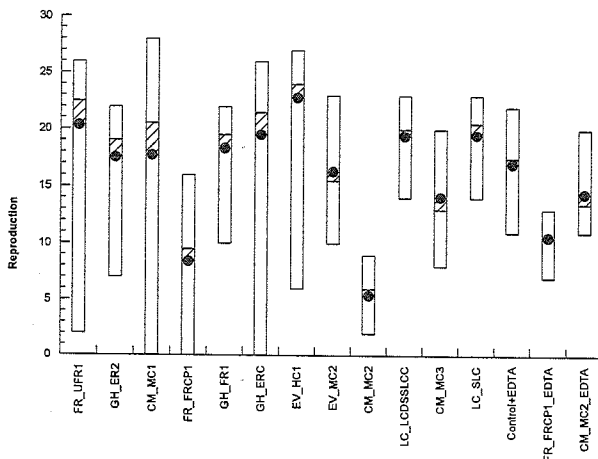
Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	20.3	15.25	25.35	22.5	2	26	2.231	34.76%	0.00%
GH_ER2		10	17.5	13.93	21.07	19	7	22	1.579	28.54%	13.79%
CM_MC1		10	17.7	10.78	24.62	20.5	0	28	3.059	54.65%	12.81%
FR_FRCP1		10	8.4	4.749	12.05	9.5	0	16	1.614	60.75%	58.62%
GH_FR1		10	18.3	15.94	20.66	19.5	10	22	1.044	18.04%	9.85%
GH_ERC		10	19.5	14.36	24.64	21.5	0	26	2.272	36.84%	3.94%
EV_HC1		10	22.8	18.47	27.13	24	6	27	1.914	26.54%	-12.32%
EV_MC2		10	16.3	12.94	19.66	15.5	10	23	1.484	28.78%	19.70%
CM_MC2		10	5.4	3.884	6.916	6	2	9	0.67	39.24%	73.40%
LC_LCDSSLCC		10	19.4	17.03	21.77	20	14	23	1.046	17.04%	4.43%
CM_MC3		10	14.1	11.27	16.93	13	8	20	1.251	28.06%	30.54%
LC_SLC	US	10	19.5	16.99	22.01	20.5	14	23	1.108	17.97%	3.94%
Control+EDTA		10	17	14.74	19.26	17.5	11	22	1	18.60%	16.26%
FR_FRCP1_EDTA		10	10.6	9.161	12.04	10.5	7	13	0.636	18.97%	47.78%
CM_MC2_EDTA		10	14.4	12.13	16.67	13.5	11	20	1.002	22.01%	29.06%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		20	23	21	22	2	26	23	25	25	16
GH_ER2		19	20	22	21	22	19	19	15	11	7
CM_MC1		20	21	19	22	23	24	28	20	0	0
FR_FRCP1		10	0	5	13	13	16	6	9	10	2
GH_FR1		18	17	20	20	20	19	10	17	22	20
GH_ERC		23	26	0	20	22	21	22	20	18	23
EV_HC1		25	24	24	6	23	26	23	26	27	24
EV_MC2		13	15	23	13	11	19	10	21	22	16
CM_MC2		2	4	7	9	7	6	3	4	6	6
LC_LCDSSLCC		21	19	14	19	23	14	21	18	22	23
CM_MC3		18	20	12	20	13	13	13	8	11	13
LC_SLC	US	16	14	21	18	22	23	23	23	15	20
Control+EDTA		19	11	22	18	16	20	14	18	15	17
FR_FRCP1_EDTA		8	10	10	13	12	12	13	10	7	11
CM_MC2_EDTA		12	20	11	12	12	17	13	19	14	14

Graphics



Client: TECO

W.O.#: 181276

Hardness and Alkalinity Datasheet

Sample ID	Subsample Date	Date Measured	Alkalinity				Hardness			Technician
			Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
FEUFF1	Aug 9/18	Aug 9/18	50	7.0	7.2	136	50	10.0	200	V
GHLEP2			50	6.6	6.7	130	50	7.4	148	
CM_MCS1			50	6.9	7.0	136	50	7.9	158	
FE_PFC01			50	9.8	10.0	192	100	6.3	630	
GH_PFA1			50	9.2	9.4	180	100	5.4	540	
GHLEP3			50	6.8	6.9	134	50	9.8	196	
EV_KCS1			50	9.2	9.3	182	100	4.0	400	
EV_MCS2			50	8.8	8.9	174	100	4.6	460	
CM_MCS2			50	8.9	9.0	172	100	7.3	730	
LC_LCS5SLC			50	9.3	9.5	182	100	5.2	520	
CM_MCS3			50	8.1	8.2	160	100	4.3	430	
LC_SLC			50	6.7	6.8	132	50	10.9	218	
26.6 number			100	9.4	9.5	93	50	5.0	100	

Notes: 1 Sample diluted w/ DI up to 100ml

Reviewed by: Jou

Date Reviewed: Aug. 28/18

APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 181277

Start Date: Aug 10/18
 Set up by: MB

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Aug 7/18
 Date Received: Aug 8/18
 Sample Volume: various

Test Organism Information:

Culture Date: Aug 3/18
 Age of culture (Day 0): 7d.

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC173
 Stock Solution ID: 18ZND5
 Date Initiated: 10 Aug 2018 Aug 24/18
 72-h IC50 (95% CL): 27.8 (24.8 - 31.1) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 31.4 (26.2 - 37.6) µg/L Zn CV (%): 9

Test Results:

	Negative Control	Cell Yield (Mean ± SD)
		29.6 ± 2.3
(site control)	FR-UFRI-MON-2018-08-06-N	100.4 ± 6.9 *
(site control)	GH-ERC-WS-2018-08-07-N	104.9 ± 8.9 *
(site control)	CM-MCI-03-WS-2018-08-07-N	99.9 ± 8.6 *
	FR-FRCP1-MON-2018-08-06-N	113.0 ± 5.9 *
	GH-FRI-WS-2018-08-07-N	108.8 ± 9.8 *
	GH-ERC-WS-2018-08-07-N	108.8 ± 6.8 *
	EV-HCI-WS-2018-08-07-N	98.5 ± 12.4 *
	EV-MCI-WS-2018-08-07-N	106.5 ± 4.8 *

* indicates cell yield that were significantly greater than the lab control

Reviewed by: JGU

Date reviewed: Sep. 20/18

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 181277

Start Date: Aug 10/18
 Set up by: ML

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Aug 7/18
 Date Received: Aug 8/18
 Sample Volume: various.

Test Organism Information:

Culture Date: Aug 3/18
 Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC173
 Stock Solution ID: 18705
 Date Initiated: Aug 24/18

72-h IC50 (95% CL): 27.8 (24.8-31.1) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 31.4 (26.2-37.6) µg/L Zn CV (%): 9

Test Results:

(site control)

	Cell Yield (Mean ± SD)
Negative Control	29.6 ± 2.3
CM-MC3-Q3-WS-20180807-N	93.0 ± 6.6 *
LC-WDSLCC-WS-2018-08-07-N	97.0 ± 12.2 *
CM-MC3-Q3-WS-20180807-N	95.8 ± 7.4 *
LC-SLC-WS-2018-08-07-N	106.2 ± 8.1 *
	±
	±
	±
	±

* indicates cell yield that were significantly greater than the lab controls

Reviewed by: JOK

Date reviewed: sep. 20/18

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: TECK Setup by: ML
 Sample ID: various Test Date/Time: Aug 10/18 @ 0830h
 Work Order No.: 181277 CER #: 4
 Test Species: Pseudokirchneriella subcapitata

Culture Date: Aug 3/18 Age of Culture: 7d Culture Health: Good
 Culture Count: 1 455 2 425 Average: 440 Culture Cell Density (c1): 440 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 440 \times 10^4 \quad \text{cells/mL}} = 5.00 \text{ mL}$$

Time Zero Counts: 1 21 2 22 Average: 21.5

No. of Cells/mL: 21.5 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 9773 cells/mL

Concentration 95.2% (v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	(°C)				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.0	24.0	25.0	25.0	25.0	25.0	✓	✓	/	✓
FR-UFPI	8.1	24.0					✓	✓	/	✓
GH-ERC	8.1	24.0					✓	✓	/	✓
CM-NCl	8.1	24.0					✓	✓	/	✓
FR-FRCP1	8.2	24.0					✓	✓	/	✓
GH-FR1	8.2	24.0					✓	✓	/	✓
GH-ERC	8.2	24.0					✓	✓	/	✓
EV-HCl	8.2	24.0					✓	✓	/	✓
EV-MC2	8.2	24.0					✓	✓	/	✓
CM-MC2	8.2	24.0	✓	✓	✓	✓	✓	✓	/	✓
Initials	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.2 Well 2: 7.2

Light intensity (lux): 4020 Date measured: Aug 10/18

Thermometer: 4 Light meter: 1 pH meter/probe: 1, 1

Sample Description: all samples (except CM-MC1): clear, colourless, odourless, some particulates // CM-MC1: clear, colourless, odourless, no particulates.

Comments: _____
 Reviewed: JGH Date reviewed: sep. 20/18

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

page 2 of 2

Client: Teck Setup by: MLJ
 Sample ID: Various Test Date/Time: Aug 10/18 @ 0830h
 Work Order No.: 181277 CER #: 4
 Test Species: Pseudokirchneriella subcapitata
 Culture Date: Aug 3/18 Age of Culture: 7d Culture Health: Good
 Culture Count: 1 455 2 455 Average: 440 Culture Cell Density (c1): 440 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 440 \times 10^4 \text{ cells/mL}} = 5.00 \text{ mL}$$

Time Zero Counts: 1 21 2 20 Average: 21.5

No. of Cells/mL: 21.5 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 9773 cells/mL

Concentration 95.2%(v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	(°C)				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.0	24.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓
KLCSLCE	8.2	24.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MC3	8.2	24.0	↓	↓	↓	↓	✓	✓	✓	✓
KL-SLE	8.2	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLJ	MLJ	MLJ	RL	A	MLJ	MLJ	RL	RL	MLJ

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.2 Well 2: 7.2

Light intensity (lux): 4010 Date measured: Aug 10/18

Thermometer: 4 Light meter: 1 pH meter/probe: 1/1

Sample Description: ① see page 1 of WO.

Comments: _____

Reviewed: John Date reviewed: Sept. 20/18

Pseudokirchneriella subcapitata Toxicity Test Data Sheet 72-h Algal Cell Counts

Client: Teck Start Date/Time: Aug 10/18 @ 0830h
 Work Order #: 181277 Termination Date: Aug 13/18 @ 0830h
 Sample ID: various Test set up by: ML
 95.2 % (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	32					ML
	B	33					
	C	29					
	D	28					
	E	30					
	F	31					
	G	28					
	H	34					
FR_UFK1 (site chl)	A	103					
	B	104					
	C	96					
	D	99					
	EA	115					
	FB ^{ML}	105					
	GC	94					
	HD	95					
GH_FR2 (site chl)	A	93					
	B	117					
	C	102					
	D	110					
	EA ^{ML}	98					
	FB	108					
	GC	101					
	HD	118					
CU_MCI (site chl)	A	90					
	B	118					
	C	103					
	D	99					
	EA ^{ML}	98					
	FB	94					
	GC	98					
	HD	107					
FR_FRCP1	A	106					
	B	118					
	C	113					
	D	119					

Comments: _____

Reviewed by: JOU Date Reviewed: Sep. 20/18

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: Teck Start Date/Time: Aug 10/18 @ 0830h
 Work Order #: 181277 Termination Date: Aug 13/18 @ 0830h
 Sample ID: various Test set up by: ML

95.7 % (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
GH-FK1	A	123					ML
	B	104					
	C	111					
	D	101					
GH-ERC	A	150					
	B	114					
	C	110					
	D	116					
EV-HC1	A	93					
	B	118					
	C	92					
	D	95					
EV-MC2	A	112					
	B	105					
	C	110					
	D	103					
CM-MC2	A	90					
	B	87					
	C	98					
	D	101					
LE-LCDSSLCC	A	96					
	B	116					
	C	91					
	D	96					
CM-MC3	A	104					
	B	102					
	C	89					
	D	92					

Comments: _____

Reviewed by: JGK Date Reviewed: sep-20/18

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

3/3

Client: Teck Start Date/Time: Aug 10/18 @ 0830h
 Work Order #: 181277 Termination Date: Aug 13/18 @ 0830h
 Sample ID: various Test set up by: MLG
 95.2% (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
LC-5LC	A	119					MLG
	B	103					
	C	106					
	D	101					↓
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Comments: _____
 Reviewed by: JGK Date Reviewed: sep-20/18

CETIS Summary Report

Report Date: 14 Sep-18 16:38 (p 1 of 21)

Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control ①	15-5397-7086	10 Aug-18	10 Aug-18	8h	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C) ✓		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C) ✓		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C) ✓		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C) ✓		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C) ✓		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C) ✓		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C) ✓		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C) ✓		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C) ✓		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C) ✓		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C) ✓		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C) ✓		

① Lab control = Deionized water with nutrients
 FR_UFR1 = site control
 GH_ER2 = site control
 CM_MC1 = site control

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	LC_LCDSSLCC passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	EV_HC1 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	GH_ERC passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	CM_MC2 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	EV_MC2 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	GH_FR1 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	LC_SLC passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	FR_FRCP1 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	CM_MC1 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	GH_ER2 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	CM_MC3 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	FR_UFR1 passed cell yield	1
03-3503-5287	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	Lab Control passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	LC_LCDSSLCC passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	GH_FR1 passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	GH_ERC passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	FR_FRCP1 passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	EV_HC1 passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	CM_MC1 passed cell yield	1
06-3269-0512	Cell Yield	Wilcoxon/Bonferroni Adj Test	1.0000	EV_MC2 passed cell yield	1

CETIS Summary Report

Report Date: 14 Sep-18 16:38 (p 21 of 21)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	8	29.62	27.73	31.52	27	33	0.8004	2.264	7.64%	0.00%
FR_UFR1		8	100.4	94.57	106.2	93	114	2.456	6.948	6.92%	-238.82%
GH_ER2		8	104.9	97.4	112.3	92	117	3.159	8.935	8.52%	-254.01%
CM_MC1	R	8	99.88	92.66	107.1	89	117	3.05	8.626	8.64%	-237.13%
FR_FRCP1		4	113	103.5	122.5	105	118	2.972	5.944	5.26%	-281.43%
GH_FR1		4	108.8	93.19	124.3	100	122	4.888	9.777	8.99%	-267.09%
GH_ERC		4	108.8	97.85	119.6	99	114	3.425	6.85	6.30%	-267.09%
EV_HC1		4	98.5	78.77	118.2	91	117	6.198	12.4	12.59%	-232.49%
EV_MC2		4	106.5	99.81	113.2	102	111	2.102	4.203	3.95%	-259.49%
CM_MC2		4	93	82.53	103.5	86	100	3.291	6.583	7.08%	-213.92%
LC_LCDSSLCC		4	97	77.6	116.4	89	115	6.096	12.19	12.57%	-227.43%
CM_MC3		4	95.75	84.03	107.5	88	103	3.683	7.365	7.69%	-223.21%
LC_SLC		4	106.2	93.36	119.1	100	118	4.049	8.098	7.62%	-258.65%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	31	32	28	27	29	30	27	33
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1	R	89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 21-1820-1193	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 24 Aug-18 20:15	Analysis: Nonparametric-Multiple Comparison	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	15-5397-7086	10 Aug-18	10 Aug-18	8h	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 21-1820-1193 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 24 Aug-18 20:15 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 failed cell yield	44.72%
		GH_ER2 failed cell yield	44.72%
		CM_MC1 failed cell yield	44.72%
		FR_FRCP1 failed cell yield	44.72%
		GH_FR1 failed cell yield	44.72%
		GH_ERC failed cell yield	44.72%
		EV_HC1 failed cell yield	44.72%
		EV_MC2 failed cell yield	44.72%
		CM_MC2 failed cell yield	44.72%
		LC_LCDSSLCC failed cell yield	44.72%
		CM_MC3 failed cell yield	44.72%
		LC_SLC failed cell yield	44.72%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1*	36	n/a	0	14	Exact	9.3E-04	Significant Effect
<i>lab control</i>		GH_ER2*	36	n/a	0	14	Exact	9.3E-04	Significant Effect
		CM_MC1*	36	n/a	0	14	Exact	9.3E-04	Significant Effect
		FR_FRCP1*	10	n/a	0	10	Exact	0.0242	Significant Effect
		GH_FR1*	10	n/a	0	10	Exact	0.0242	Significant Effect
		GH_ERC*	10	n/a	0	10	Exact	0.0242	Significant Effect
		EV_HC1*	10	n/a	0	10	Exact	0.0242	Significant Effect
		EV_MC2*	10	n/a	0	10	Exact	0.0242	Significant Effect
		CM_MC2*	10	n/a	0	10	Exact	0.0242	Significant Effect
		LC_LCDSSLCC*	10	n/a	0	10	Exact	0.0242	Significant Effect
		CM_MC3*	10	n/a	0	10	Exact	0.0242	Significant Effect
		LC_SLC*	10	n/a	0	10	Exact	0.0242	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	39243.3	3270.27	12	52.34	<1.0E-37	Significant Effect
Error	3436.5	62.4818	55			
Total	42679.8		67			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.96	26.22	0.1932	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9482	0.9514	0.0068	Non-Normal Distribution

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 21-1820-1193 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 24 Aug-18 20:15 Analysis: Nonparametric-Multiple Comparison Status Level: 1

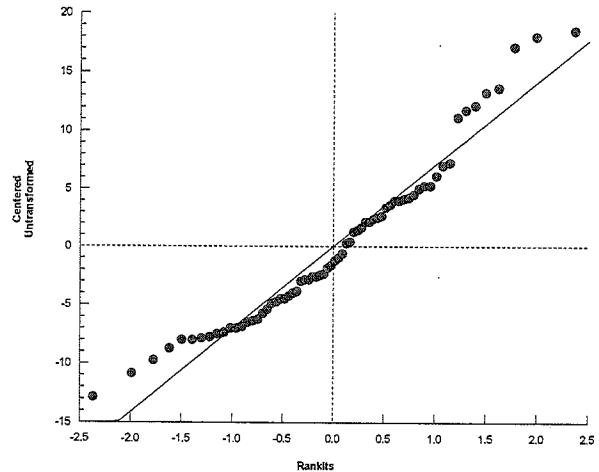
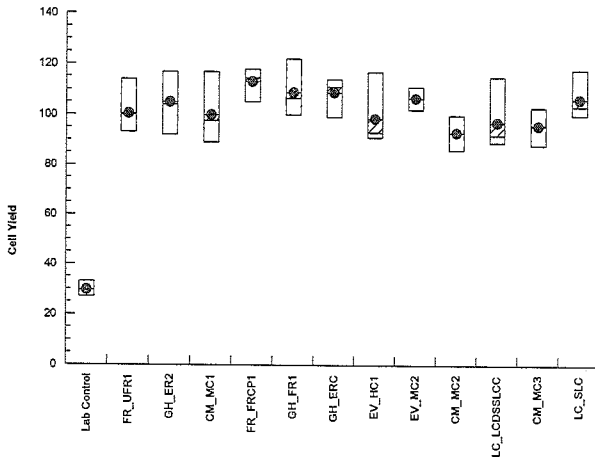
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	N	8	29.62	27.73	31.52	29.5	27	33	0.8004	7.64%	0.00%
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	-238.82%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-254.01%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	-237.13%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-281.43%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-267.09%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-267.09%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	-232.49%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-259.49%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	-213.92%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	-227.43%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	-223.21%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-258.65%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	31	32	28	27	29	30	27	33
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-4292-3581	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 14 Sep-18 16:34	Analysis: Nonparametric-Multiple Comparison	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 16-4292-3581 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:34 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_ER2 passed cell yield	13.96%
		CM_MC1 passed cell yield	13.96%
		FR_FRCP1 passed cell yield	13.96%
		GH_FR1 passed cell yield	13.96%
		GH_ERC passed cell yield	13.96%
		EV_HC1 passed cell yield	13.96%
		EV_MC2 passed cell yield	13.96%
		CM_MC2 passed cell yield	13.96%
		LC_LCDSSLCC passed cell yield	13.96%
		CM_MC3 passed cell yield	13.96%
		LC_SLC passed cell yield	13.96%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	77	n/a	0	14	Exact	1.0000	Non-Significant Effect
<i>FR_UFR1</i>		CM_MC1	65.5	n/a	3	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	40	n/a	0	10	Exact	1.0000	Non-Significant Effect
		GH_FR1	34.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		GH_ERC	35.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_HC1	19.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	35	n/a	2	10	Exact	1.0000	Non-Significant Effect
		CM_MC2	17	n/a	0	10	Exact	0.8444	Non-Significant Effect
		LC_LCDSSLCC	19.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC3	19.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		LC_SLC	33.5	n/a	1	10	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.5484	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

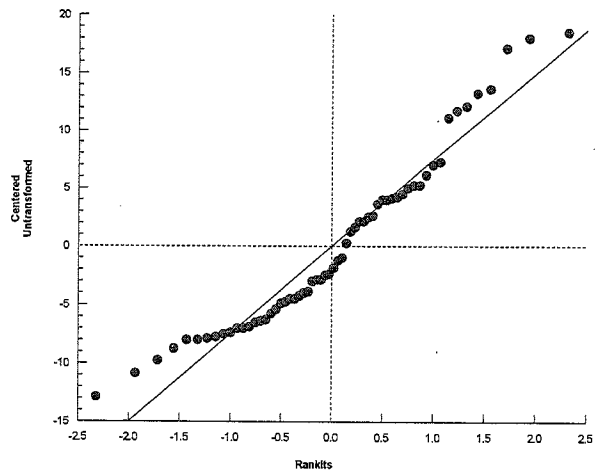
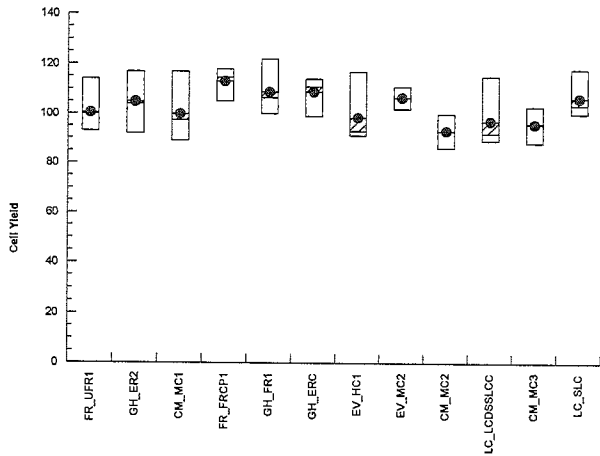
Nautilus Environmental

Analysis ID: 16-4292-3581 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:34 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	U	102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 03-4731-7925	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4			
Analyzed: 14 Sep-18 16:34	Analysis: Nonparametric-Multiple Comparison	Status Level: 1			
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:			
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 03-4731-7925 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:34 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_ER2 passed cell yield	13.96%
		CM_MC1 passed cell yield	13.96%
		FR_FRCP1 passed cell yield	13.96%
		GH_FR1 passed cell yield	13.96%
		GH_ERC passed cell yield	13.96%
		EV_HC1 passed cell yield	13.96%
		EV_MC2 passed cell yield	13.96%
		CM_MC2 passed cell yield	13.96%
		LC_LCDSSLCC passed cell yield	13.96%
		CM_MC3 passed cell yield	13.96%
		LC_SLC passed cell yield	13.96%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	59	n/a	0	14	Exact	1.0000	Non-Significant Effect
<i>FR_UFR1</i>		CM_MC1	70.5	n/a	3	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	12	n/a	0	10	Exact	0.0889	Non-Significant Effect
		GH_FR1	17.5	n/a	1	10	Exact	0.9111	Non-Significant Effect
		GH_ERC	16.5	n/a	1	10	Exact	0.6000	Non-Significant Effect
		EV_HC1	32.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	17	n/a	2	10	Exact	0.7778	Non-Significant Effect
		CM_MC2	35	n/a	0	10	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	32.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC3	32.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		LC_SLC	18.5	n/a	1	10	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.5484	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:38 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

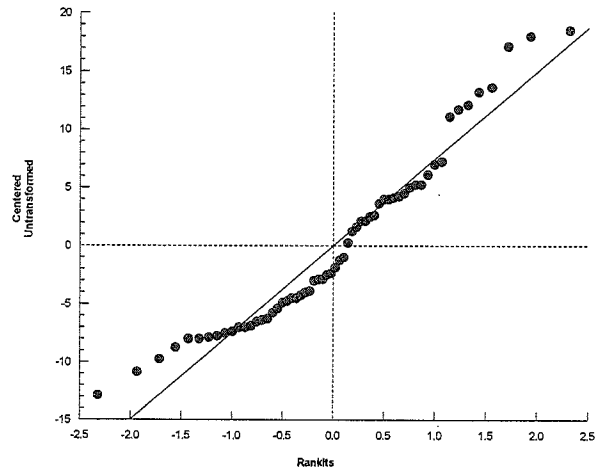
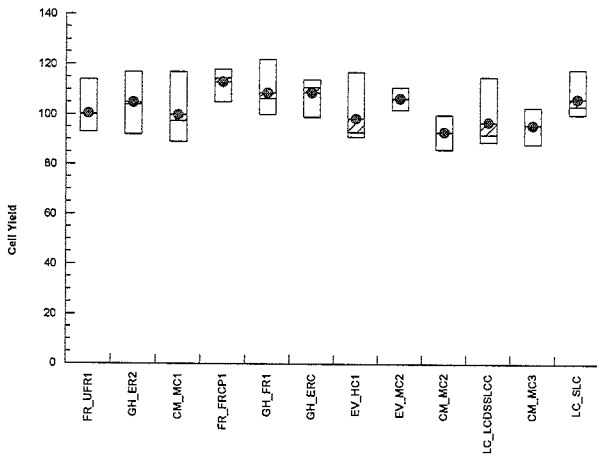
Analysis ID: 03-4731-7925 Endpoint: Cell Yield
 Analyzed: 14 Sep-18 16:34 Analysis: Nonparametric-Multiple Comparison

CETIS Version: CETISv1.9.4
 Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	U	102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



14 Sep 2018

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 20-7550-8811	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 14 Sep-18 16:35	Analysis: Nonparametric-Multiple Comparison	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 20-7550-8811 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:35 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	13.36%
		CM_MC1 passed cell yield	13.36%
		FR_FRCP1 passed cell yield	13.36%
		GH_FR1 passed cell yield	13.36%
		GH_ERC passed cell yield	13.36%
		EV_HC1 passed cell yield	13.36%
		EV_MC2 passed cell yield	13.36%
		CM_MC2 passed cell yield	13.36%
		LC_LCDSSLCC passed cell yield	13.36%
		CM_MC3 passed cell yield	13.36%
		LC_SLC passed cell yield	13.36%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	59	n/a	0	14	Exact	1.0000	Non-Significant Effect
GH_ER2		CM_MC1	57.5	n/a	2	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	35.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		GH_FR1	30.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		GH_ERC	29.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_HC1	19	n/a	2	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	29.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC2	14	n/a	2	10	Exact	0.2667	Non-Significant Effect
		LC_LCDSSLCC	17	n/a	0	10	Exact	0.8444	Non-Significant Effect
		CM_MC3	17.5	n/a	1	10	Exact	0.8889	Non-Significant Effect
		LC_SLC	28.5	n/a	1	10	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.5484	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2	XC	8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

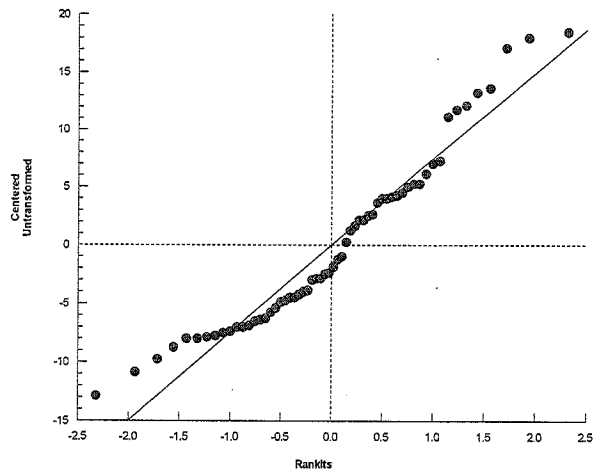
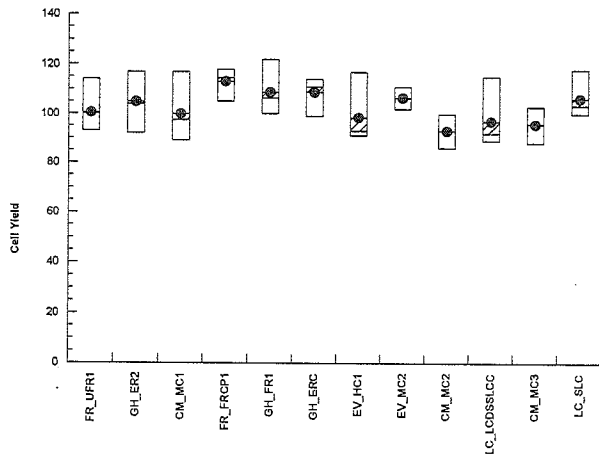
Nautilus Environmental

Analysis ID: 20-7550-8811 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:35 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2	XC	92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 06-3269-0512	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4			
Analyzed: 14 Sep-18 16:35	Analysis: Nonparametric-Multiple Comparison	Status Level: 1			
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:			
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-3269-0512 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:35 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	13.36%
		CM_MC1 passed cell yield	13.36%
		FR_FRCP1 passed cell yield	13.36%
		GH_FR1 passed cell yield	13.36%
		GH_ERC passed cell yield	13.36%
		EV_HC1 passed cell yield	13.36%
		EV_MC2 passed cell yield	13.36%
		CM_MC2 passed cell yield	13.36%
		LC_LCDSSLCC passed cell yield	13.36%
		CM_MC3 passed cell yield	13.36%
		LC_SLC passed cell yield	13.36%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	77	n/a	0	14	Exact	1.0000	Non-Significant Effect
<i>GH_ER2</i>		CM_MC1	78.5	n/a	2	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	16.5	n/a	1	10	Exact	0.6222	Non-Significant Effect
		GH_FR1	21.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		GH_ERC	22.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_HC1	33	n/a	2	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	22.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC2	38	n/a	2	10	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	35	n/a	0	10	Exact	1.0000	Non-Significant Effect
		CM_MC3	34.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		LC_SLC	23.5	n/a	1	10	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.5484	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2	XC	8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

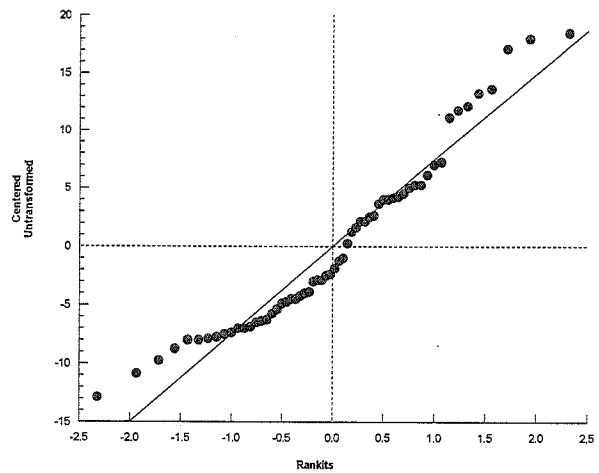
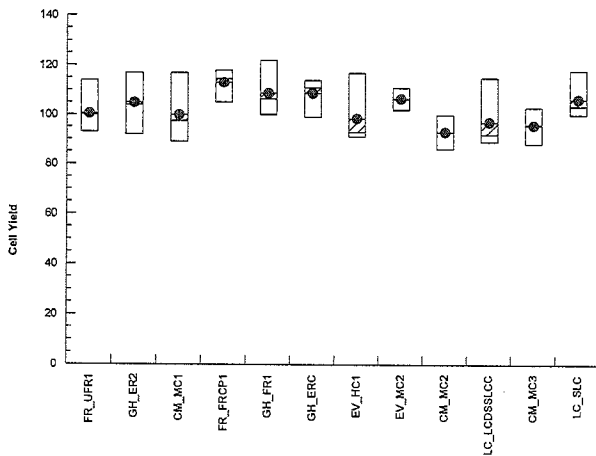
Nautilus Environmental

Analysis ID: 06-3269-0512 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:35 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2	XC	92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 03-3503-5287	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 14 Sep-18 16:36	Analysis: Nonparametric-Multiple Comparison	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 03-3503-5287 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:36 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	14.03%
		GH_ER2 passed cell yield	14.03%
		FR_FRCP1 passed cell yield	14.03%
		GH_FR1 passed cell yield	14.03%
		GH_ERC passed cell yield	14.03%
		EV_HC1 passed cell yield	14.03%
		EV_MC2 passed cell yield	14.03%
		CM_MC2 passed cell yield	14.03%
		LC_LCDSSLCC passed cell yield	14.03%
		CM_MC3 passed cell yield	14.03%
		LC_SLC passed cell yield	14.03%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	70.5	n/a	3	14	Exact	1.0000	Non-Significant Effect
<i>CM_MC1</i>		GH_ER2	78.5	n/a	2	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	38.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		GH_FR1	36	n/a	0	10	Exact	1.0000	Non-Significant Effect
		GH_ERC	36	n/a	0	10	Exact	1.0000	Non-Significant Effect
		EV_HC1	21.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	35.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC2	18.5	n/a	2	10	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	20.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC3	22	n/a	0	10	Exact	1.0000	Non-Significant Effect
		LC_SLC	34.5	n/a	1	10	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1	R	8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

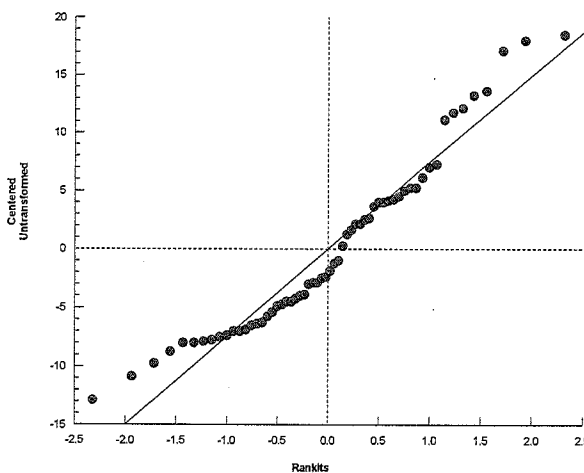
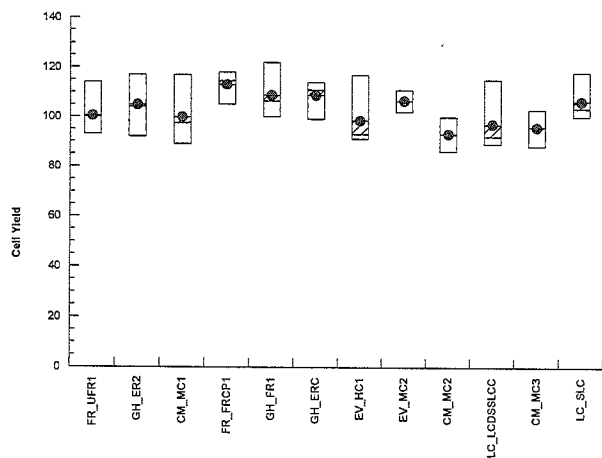
Nautilus Environmental

Analysis ID: 03-3503-5287 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:36 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1	R	89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-8128-1066	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 14 Sep-18 16:36	Analysis: Nonparametric-Multiple Comparison	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-8128-1066 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:36 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	14.03%
		GH_ER2 passed cell yield	14.03%
		FR_FRCP1 passed cell yield	14.03%
		GH_FR1 passed cell yield	14.03%
		GH_ERC passed cell yield	14.03%
		EV_HC1 passed cell yield	14.03%
		EV_MC2 passed cell yield	14.03%
		CM_MC2 passed cell yield	14.03%
		LC_LCDSSLCC passed cell yield	14.03%
		CM_MC3 passed cell yield	14.03%
		LC_SLC passed cell yield	14.03%

Wilcoxon/Bonferroni Adj Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	65.5	n/a	3	14	Exact	1.0000	Non-Significant Effect
<i>OM-MC1</i>		GH_ER2	57.5	n/a	2	14	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	13.5	n/a	1	10	Exact	0.1778	Non-Significant Effect
		GH_FR1	16	n/a	0	10	Exact	0.5333	Non-Significant Effect
		GH_ERC	16	n/a	0	10	Exact	0.5333	Non-Significant Effect
		EV_HC1	30.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		EV_MC2	16.5	n/a	1	10	Exact	0.6222	Non-Significant Effect
		CM_MC2	33.5	n/a	2	10	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	31.5	n/a	1	10	Exact	1.0000	Non-Significant Effect
		CM_MC3	30	n/a	0	10	Exact	1.0000	Non-Significant Effect
		LC_SLC	17.5	n/a	1	10	Exact	0.8444	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1	R	8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC		4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 14 Sep-18 16:37 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

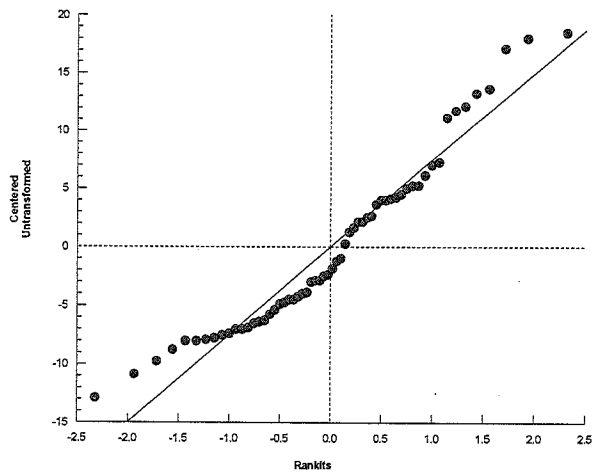
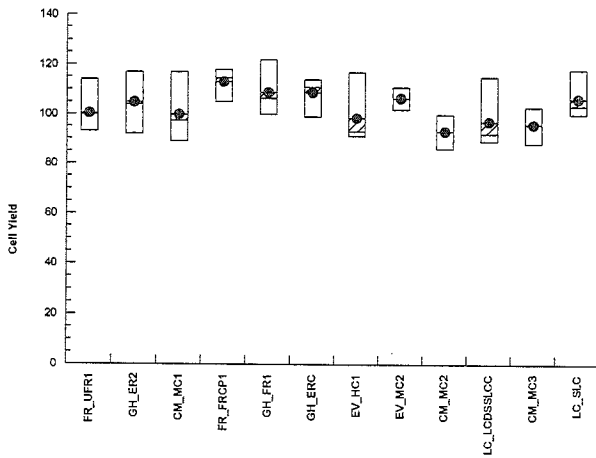
Nautilus Environmental

Analysis ID: 15-8128-1066 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 14 Sep-18 16:36 Analysis: Nonparametric-Multiple Comparison Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1	R	89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC		118	102	105	100				

Graphics



CETIS Analytical Report

Report Date: 18 Jan-19 10:10 (p 1 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-8444-4409	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 18 Jan-19 10:09	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 16-1263-1231	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 10 Aug-18 08:30	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 13 Aug-18 08:30	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	69h (18.8 °C)	Teck Coal	
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	70h (17.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	71h (17.5 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	70h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	67h (19 °C)		
GH_ERC	13-0170-3026	07 Aug-18 12:27	08 Aug-18 09:30	68h (17.5 °C)		
EV_HC1	01-1419-9221	07 Aug-18 10:20	08 Aug-18 09:30	70h (15 °C)		
EV_MC2	12-7570-0741	07 Aug-18 11:20	08 Aug-18 09:30	69h (15 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	69h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	71h (16.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	69h (17.5 °C)		
① LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	71h (16.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-08-07	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-08-07_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	

① site control = LC_SLC

CETIS Analytical Report

Report Date: 18 Jan-19 10:10 (p 2 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-8444-4409 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 18 Jan-19 10:09 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	10.38%
		GH_ER2 passed cell yield	10.38%
		CM_MC1 passed cell yield	10.38%
		FR_FRCP1 passed cell yield	10.38%
		GH_FR1 passed cell yield	10.38%
		GH_ERC passed cell yield	10.38%
		EV_HC1 passed cell yield	10.38%
		EV_MC2 passed cell yield	10.38%
		CM_MC2 passed cell yield	10.38%
		LC_LCDSSLCC passed cell yield	10.38%
		CM_MC3 passed cell yield	10.38%

Unequal Variance t Two-Sample Test

*LC_SLC
(site control)*

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	-1.241	2.015	9.543	5	CDF	0.8651	Non-Significant Effect
		GH_ER2	-0.2677	1.943	9.98	6	CDF	0.6011	Non-Significant Effect
		CM_MC1	-1.258	1.943	9.85	6	CDF	0.8724	Non-Significant Effect
		FR_FRCP1	1.344	2.015	10.12	5	CDF	0.1184	Non-Significant Effect
		GH_FR1	0.3939	2.015	12.79	5	CDF	0.3550	Non-Significant Effect
		GH_ERC	0.4714	2.015	10.69	5	CDF	0.3286	Non-Significant Effect
		EV_HC1	-1.047	2.015	14.92	5	CDF	0.8284	Non-Significant Effect
		EV_MC2	0.0548	2.132	9.726	4	CDF	0.4795	Non-Significant Effect
		CM_MC2	-2.539	2.015	10.51	5	CDF	0.9740	Non-Significant Effect
		LC_LCDSSLCC	-1.264	2.015	14.75	5	CDF	0.8690	Non-Significant Effect
		CM_MC3	-1.918	2.015	11.03	5	CDF	0.9434	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1738.36	158.033	11	2.231	0.0279	Significant Effect
Error	3400.62	70.8464	48			
Total	5138.98		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.491	24.72	0.9051	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9399	0.9459	0.0054	Non-Normal Distribution

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	100.4	94.57	106.2	100	93	114	2.456	6.92%	0.00%
GH_ER2		8	104.9	97.4	112.3	104	92	117	3.159	8.52%	-4.48%
CM_MC1		8	99.88	92.66	107.1	97.5	89	117	3.05	8.64%	0.50%
FR_FRCP1		4	113	103.5	122.5	114.5	105	118	2.972	5.26%	-12.58%
GH_FR1		4	108.8	93.19	124.3	106.5	100	122	4.888	8.99%	-8.34%
GH_ERC		4	108.8	97.85	119.6	111	99	114	3.425	6.30%	-8.34%
EV_HC1		4	98.5	78.77	118.2	93	91	117	6.198	12.59%	1.87%
EV_MC2		4	106.5	99.81	113.2	106.5	102	111	2.102	3.95%	-6.10%
CM_MC2		4	93	82.53	103.5	93	86	100	3.291	7.08%	7.35%
LC_LCDSSLCC		4	97	77.6	116.4	92	89	115	6.096	12.57%	3.36%
CM_MC3		4	95.75	84.03	107.5	96	88	103	3.683	7.69%	4.61%
LC_SLC	R	4	106.2	93.36	119.1	103.5	100	118	4.049	7.62%	-5.85%

CETIS Analytical Report

Report Date: 18 Jan-19 10:10 (p 3 of 3)
 Test Code/ID: 181277 / 07-9157-5957

EC Alga Growth Inhibition Test

Nautilus Environmental

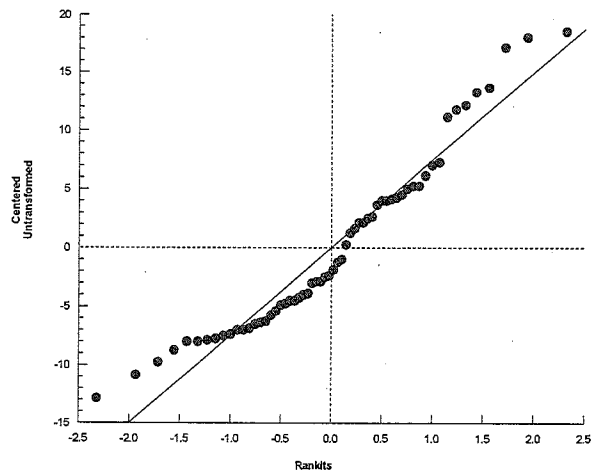
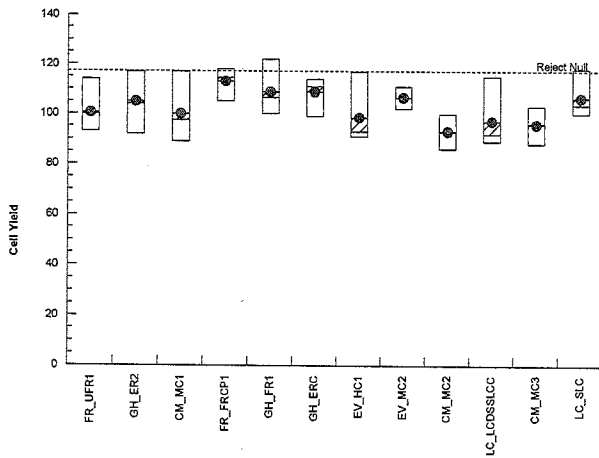
Analysis ID: 17-8444-4409 Endpoint: Cell Yield
 Analyzed: 18 Jan-19 10:09 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		102	103	95	98	114	104	93	94
GH_ER2		92	116	101	109	97	107	100	117
CM_MC1		89	117	102	98	97	93	97	106
FR_FRCP1		105	117	112	118				
GH_FR1		122	103	110	100				
GH_ERC		99	113	109	114				
EV_HC1		92	117	91	94				
EV_MC2		111	104	109	102				
CM_MC2		89	86	97	100				
LC_LCDSSLCC		94	115	90	89				
CM_MC3		103	101	88	91				
LC_SLC	R	118	102	105	100				

Graphics



APPENDIX C – *Hyaella azteca* Toxicity Test Data

Hyaella azteca Water-only Test Summary Sheet

Client: Teck
Work Order No.: 181278

Start Date: Aug 9/18
Set up by: EC

Sample Information:

Sample ID: see below
Sample Date: Aug 7, 14, 21 & 28, 2018
Date Received: Aug 8, 15, 22 & 29, 2018
Sample Volume: various (see COEs)

Test Organism Information:

Species: Hyaella azteca
Supplier: Aquatic Biosystems, CO.
Date received: Aug 9/18
Age or size (Day 0): 7-8 days

③ There is a significant difference when compared to CM-MCI (site control)
④ There is a significant difference when compared to GH-ER2 (site control)

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA152
Stock Solution ID: n/a
Date Initiated: Aug 9/18

96-h LC50 (95% CL): 6.0 (4.8-7.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.3 (5.0-6.8) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
control	88.0 ± 8.4	0.30 ± 0.08
FR-UFRI	94.0 ± 5.5	0.54 ± 0.08
CM-MCI	84.0 ± ^{MSD} 19.5	0.41 0.40 ± 0.14
GH-ER2	94.0 ± 5.5	0.43 ± 0.03
FR-FRCP1	98.0 ± 4.5	0.43 ± 0.05
GH-FRI	96.0 ± 5.5	0.39 ± 0.08
CM-MC2	26.0 ± 11.4 ①②③④	0.073 ± 0.02 ①②③④
CM-MC3	68.0 ± 32.7 ②④	0.077 ± 0.07 ①②③④

① There is a significant difference when compared to lab control
② There is a significant difference when compared to FR-UFRI site control

Reviewed by: Jell

Date reviewed: Jan. 15/19

Hyaella azteca Water-only Test Summary Sheet

Client: Teck
Work Order No.: 181278

Start Date: Aug 9/18
Set up by: EC

Sample Information:

Sample ID: see below
Sample Date: Aug 7, 14, 21 & 28, 2018
Date Received: Aug 8, 15, 22 & 29, 2018
Sample Volume: various (see COEs)

Test Organism Information:

Species: *Hyaella azteca*
Supplier: Aquatic Biosystems, CO.
Date received: Aug 9/18
Age or size (Day 0): 7-8 days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA152
Stock Solution ID: n/a
Date Initiated: Aug 9/18

96-h LC50 (95% CL): 6.0 (4.8-7.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.3 (5.0-6.8) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
LC-LCDSLEC	96.0 ± 8.9	0.45 ± 0.09
LC-SLC	62.0 ± 32.7 ⁽²⁾	0.35 0.34 ± 0.28 0.27
Control + EDTA	98.0 ± 4.5	0.52 ± 0.07
FR-FRCP1 + EDTA	90.0 ± 10.0	0.45 ± 0.05
CM-MC2 + EDTA	90.0 ± 10.0	0.43 ± 0.12
	±	±
	±	±
	±	±

⁽²⁾ There is a significant difference when compared to LC-SLC50% control

Reviewed by: JCH

Date reviewed: Jan. 15/19

^{water only}
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality
FV

Client: Teck
 WO #: 181298
 Sample ID: See below

Start Date: Aug 9/18
 Termination Date: Sept 6/18
 CER #: 1176
 Test Organism: H. azteca

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
FR-VFRI	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
CM-MC1	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
GH-ER2	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
FR-FRCP1	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
GH-FR1	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
CM-MC2	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
CM-MC3	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
LL-LDSSLCC	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
LL-SLL	23.0	24.0	23.0	23.5	23.5	23.5	23.5	23.5	23.0	23.0	22.5	23.0	23.0	23.0	23.0
Technician Initials	EL	EL	AL	A	EL	EL	EL	EL	ML	A	A	EV	EL	EV	EV

Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-VFRI	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC1	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ER2	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCP1	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-FR1	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC3	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LL-LDSSLCC	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LL-SLL	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	EL	EL	A	ML	EL	EL	EL	EL	A	A	AL	ML	ML	ML

Thermometer: CER11 / CER6 Light meter: L:LI Light intensity (Lux): 500-1000

Comments: Test jars were transferred to CER6 on day 5.

Reviewed by: JCH Date Reviewed: Dec. 10/18

Chronic ^{in water only} *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

Client: Tecla
WO #: 181278
Sample ID: See below

Start Date: Aug 9/18
Termination Date: Sept 6/18
CER #: 1176
Test Organism: H. azteca

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	417	451	446	434	434	447	447	426	420	419	423	455	467	443	449
FR-UFRI	418	455	438	433	434	431	440	431	422	431	436	438	428	439	438
CM-MC1	380	386	385	386	392	395	390	382	374	374	375	383	392	379	377
GH-ER2	377	306	375	375	384	409	380	381	361	360	361	371	371	365	344
FR-FRLP1	1016	1041	1038	1037	1032	944	1023	1038	988	1077	1105	1066	1065	1073	1058
GH-FR1	886	911	912	909	915	869	910	899	890	878	863	867	851	867	862
CM-ML2	1190	1201	1207	1187	1181	1103	1190	1141	1142	1219	1206	1118	1173	1193	1170
CM-MC3	747	725	775	775	795	749	777	767	759	785	797	806	815	792	787
LC-LOSSLLC	876	876	904	908	920	856	870	880	830	897	906	923	896	910	900
LC-SLC	470	433	446	455	464	430	465	470	484	447	452	464	443	459	466
Technician Initials	EL	EL	ML	A	EL	EL	EL	EL	ML	ML	ML	EL	EL	EL	EL

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	469	428	426	417	423	424	429	436	425	442	434	418	422	417
FR-UFRI	446	432	434	422	440	439	444	455	454	459	467	451	440	438
CM-MC1	383	374	379	373	380	388	394	395	390	395	398	387	376	376
GH-ER2	372	357	360	361	368	368	367	373	370	379	384	371	365	365
FR-FRLP1	1186	1188	1211	1200	1266	1195	1179	1027	1008	1009	1009	975	998	997
GH-FR1	881	854	859	858	860	864	845	8912	913	918	932	897	912	913
CM-ML2	1233	1226	1230	1225	1255	1278	1204	1137	1124	1117	1117	1077	1102	1102
CM-MC3	835	810	811	814	828	822	825	751	753	758	762	741	722	700
LC-LOSSLLC	952	919	922	920	931	920	921	946	932	938	943	902	929	929
LC-SLC	405	449	457	460	460	466	456	458	447	460	466	451	448	451
Technician Initials	EL	ML	ML	ML	ML	ML	ML	ML	A	A	ML	ML	ML	ML

Conductivity meter/probe: C3/Cp3

① 365

Comments: Test jars were transferred to CER 6 on Day 5.

Reviewed by: Joh

Date Reviewed: Dec. 10/18

^{water only}
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
 Freshwater Sediment Water Quality
_{EL}

Client: Teck
 WO #: 181278
 Sample ID: See below

Start Date: Aug 9/18
 Termination Date: Sept 6/18
 CER #: 11/6
 Test Organism: H. azteca

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	8.3	6.9	7.7	6.5	7.8	7.6	6.9	7.1	7.0	7.0	6.5	6.3	6.5	6.4	6.8
FR-VFRI	8.3	6.9	7.8	6.6	7.9	7.7	6.9	7.0	7.1	7.80	6.3	6.6	6.5	6.7	7.0
CM-MC1	8.2	6.9	7.9	6.7	7.8	7.8	7.0	7.1	7.1	7.71	6.4	7.0	7.0	6.0	7.1
GH-ER2	8.5	6.8	8.0	6.7	7.8	7.7	6.8	7.0	7.1	7.80	6.5	7.0	7.0	6.2	7.2
FR-FRCPI	8.5	6.9	8.0	6.8	7.9	7.7	6.9	6.9	7.0	7.80	6.5	6.8	7.0	6.1	7.2
GH-FRI	8.4	6.9	8.0	6.7	7.9	7.7	6.9	6.8	7.0	7.81	6.6	6.8	7.0	6.2	7.2
CM-MC2	8.4	7.0	8.1	6.6	7.9	7.7	6.9	6.9	7.1	7.81	6.5	6.8	7.0	6.2	7.2
CM-MC3	8.3	6.9	8.2	6.7	7.9	7.8	6.8	6.9	7.0	7.80	6.4	6.1	6.5	6.7	7.2
LC-LCDSLCC	8.2	6.9	8.2	6.6	7.8	7.8	7.0	7.0	7.2	7.81	6.4	6.3	6.6	6.7	7.3
LC-SLL	8.3	6.9	8.2	6.7	7.8	7.7	6.9	7.1	7.3	7.81	6.5	6.4	6.8	6.7	7.3
Technician Initials	EL	EL	EL	EL	EL	EL	EL	EL	ML	EL	A	EL	EL	EL	EL

Dissolved oxygen (mg/L)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Control	5.6	6.2	6.9	6.6	7.0	6.0	6.3	6.5	6.6	6.3	5.5	5.6	6.0	6.1	
FR-VFRI	6.6	6.5	6.8	6.6	6.7	6.2	6.7	6.6	6.7	6.4	5.6	5.7	6.0	6.1	
CM-MC1	7.0	6.7	6.7	6.5	6.6	6.3	6.6	6.5	6.4	6.3	5.4	5.6	6.7	6.0	
GH-ER2	7.1	7.1	6.8	6.4	6.6	6.2	6.7	6.7	6.5	6.3	5.4	5.5	5.6	5.9	
FR-FRCPI	7.3	7.2	6.8	6.5	6.7	6.1	6.9	6.7	6.6	6.2	5.5	5.4	5.8	5.9	
GH-FRI	7.3	7.1	6.9	6.4	6.5	6.1	6.9	6.6	6.5	6.3	5.6	5.3	5.9	6.1	
CM-MC2	7.3	7.2	6.9	6.4	6.5	6.2	7.1	6.5	6.5	6.3	5.7	5.6	5.7	6.0	
CM-MC3	7.3	7.2	7.0	6.4	6.7	6.0	7.2	6.5	6.6	6.2	5.5	5.4	5.6	6.0	
LC-LCDSLCC	7.3	7.2	7.0	6.4	6.6	6.0	7.1	6.6	6.5	6.2	5.4	5.1	5.6	5.8	
LC-SLL	7.3	7.0	6.9	6.5	6.6	6.1	7.0	6.7	6.6	6.3	5.5	5.4	5.9	5.9	
Technician Initials	EL	ML	ML	ML	ML	ML	ML	ML	A	A	EL	ML	ML	ML	

DO meter/probe: DO3, D3

Comments: Test jars were transferred to CER6 on Day 5

Reviewed by: JOU

Date Reviewed: Dec 10/18

^{water only}
Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality
_{EL}

Client: Teck
WO #: 181278
Sample ID: See below

Start Date: Aug 9/18
Termination Date: Sept 6/18
CER #: 1176
Test Organism: H. azteca

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	7.7	7.3	7.5	7.4	7.4	7.0	7.0	7.0	7.2	7.0	7.1	7.0	7.0	6.8	6.9
FR-VFRI	8.1	7.9	8.1	7.9	8.0	7.6	7.6	7.7	7.8	7.8	7.6	7.7	7.6	7.8	7.7
CM-MC1	7.9	7.8	8.1	8.0	8.0	7.6	7.6	7.8	7.8	7.7	7.7	7.7	7.6	7.8	7.7
GH-ER2	7.9	7.8	8.0	8.0	7.9	7.6	7.5	7.8	7.9	7.6	7.7	7.7	7.6	7.8	7.7
FR-FRCP1	8.0	8.1	8.3	8.1	8.1	7.8	7.7	7.8	7.9	7.8	7.8	7.9	7.8	7.9	7.9
GH-FRI	7.9	8.1	8.3	8.0	8.1	8.0	7.9	8.0	7.9	7.8	7.7	7.9	7.9	8.0	8.0
CM-MC2	7.9	8.1	8.2	8.1	8.2	7.9	7.9	8.0	8.0	7.8	7.7	7.8	7.7	7.8	7.8
CM-MC3	8.1	8.1	8.2	8.1	8.2	7.9	7.9	8.1	8.0	7.8	7.7	8.0	7.9	8.0	8.0
LC-LCDSLCC	8.0	8.1	8.3	8.1	8.2	7.8	7.9	8.2	8.0	8.0	7.7	8.0	7.9	8.0	8.0
LC-SLL	8.1	8.1	8.3	8.2	8.1	7.8	7.8	8.2	8.1	7.9	7.8	8.0	8.0	8.1	8.0
Technician Initials	EL	EL	M	A	EL	EL	EL	EL	ML	PL	A	EL	EL	EL	EL

pH

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	7.0	6.9	7.2	7.0	7.1	7.2	7.0	7.0	7.2	7.3	7.0	7.0	6.9	6.9
FR-VFRI	7.8	7.7	7.9	7.7	7.7	7.6	7.5	7.5	7.6	7.7	7.5	7.6	7.2	7.3
CM-MC1	7.7	7.6	7.9	7.8	7.6	7.7	7.5	7.5	7.7	7.8	7.6	7.6	7.3	7.4
GH-ER2	7.7	7.7	8.0	7.8	7.6	7.7	7.5	7.5	7.8	7.8	7.4	7.6	7.2	7.4
FR-FRCP1	7.8	8.0	8.1	7.7	7.9	7.7	7.7	7.8	7.8	7.9	7.9	7.8	7.5	7.8
GH-FRI	7.9	8.0	8.0	7.9	7.9	7.9	7.7	8.0	7.9	7.8	8.0	7.8	7.6	7.8
CM-MC2	7.9	8.0	8.0	7.9	7.8	7.9	7.8	8.0	8.0	8.0	7.8	7.8	7.6	7.8
CM-MC3	8.0	8.0	8.0	8.0	8.0	8.0	7.8	7.9	8.0	8.0	7.8	7.8	7.6	7.7
LC-LCDSLCC	8.0	8.0	8.1	8.0	8.0	7.9	7.7	7.9	8.0	7.9	7.7	7.6	7.6	7.5
LC-SLL	8.0	7.8	8.0	7.8	7.9	8.0	7.6	7.9	8.0	8.0	7.6	7.6	7.4	7.5
Technician Initials	EL	EL	M	ML	EL	EL	EL	EL	EL	EL	EL	ML	ML	ML

pH meter/probe: pH 3 1p3

Comments: Test jars were transferred to CER6 on Day 5

Reviewed by: Joh

Date Reviewed: Dec. 10/18

^{EC water only}
H. azteca Sediment Toxicity Test Data Sheet
Freshwater ^{EC}Sediment-14-d Survival and Weight

28

Client: Teck
Work Order No: 181278
Sample ID: See below

Start Date: Aug 9/18
Termination Date: Sept 6/18
Test Organism: Hyalella azteca
Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment- ^{EC}	1	A	8	0	2	ML	991.05	992.73	8	EC/ML
	2	B	9	0	1		1021.03	1023.65	9	
	3	C	9	0	1		1006.16	1008.78	9	
	4	D	10	0	0		1050.49	1054.69	10	
	5	E	8	0	2		1039.50	1041.80	8	
FR-VFRI	6	A	9	0	1		1031.77	1037.67	9	
	7	B	9	0	1		1002.97	1008.12	9	
	8	C	10	0	0		985.38	990.23	10	
	9	D	9	0	1		1011.02	1014.95	9	
	10	E	10	0	0		1025.10	1030.58	10	
CM-MCI	11	A	5 [Ⓢ]	0	5 ^{WR}		1021.17	1022.18	5	
	12	B	9	0	1		1047.48	1051.52	9	
	13	C	9	0	1		1017.94	1023.14	9	
	14	D	9	0	1		1036.49	1040.29	9	
	15	E	10	0	0		1030.13	1034.08	10	
GH-ER2	16	A	9	0	1		1036.07	1039.91	9	
	17	B	10	0	0		1008.51	1004.83	10	
	18	C	9	0	1		1054.63	1058.57	9	
	19	D	9	0	1		1002.98	1007.23	9	
	20	E	10	0	0		1018.97	1022.99	10	

Comments:

Ⓢ checked by KL

10% reweigh (mg):

#6 : 1037.68

#33: 1030.06

#60:

#17: 1004.89

#40: 1051.67

1006.93

#24: 1019.96

#51: 1001.56

Reviewed by:

JOU

Date Reviewed:

Jan. 14/19

^{water-only}
H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment 14-d Survival and Weight
 28

Client: Teck
 Work Order No: 181278
 Sample ID: See below

Start Date: Aug 9/18
 Termination Date: Sept 6/18
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
EC-Control Sediment	21	A	10	0	0	ML7	1030.42 1021.16 ^{aw}	1035.13	10	EC / ML7
FR-FRCP1	22	B	10	0	0		1005.55	1010.13	10	
	23	C	9	0	1		1012.19	1016.50	9	
	24	D	10	0	0		1015.98	1019.89	10	
	25	E	10	0	0		1021.11	1024.68	10	
	26	A	10	0	0		1019.64	1024.53	10	
GH-FR1	27	B	9	0	1		1020.71	1024.25	9	
	28	C	9	0	1		1031.76	1034.32	9	
	29	D	10	0	0		1015.81	1020.02	10	
	30	E	10	0	0		1010.03	1013.65	10	
	31	A	30	0	7		1022.06	1022.16	3	
CM-MC2	32	B	30	0	7		1008.18	1008.22	3	
	33	C	40	0	6		1030.05	1030.09	4	
	34	D	20	0	8		991.70	991.73	2	
	35	E	10	0	9		1034.68 ^{MS}	1034.67 ^{MS} + 58	1	
	36	A	10	1	8		1025.61 ^{MS}	1025.54 ^{MS} + 10	1	
CM-MC3	37	B	8	0	2		1021.87	1022.67	8	
	38	C	8	0	2		1027.12	1027.60	8	
	39	D	8	0	2		1020.63	1021.05	8	
	40	E	9	0	1		1050.37	1051.10	9	
							1034.52			

Comments: _____

Reviewed by: JCW

Date Reviewed: Dec. 10/18

^{in water only}
H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment ²⁸ 14-d Survival and Weight

Client: Toek
 Work Order No: 181278
 Sample ID: See below

Start Date: Aug 9/18
 Termination Date: Sept 6/18
 Test Organism: Hyaella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
²⁸ Control Sediment	41	A	10	0	0	ML7	1009.64	1015.02	10	ec/ML7
LC_LWSSLCC	42	B	10	0	0		1033.23	1037.07	10	
	43	C	8	0	2		1025.17	1029.67	8	
	44	D	10	0	0		1016.66	1020.48	10	
	45	E	10	0	0		1032.05	1035.91	10	
	46	A	9	0	1		1020.85	1025.73	9	
LC_SLC	47	B	50	1	4		1036.66 ³⁸	1036.98 ³⁸	5	
	48	C	8	0	2		1041.68	1045.39	8	
	49	D	10	4	5		1035.49 ³	1045.45	1	
	50	E	8	0	2		988.49	993.45	8	
			A							
		B								
		C								
		D								
		E								
		A								
		B								
		C								
		D								
		E								

³ 1045.43

Comments: ① checked by KC ② checked by AWD

Reviewed by: JGW

Date Reviewed: Dec. 10/18

Client: Teck

W.O.#: 181278

Hardness and Alkalinity Datasheet

(Day 0)	Alkalinity						Hardness			
	Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)
Control	Aug 9/18	Aug 16/18	10 ^①	0.9	1.0	80	50	5.5	110	AW
FR_VFR1			50	7.0	7.1	138	50	9.2	184	AW
CM-MC1			50	7.0	7.1	138	50	6.6	132	AW
GH-ER2			50	6.4	6.5	126	50	7.3	146	AW
FR-FRCPI			50	10.2	10.3	202	50	15.7	314	AW
GH-FR1			50	9.5	9.6	188	50	16.2	324	AW
CM-MC2			50	10.3	10.4	204	50	21.5	430	AW
CM-MC3			10 ^①	1.6	1.7	150	10 ^①	3.1	310	AW
LC-LCDSLCC			10 ^①	2.0	2.1	190	10 ^① 50 ^{AW}	3.5 15.7 ^{AW}	350	AW
LC-SLL			10 ^①	1.4	1.5	130	10 ^①	1.7	170	AW
Control + EDTA			50	2.9	3.0	56	50 ^{AW}	21.5 ^{AW}		AW ^m
FR-FRCPI + EDTA			10 ^①	2.4	2.5	230	50	5.3	106	AW
CM-MC2 + EDTA	↓	↓	50	10.2	10.3	202	50	17.2	344	AW
							50	21.2	424	AW
MAW	Aug 9/18	Aug 9/18	50	3.1	3.2	60	50	6.8	136	EC

Notes: ① diluted up to a 100 ml with DI water

Reviewed by: POH Date Reviewed: Jan - 14/19

Client: Teck

W.O.#: 181278

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
(Day 28) Control	Sept 6 Aug 29/18	Sept 6/18	50	2.6	2.8	48	50	6.8	132	h
FR-VFRI				6.9	7.1	134	50	10.4	208	
CM-MC1				6.8	6.9	134		9.5	190	
GH-ER2				6.4	6.5	126		8.5	170	
FR-FRCPI				9.2	9.3	182		25.8	516	
GH-FR1				9.2	9.4	180		27.5	550	
CM-MC2				9.7	9.8	192		29.8	582	
CM-MC3				8.0	8.2	156	100	4.5	450	
LL-LDSSLL1				8.8	9.0	172	100	8.0	800	
LL-SLC				6.2	6.4	120	100	1.8	180	
Control EDTA				2.7	2.9	50	50	8.5	170	
FR-FRCPI EDTA				9.5	9.7	186		27.6	552	
CM-MC2 EDTA	↓	↓	↓	9.9	10.1	194	↓	30.7	614	↓
MHW	Sept 6/18	Sept 6/18	50	3.2	3.3	62	50	6.7	134	MLG

Notes: ① diluted to 100mL with DI water

Reviewed by: JG Date Reviewed: Jan-14/19

CETIS Summary Report

Report Date: 14 Jan-19 13:29 (p 1 of 53)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Batch ID: 06-3223-1332 Test Type: Survival-Growth Analyst: Mimi Tran
 Start Date: 09 Aug-18 Protocol: EPA/600/R-99/064 (2000) *(modified)* Diluent: Reconstituted Water
 Ending Date: 06 Sep-18 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48 ✓	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28 ✓	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40 ✓	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12 ✓	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28 ✓	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15 ✓	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42 ✓	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42 ✓	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00 ✓	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	LC_SLC failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	CM_MC2 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	FR_FRCP1 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	CM_MC3 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	GH_FR1 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	CM_MC1 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	GH_ER2 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	Control+EDTA failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	FR_UFR1 failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	FR_FRCP1_EDTA failed mean dry weight-	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	Lab Control failed mean dry weight-mg	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	CM_MC2_EDTA failed mean dry weight-m	1
06-2476-0022	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	8.2E-04	LC_LCDSSLCC failed mean dry weight-mg	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	CM_MC2_EDTA passed mean dry weight-	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	FR_FRCP1_EDTA passed mean dry weig	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	LC_SLC passed mean dry weight-mg	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	LC_LCDSSLCC passed mean dry weight-	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	Lab Control passed mean dry weight-mg	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	CM_MC2 passed mean dry weight-mg	1
17-4572-9387	Mean Dry Weight-mg	Steel Many-One Rank Sum Test	1.0000	GH_FR1 passed mean dry weight-mg	1

CETIS Summary Report

Report Date: 14 Jan-19 13:29 (p 51 of 53)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC3 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed survival rate	1
15-5393-8992	Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	LC_SLC passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	CM_MC2 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	Lab Control passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	FR_UFR1 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	LC_LCDSSLCC passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	FR_FRCP1_EDTA passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	CM_MC1 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	GH_ER2 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	FR_FRCP1 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	CM_MC2_EDTA passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	CM_MC3 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	GH_FR1 passed survival rate	1
18-7182-7188	Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.3066	Control+EDTA passed survival rate	1

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits		Overlap	Decision
				Lower	Upper		
01-6008-1022	Survival Rate	Control Resp	0.88	0.8	>>	Yes	Passes Criteria
13-5493-4098	Survival Rate	Control Resp	0.88	0.8	>>	Yes	Passes Criteria
18-7182-7188	Survival Rate	Control Resp	0.88	0.8	>>	Yes	Passes Criteria

CETIS Summary Report

Report Date: 14 Jan-19 13:29 (p 52 of 53)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	5	0.2999	0.2062	0.3937	0.21	0.42	0.03377	0.07552	25.18%	0.00%
FR_UFR1		5	0.5395	0.4353	0.6437	0.4367	0.6556	0.03752	0.0839	15.55%	-79.86%
CM_MC1		5	0.4092	0.2411	0.5773	0.202	0.5778	0.06054	0.1354	33.08%	-36.42%
GH_ER2	XC	5	0.4341	0.4027	0.4655	0.402	0.4722	0.01131	0.02528	5.82%	-44.74%
FR_FRCP1		5	0.4312	0.364	0.4983	0.357	0.4789	0.02418	0.05408	12.54%	-43.75%
GH_FR1		5	0.39	0.2964	0.4835	0.2844	0.489	0.03369	0.07533	19.32%	-30.01%
CM_MC2		5	0.02631	0.0003872	0.05223	0.009979	0.05994	0.009337	0.02088	79.35%	91.23%
CM_MC3		5	0.07073	0.04648	0.09498	0.0525	0.1	0.008735	0.01953	27.61%	76.42%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.382	0.5625	0.04091	0.09148	20.31%	-50.19%
LC_SLC		5	0.3464	0.00555	0.6872	0.0199	0.62	0.1228	0.2745	79.25%	-15.48%
Control+EDTA		5	0.5175	0.4311	0.604	0.458	0.624	0.03114	0.06963	13.45%	-72.53%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.3922	0.505	0.02217	0.04957	11.02%	-49.89%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.298	0.5975	0.05232	0.117	27.23%	-43.26%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	5	0.8800	0.7761	0.9839	0.8000	1.0000	0.0374	0.0837	9.51%	0.00%
FR_UFR1		5	0.9400	0.8720	1.0000	0.9000	1.0000	0.0245	0.0548	5.83%	-6.82%
CM_MC1		5	0.8400	0.5980	1.0000	0.5000	1.0000	0.0872	0.1949	23.21%	4.55%
GH_ER2	XC	5	0.9400	0.8720	1.0000	0.9000	1.0000	0.0245	0.0548	5.83%	-6.82%
FR_FRCP1		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-11.36%
GH_FR1		5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-9.09%
CM_MC2		5	0.2600	0.1184	0.4016	0.1000	0.4000	0.0510	0.1140	43.85%	70.45%
CM_MC3		5	0.6800	0.2738	1.0000	0.1000	0.9000	0.1463	0.3271	48.10%	22.73%
LC_LCDSSLCC		5	0.9600	0.8489	1.0000	0.8000	1.0000	0.0400	0.0894	9.32%	-9.09%
LC_SLC		5	0.6200	0.2138	1.0000	0.1000	0.9000	0.1463	0.3271	52.76%	29.55%
Control+EDTA		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-11.36%
FR_FRCP1_EDTA		5	0.9000	0.7758	1.0000	0.8000	1.0000	0.0447	0.1000	11.11%	-2.27%
CM_MC2_EDTA		5	0.9000	0.7758	1.0000	0.8000	1.0000	0.0447	0.1000	11.11%	-2.27%

CETIS Summary Report

Report Date: 14 Jan-19 13:29 (p 53 of 53)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.21	0.2911	0.2911	0.42	0.2875
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
CM_MC1		0.202	0.4489	0.5778	0.4222	0.395
GH_ER2	XC	0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC		0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.8000	0.9000	0.9000	1.0000	0.8000
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2	XC	0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	8/10	9/10	9/10	10/10	8/10
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
GH_ER2	XC	9/10	10/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

CETIS Analytical Report

Report Date: 14 Jan-19 13:19 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-9247-2041 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 14 Jan-19 13:19 Analysis: Nonparametric-Control vs Treatments Status Level: 1
 Batch ID: 06-3223-1332 Test Type: Survival-Growth Analyst: Mimi Tran
 Start Date: 09 Aug-18 Protocol: EPA/600/R-99/064 (2000) (modified) Diluent: Reconstituted Water
 Ending Date: 06 Sep-18 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 14 Jan-19 13:19 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-9247-2041 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 14 Jan-19 13:19 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	57.51%
		CM_MC1 passed mean dry weight-mg	57.51%
		GH_ER2 passed mean dry weight-mg	57.51%
		FR_FRCP1 passed mean dry weight-mg	57.51%
		GH_FR1 passed mean dry weight-mg	57.51%
		CM_MC2 failed mean dry weight-mg	57.51%
		CM_MC3 failed mean dry weight-mg	57.51%
		LC_LCDSSLCC passed mean dry weight-mg	57.51%
		LC_SLC passed mean dry weight-mg	57.51%
		Control+EDTA passed mean dry weight-mg	57.51%
		FR_FRCP1_EDTA passed mean dry weight-m	57.51%
		CM_MC2_EDTA passed mean dry weight-mg	57.51%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	40	15	0	8	CDF	1.0000	Non-Significant Effect
		CM_MC1	34	15	0	8	CDF	0.9992	Non-Significant Effect
		GH_ER2	39	15	0	8	CDF	1.0000	Non-Significant Effect
		FR_FRCP1	38	15	0	8	CDF	1.0000	Non-Significant Effect
		GH_FR1	34	15	0	8	CDF	0.9992	Non-Significant Effect
		CM_MC2*	15	15	0	8	CDF	0.0380	Significant Effect
		CM_MC3*	15	15	0	8	CDF	0.0380	Significant Effect
		LC_LCDSSLCC	37	15	0	8	CDF	1.0000	Non-Significant Effect
		LC_SLC	30	15	0	8	CDF	0.9815	Non-Significant Effect
		Control+EDTA	40	15	0	8	CDF	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	38	15	0	8	CDF	1.0000	Non-Significant Effect
		CM_MC2_EDTA	38	15	0	8	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.44893	0.120744	12	10.76	<1.0E-37	Significant Effect
Error	0.583317	0.0112176	52			
Total	2.03225		64			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	46.68	26.22	5.3E-06	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.939	0.9495	0.0031	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	N	5	0.2999	0.2062	0.3937	0.2911	0.21	0.42	0.03377	25.18%	0.00%
FR_UFR1		5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	-79.86%
CM_MC1		5	0.4092	0.2411	0.5773	0.4222	0.202	0.5778	0.06054	33.08%	-36.42%
GH_ER2		5	0.4341	0.4027	0.4655	0.432	0.402	0.4722	0.01131	5.82%	-44.74%
FR_FRCP1		5	0.4312	0.364	0.4983	0.458	0.357	0.4789	0.02418	12.54%	-43.75%
GH_FR1		5	0.39	0.2964	0.4835	0.3933	0.2844	0.489	0.03369	19.32%	-30.01%
CM_MC2		5	0.02631	0.0003872	0.05223	0.01498	0.009979	0.05994	0.009337	79.35%	91.23%
CM_MC3		5	0.07073	0.04648	0.09498	0.06006	0.0525	0.1	0.008735	27.61%	76.42%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.386	0.382	0.5625	0.04091	20.31%	-50.19%
LC_SLC		5	0.3464	0.00555	0.6872	0.4637	0.0199	0.62	0.1228	79.25%	-15.48%
Control+EDTA		5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	-72.53%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	-49.89%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	-43.26%

CETIS Analytical Report

Report Date: 14 Jan-19 13:19 (p 3 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

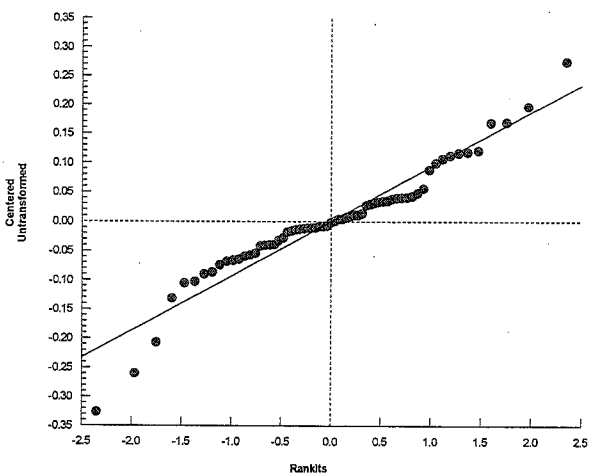
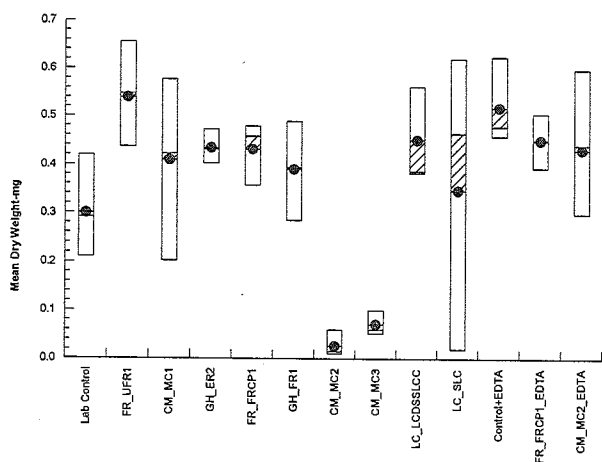
Analysis ID: 09-9247-2041 Endpoint: Mean Dry Weight-mg
 Analyzed: 14 Jan-19 13:19 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.21	0.2911	0.2911	0.42	0.2875
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
CM_MC1		0.202	0.4489	0.5778	0.4222	0.395
GH_ER2		0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC		0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



CETIS Analytical Report

Report Date: 14 Jan-19 13:11 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 18-7894-6875	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 14 Jan-19 13:11	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 14 Jan-19 13:11 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 18-7894-6875 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 14 Jan-19 13:11 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Lab Control failed mean dry weight-mg	31.97%
		CM_MC1 passed mean dry weight-mg	31.97%
		GH_ER2 passed mean dry weight-mg	31.97%
		FR_FRCP1 passed mean dry weight-mg	31.97%
		GH_FR1 passed mean dry weight-mg	31.97%
		CM_MC2 failed mean dry weight-mg	31.97%
		CM_MC3 failed mean dry weight-mg	31.97%
		LC_LCDSSLCC passed mean dry weight-mg	31.97%
		LC_SLC passed mean dry weight-mg	31.97%
		Control+EDTA passed mean dry weight-mg	31.97%
		FR_FRCP1_EDTA passed mean dry weight-mg	31.97%
		CM_MC2_EDTA passed mean dry weight-mg	31.97%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		Lab Control*	15	15	0	8	CDF	0.0380	Significant Effect
<i>FR_FRCP1</i>		CM_MC1	20	15	0	8	CDF	0.3025	Non-Significant Effect
		GH_ER2	17	15	0	8	CDF	0.1010	Non-Significant Effect
		FR_FRCP1	18	15	0	8	CDF	0.1528	Non-Significant Effect
		GH_FR1	17	15	0	8	CDF	0.1010	Non-Significant Effect
		CM_MC2*	15	15	0	8	CDF	0.0380	Significant Effect
		CM_MC3*	15	15	0	8	CDF	0.0380	Significant Effect
		LC_LCDSSLCC	20	15	0	8	CDF	0.3025	Non-Significant Effect
		LC_SLC	22	15	0	8	CDF	0.4981	Non-Significant Effect
		Control+EDTA	25	15	0	8	CDF	0.7800	Non-Significant Effect
		FR_FRCP1_EDTA	20	15	0	8	CDF	0.3025	Non-Significant Effect
		CM_MC2_EDTA	21	15	0	8	CDF	0.3968	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.44893	0.120744	12	10.76	<1.0E-37	Significant Effect
Error	0.583317	0.0112176	52			
Total	2.03225		64			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	46.68	26.22	5.3E-06	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.939	0.9495	0.0031	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control		5	0.2999	0.2062	0.3937	0.2911	0.21	0.42	0.03377	25.18%	0.00%
FR_UFR1	XC	5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	-79.86%
CM_MC1		5	0.4092	0.2411	0.5773	0.4222	0.202	0.5778	0.06054	33.08%	-36.42%
GH_ER2		5	0.4341	0.4027	0.4655	0.432	0.402	0.4722	0.01131	5.82%	-44.74%
FR_FRCP1		5	0.4312	0.364	0.4983	0.458	0.357	0.4789	0.02418	12.54%	-43.75%
GH_FR1		5	0.39	0.2964	0.4835	0.3933	0.2844	0.489	0.03369	19.32%	-30.01%
CM_MC2		5	0.02631	0.0003872	0.05223	0.01498	0.009979	0.05994	0.009337	79.35%	91.23%
CM_MC3		5	0.07073	0.04648	0.09498	0.06006	0.0525	0.1	0.008735	27.61%	76.42%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.386	0.382	0.5625	0.04091	20.31%	-50.19%
LC_SLC		5	0.3464	0.00555	0.6872	0.4637	0.0199	0.62	0.1228	79.25%	-15.48%
Control+EDTA		5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	-72.53%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	-49.89%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	-43.26%

CETIS Analytical Report

Report Date: 14 Jan-19 13:11 (p 3 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

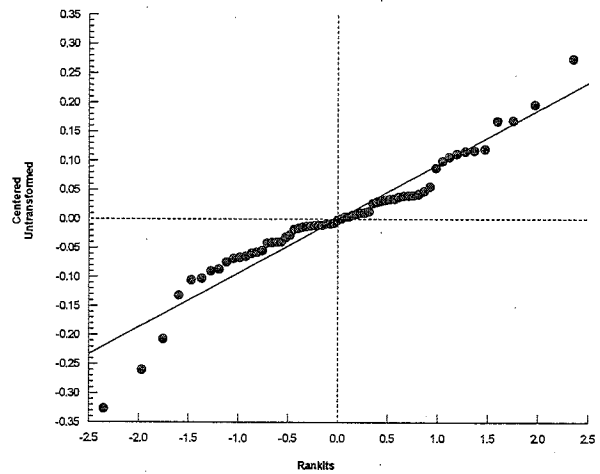
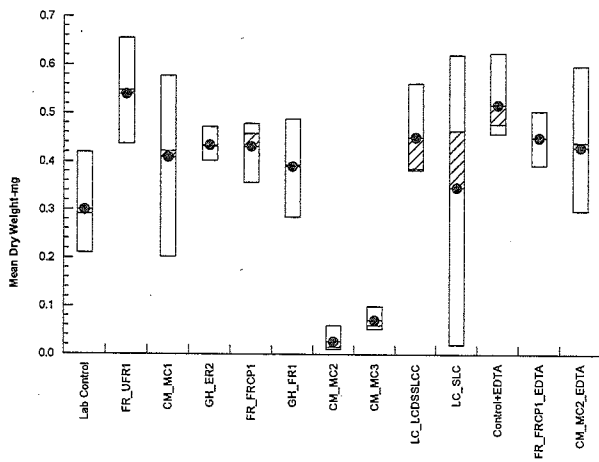
Analysis ID: 18-7894-6875 Endpoint: Mean Dry Weight-mg
 Analyzed: 14 Jan-19 13:11 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control		0.21	0.2911	0.2911	0.42	0.2875
FR_UFR1	XC	0.6556	0.5722	0.485	0.4367	0.548
CM_MC1		0.202	0.4489	0.5778	0.4222	0.395
GH_ER2		0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC		0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



CETIS Analytical Report

Report Date: 14 Jan-19 13:10 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 17-8505-0531	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 14 Jan-19 13:10	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
<hr/>		
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyaella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 14 Jan-19 13:10 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-8505-0531 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 14 Jan-19 13:10 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Lab Control passed mean dry weight-mg	42.16%
		FR_UFR1 passed mean dry weight-mg	42.16%
		GH_ER2 passed mean dry weight-mg	42.16%
		FR_FRCP1 passed mean dry weight-mg	42.16%
		GH_FR1 passed mean dry weight-mg	42.16%
		CM_MC2 failed mean dry weight-mg	42.16%
		CM_MC3 failed mean dry weight-mg	42.16%
		LC_LCDSSLCC passed mean dry weight-mg	42.16%
		LC_SLC passed mean dry weight-mg	42.16%
		Control+EDTA passed mean dry weight-mg	42.16%
		FR_FRCP1_EDTA passed mean dry weight-m	42.16%
		CM_MC2_EDTA passed mean dry weight-mg	42.16%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		Lab Control	21	15	0	8	CDF	0.3968	Non-Significant Effect
<i>CM_MC1</i>		FR_UFR1	35	15	0	8	CDF	0.9997	Non-Significant Effect
		GH_ER2	30	15	0	8	CDF	0.9815	Non-Significant Effect
		FR_FRCP1	29	15	0	8	CDF	0.9657	Non-Significant Effect
		GH_FR1	24	15	0	8	CDF	0.6957	Non-Significant Effect
		CM_MC2*	15	15	0	8	CDF	0.0380	Significant Effect
		CM_MC3*	15	15	0	8	CDF	0.0380	Significant Effect
		LC_LCDSSLCC	26	15	0	8	CDF	0.8492	Non-Significant Effect
		LC_SLC	28	15	0	8	CDF	0.9403	Non-Significant Effect
		Control+EDTA	36	15	0	8	CDF	0.9999	Non-Significant Effect
		FR_FRCP1_EDTA	30	15	0	8	CDF	0.9815	Non-Significant Effect
		CM_MC2_EDTA	29	15	0	8	CDF	0.9657	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.44893	0.120744	12	10.76	<1.0E-37	Significant Effect
Error	0.583317	0.0112176	52			
Total	2.03225		64			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	46.68	26.22	5.3E-06	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.939	0.9495	0.0031	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control		5	0.2999	0.2062	0.3937	0.2911	0.21	0.42	0.03377	25.18%	0.00%
FR_UFR1		5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	-79.86%
CM_MC1	XC	5	0.4092	0.2411	0.5773	0.4222	0.202	0.5778	0.06054	33.08%	-36.42%
GH_ER2		5	0.4341	0.4027	0.4655	0.432	0.402	0.4722	0.01131	5.82%	-44.74%
FR_FRCP1		5	0.4312	0.364	0.4983	0.458	0.357	0.4789	0.02418	12.54%	-43.75%
GH_FR1		5	0.39	0.2964	0.4835	0.3933	0.2844	0.489	0.03369	19.32%	-30.01%
CM_MC2		5	0.02631	0.0003872	0.05223	0.01498	0.009979	0.05994	0.009337	79.35%	91.23%
CM_MC3		5	0.07073	0.04648	0.09498	0.06006	0.0525	0.1	0.008735	27.61%	76.42%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.386	0.382	0.5625	0.04091	20.31%	-50.19%
LC_SLC		5	0.3464	0.00555	0.6872	0.4637	0.0199	0.62	0.1228	79.25%	-15.48%
Control+EDTA		5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	-72.53%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	-49.89%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	-43.26%

CETIS Analytical Report

Report Date: 14 Jan-19 13:10 (p 3 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

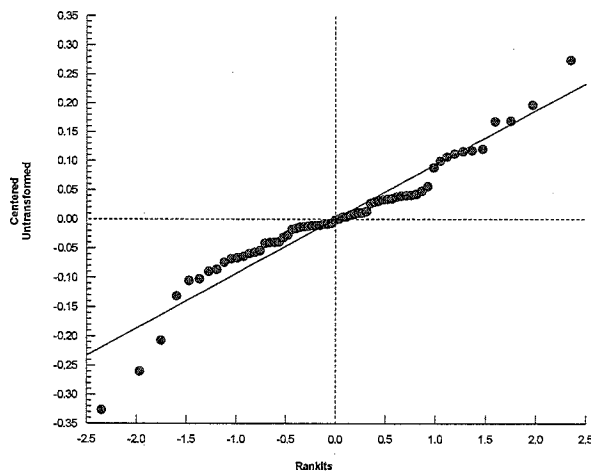
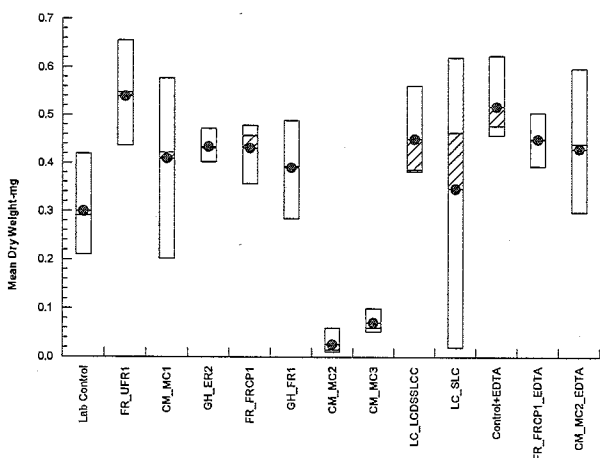
Analysis ID: 17-8505-0531 Endpoint: Mean Dry Weight-mg
 Analyzed: 14 Jan-19 13:10 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control		0.21	0.2911	0.2911	0.42	0.2875
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
CM_MC1	XC	0.202	0.4489	0.5778	0.4222	0.395
GH_ER2		0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC		0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



CETIS Analytical Report

Report Date: 14 Jan-19 13:22 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 11-2294-2428	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 14 Jan-19 13:22	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 14 Jan-19 13:22 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 11-2294-2428 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 14 Jan-19 13:22 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	40.21%
		CM_MC1 passed mean dry weight-mg	40.21%
		FR_FRCP1 passed mean dry weight-mg	40.21%
		GH_FR1 passed mean dry weight-mg	40.21%
		CM_MC2 failed mean dry weight-mg	40.21%
		CM_MC3 failed mean dry weight-mg	40.21%
		LC_LCDSSLCC passed mean dry weight-mg	40.21%
		LC_SLC passed mean dry weight-mg	40.21%
		Control+EDTA passed mean dry weight-mg	40.21%
		FR_FRCP1_EDTA passed mean dry weight-m	40.21%
		CM_MC2_EDTA passed mean dry weight-mg	40.21%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	38	15	0	8	CDF	1.0000	Non-Significant Effect
<i>GH_ER2</i>		CM_MC1	25	15	0	8	CDF	0.7678	Non-Significant Effect
		FR_FRCP1	28	15	0	8	CDF	0.9350	Non-Significant Effect
		GH_FR1	21	15	0	8	CDF	0.3830	Non-Significant Effect
		CM_MC2*	15	15	0	8	CDF	0.0356	Significant Effect
		CM_MC3*	15	15	0	8	CDF	0.0356	Significant Effect
		LC_LCDSSLCC	25	15	0	8	CDF	0.7678	Non-Significant Effect
		LC_SLC	29	15	0	8	CDF	0.9622	Non-Significant Effect
		Control+EDTA	39	15	0	8	CDF	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	30	15	0	8	CDF	0.9793	Non-Significant Effect
		CM_MC2_EDTA	28	15	0	8	CDF	0.9350	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.42324	0.129385	11	11.08	<1.0E-37	Significant Effect
Error	0.560503	0.0116772	48			
Total	1.98374		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	45.95	24.72	3.3E-06	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9383	0.9459	0.0045	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	0.00%
CM_MC1		5	0.4092	0.2411	0.5773	0.4222	0.202	0.5778	0.06054	33.08%	24.15%
<i>GH_ER2</i>	XC	5	0.4341	0.4027	0.4655	0.432	0.402	0.4722	0.01131	5.82%	19.53%
FR_FRCP1		5	0.4312	0.364	0.4983	0.458	0.357	0.4789	0.02418	12.54%	20.08%
GH_FR1		5	0.39	0.2964	0.4835	0.3933	0.2844	0.489	0.03369	19.32%	27.72%
CM_MC2		5	0.02631	0.0003872	0.05223	0.01498	0.009979	0.05994	0.009337	79.35%	95.12%
CM_MC3		5	0.07073	0.04648	0.09498	0.06006	0.0525	0.1	0.008735	27.61%	86.89%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.386	0.382	0.5625	0.04091	20.31%	16.50%
LC_SLC		5	0.3464	0.00555	0.6872	0.4637	0.0199	0.62	0.1228	79.25%	35.80%
Control+EDTA		5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	4.07%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	16.66%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	20.35%

CETIS Analytical Report

Report Date: 14 Jan-19 13:22 (p 3 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

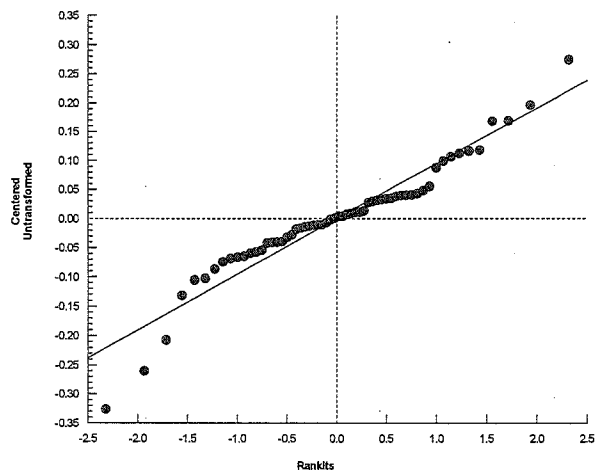
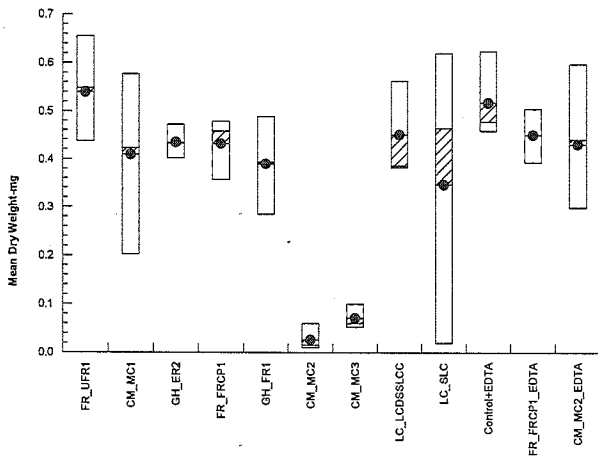
Analysis ID: 11-2294-2428 Endpoint: Mean Dry Weight-mg
 Analyzed: 14 Jan-19 13:22 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
CM_MC1		0.202	0.4489	0.5778	0.4222	0.395
GH_ER2	XC	0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC		0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



CETIS Analytical Report

Report Date: 06 Dec-18 12:56 (p 1 of 2)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID: 06-2476-0022	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 06 Dec-18 12:48	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyaella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Lab Control failed mean dry weight-mg	23.13%
		FR_UFR1 passed mean dry weight-mg	23.13%
		FR_FRCP1_EDTA passed mean dry weight-m	23.13%
		CM_MC2_EDTA passed mean dry weight-mg	23.13%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		Lab Control*	4.188	2.305	0.12	8	CDF	8.2E-04	Significant Effect
Control + EDTA		FR_UFR1	-0.4231	2.305	0.12	8	CDF	0.9082	Non-Significant Effect
		FR_FRCP1_EDTA	1.307	2.305	0.12	8	CDF	0.2612	Non-Significant Effect
		CM_MC2_EDTA	1.69	2.305	0.12	8	CDF	0.1486	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.177283	0.0443208	4	6.569	0.0015	Significant Effect
Error	0.134939	0.006747	20			
Total	0.312222		24			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.76	13.28	0.5988	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9726	0.8877	0.7117	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control		5	0.2999	0.2062	0.3937	0.2911	0.21	0.42	0.03377	25.18%	0.00%
FR_UFR1		5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	-79.86%
Control+EDTA	L	5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	-72.53%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	-49.89%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	-43.26%

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

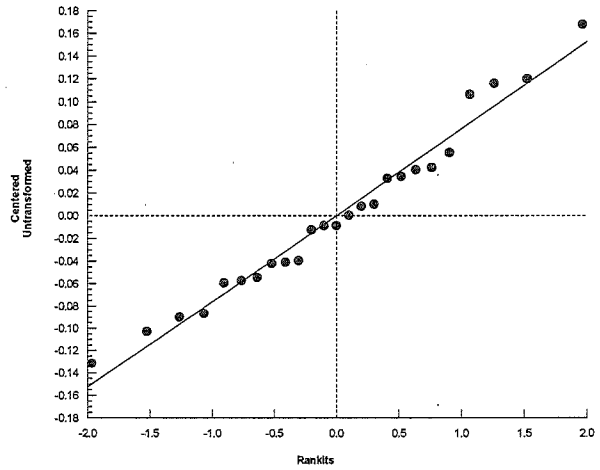
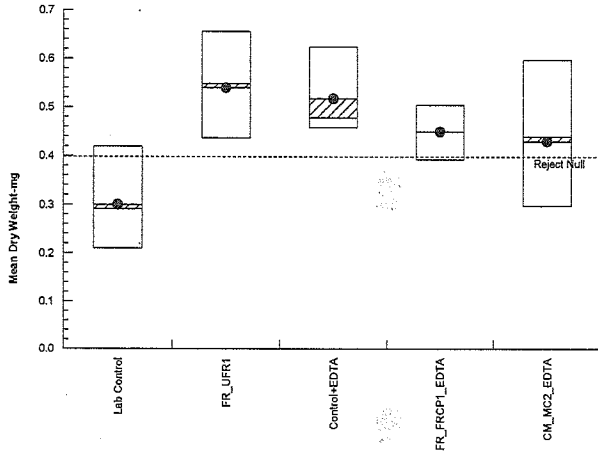
Analysis ID: 06-2476-0022 Endpoint: Mean Dry Weight-mg
 Analyzed: 06 Dec-18 12:48 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control		0.21	0.2911	0.2911	0.42	0.2875
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
Control+EDTA	L	0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-5493-4098	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:44	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
C>T		FR_UFR1	0.9202	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.3871	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.9202	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.9938	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.9703	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0000	Exact	1.9E-09	Significant Effect
		CM_MC3	0.0142	Exact	0.1417	Non-Significant Effect
		LC_LCDSSLCC	0.9703	Exact	1.0000	Non-Significant Effect
		LC_SLC*	0.0025	Exact	0.0272	Significant Effect
		Control+EDTA	0.9938	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.7377	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.7377	Exact	1.0000	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits			Decision
		Lower	Upper	Overlap	
Control Resp	0.88	0.8	>>	Yes	Passes Criteria

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-5493-4098 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:44 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	N	44	6	50	0.88	0.12	-29.41%
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.8000	0.9000	0.9000	1.0000	0.8000
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	8/10	9/10	9/10	10/10	8/10
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 3 of 3)
Test Code/ID: 181278 / 10-1633-9583

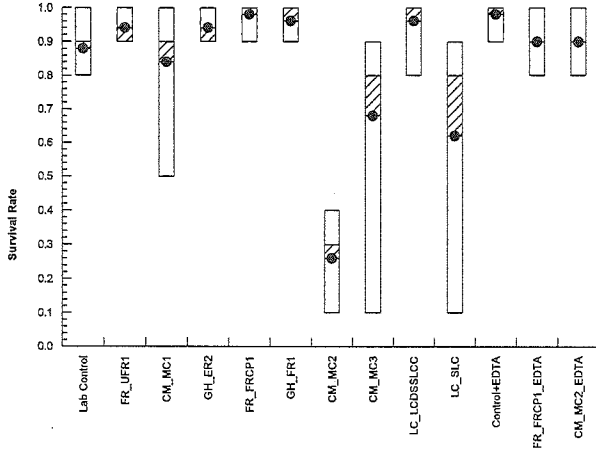
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-5493-4098 Endpoint: Survival Rate
Analyzed: 26 Sep-18 15:44 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:55 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 01-6008-1022	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:44	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	06-6160-1066	09 Aug-18	09 Aug-18	n/a	Teck Coal	
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)		
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	0.2435	Exact	1.0000	Non-Significant Effect
CCT		CM_MC1	0.8060	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.2435	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.0559	Exact	0.6705	Non-Significant Effect
		GH_FR1	0.1343	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	0.9965	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.1343	Exact	1.0000	Non-Significant Effect
		LC_SLC	0.9995	Exact	1.0000	Non-Significant Effect
		Control+EDTA	0.0559	Exact	0.6705	Non-Significant Effect
		FR_FRCP1_EDTA	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.5000	Exact	1.0000	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits		Overlap	Decision
		Lower	Upper		
Control Resp	0.88	0.8	>>	Yes	Passes Criteria

CETIS Analytical Report

Report Date: 26 Sep-18 15:55 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 01-6008-1022 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:44 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	N	44	6	50	0.88	0.12	-29.41%
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	0.8000	0.9000	0.9000	1.0000	0.8000
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	N	8/10	9/10	9/10	10/10	8/10
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

Hyalella 28-d Survival and Growth Sediment Test

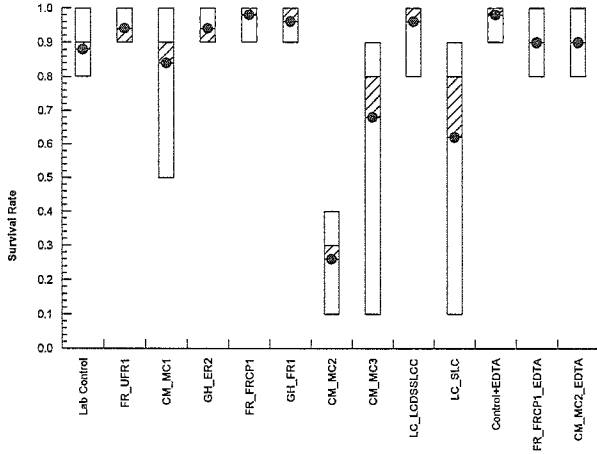
Nautilus Environmental

Analysis ID: 01-6008-1022
Analyzed: 26 Sep-18 15:44

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6115-7850	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:46	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC1	0.0999	Exact	0.7989	Non-Significant Effect
FR_UFR1		GH_ER2	0.6611	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.9413	Exact	1.0000	Non-Significant Effect
C7T		GH_FR1	0.8189	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0000	Exact	5.7E-12	Significant Effect
		CM_MC3*	0.0008	Exact	0.0074	Significant Effect
		LC_LCDSSLCC	0.8189	Exact	1.0000	Non-Significant Effect
		LC_SLC*	0.0001	Exact	9.0E-04	Significant Effect
		Control+EDTA	0.9413	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.3575	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.3575	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6115-7850 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:46 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	XC	47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	XC	0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
CM_MC1		5/10	9/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

JG
Dec - 10 / 18

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 3 of 3)
Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

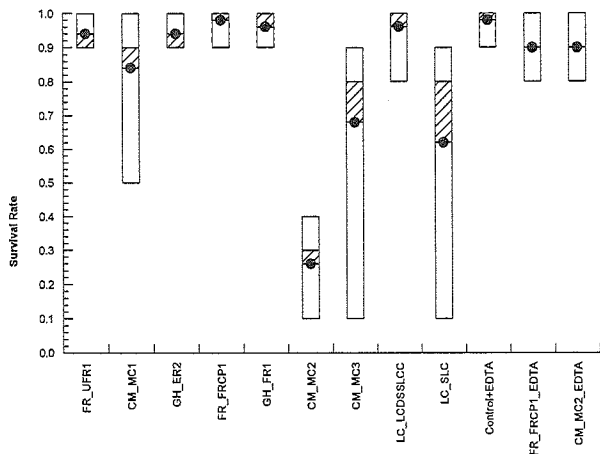
Nautilus Environmental

Analysis ID: 14-6115-7850
Analyzed: 26 Sep-18 15:46

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 01-4138-6824	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:46	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC1	0.9744	Exact	1.0000	Non-Significant Effect
FR_UFR1		GH_ER2	0.6611	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.3087	Exact	1.0000	Non-Significant Effect
CCT		GH_FR1	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	0.9999	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.5000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect
		Control+EDTA	0.3087	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.8657	Exact	1.0000	Non-Significant Effect
	CM_MC2_EDTA	0.8657	Exact	1.0000	Non-Significant Effect	

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 01-4138-6824 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:46 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	XC	47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	XC	0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
CM_MC1		5/10	9/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

Hyaella 28-d Survival and Growth Sediment Test

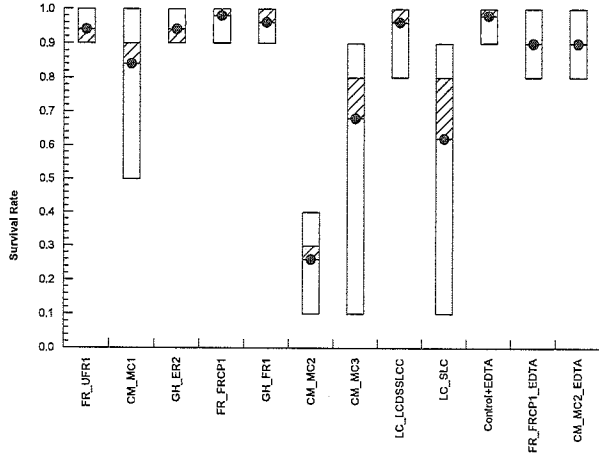
Nautilus Environmental

Analysis ID: 01-4138-6824
Analyzed: 26 Sep-18 15:46

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-6154-6405	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:51	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.9744	Exact	1.0000	Non-Significant Effect
<i>CAL MC1</i>		GH_ER2	0.9744	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.9987	Exact	1.0000	Non-Significant Effect
<i>C>T</i>		GH_FR1	0.9922	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0000	Exact	3.6E-08	Significant Effect
		CM_MC3	0.0500	Exact	0.4502	Non-Significant Effect
		LC_LCDSSLCC	0.9922	Exact	1.0000	Non-Significant Effect
		LC_SLC	0.0116	Exact	0.1164	Non-Significant Effect
		Control+EDTA	0.9987	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.8832	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.8832	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-6154-6405 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:51 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1	XC	42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1	XC	0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		9/10	9/10	10/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 3 of 3)
Test Code/ID: 181278 / 10-1633-9583

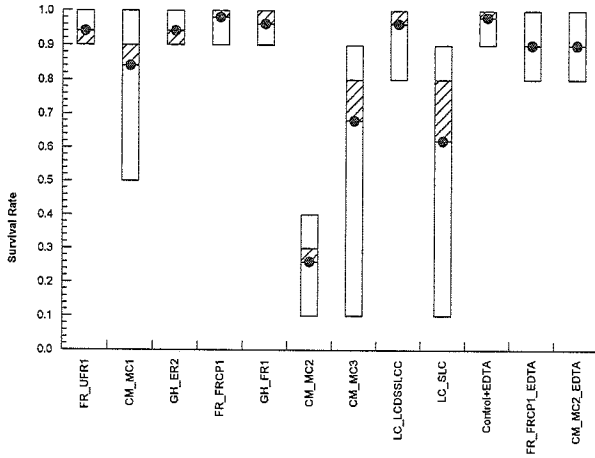
Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-6154-6405 Endpoint: Survival Rate
Analyzed: 26 Sep-18 15:51 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-4600-6528	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:51	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.0999	Exact	0.6990	Non-Significant Effect
<i>CM_MC1</i>		GH_ER2	0.0999	Exact	0.6990	Non-Significant Effect
<i>CLT</i>		FR_FRCP1	0.0154	Exact	0.1697	Non-Significant Effect
		GH_FR1	0.0458	Exact	0.4124	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	0.9831	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.0458	Exact	0.4124	Non-Significant Effect
		LC_SLC	0.9969	Exact	1.0000	Non-Significant Effect
		Control+EDTA	0.0154	Exact	0.1697	Non-Significant Effect
		FR_FRCP1_EDTA	0.2768	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.2768	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 26 Sep-18 15:54 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-4600-6528 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:51 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1	XC	42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1	XC	0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		9/10	9/10	10/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

Hyalella 28-d Survival and Growth Sediment Test

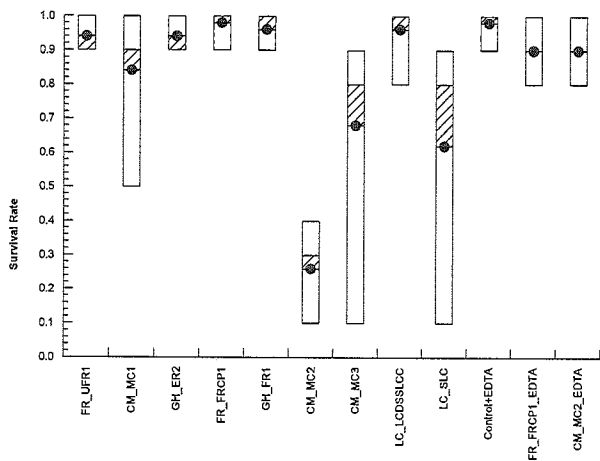
Nautilus Environmental

Analysis ID: 00-4600-6528
Analyzed: 26 Sep-18 15:51

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-5393-8992	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:52	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000)(modified)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.6611	Exact	1.0000	Non-Significant Effect
GH_ER2		CM_MC1	0.0999	Exact	0.7989	Non-Significant Effect
		FR_FRCP1	0.9413	Exact	1.0000	Non-Significant Effect
C7T		GH_FR1	0.8189	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0000	Exact	5.7E-12	Significant Effect
		CM_MC3*	0.0008	Exact	0.0074	Significant Effect
		LC_LCDSSLCC	0.8189	Exact	1.0000	Non-Significant Effect
		LC_SLC*	0.0001	Exact	9.0E-04	Significant Effect
		Control+EDTA	0.9413	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.3575	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.3575	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-5393-8992 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:52 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2	XC	47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2	XC	0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
GH_ER2	XC	9/10	10/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

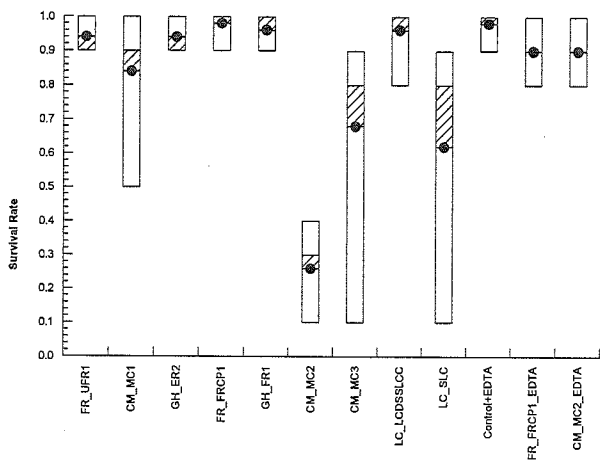
Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-5393-8992 Endpoint: Survival Rate
Analyzed: 26 Sep-18 15:52 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-5049-1239	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Sep-18 15:52	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.6611	Exact	1.0000	Non-Significant Effect
<i>GH_ER2</i>		CM_MC1	0.9744	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.3087	Exact	1.0000	Non-Significant Effect
<i>CCT</i>		GH_FR1	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC3	0.9999	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.5000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect
		Control+EDTA	0.3087	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.8657	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.8657	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 26 Sep-18 15:53 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-5049-1239 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 26 Sep-18 15:52 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2	XC	47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC		31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2	XC	0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC		0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
GH_ER2	XC	9/10	10/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC		9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

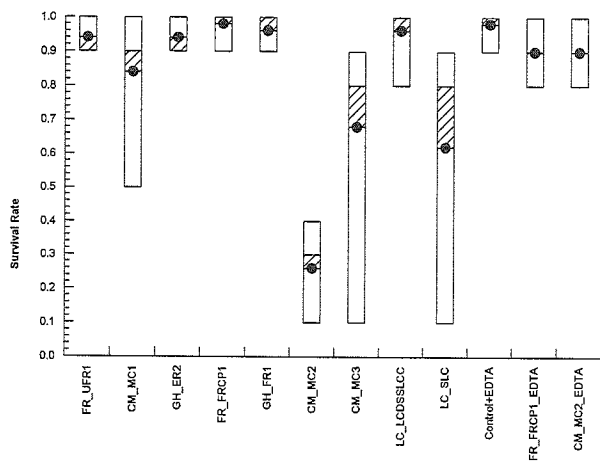
Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-5049-1239 Endpoint: Survival Rate
 Analyzed: 26 Sep-18 15:52 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 30 Jan-19 10:13 (p 1 of 3)
Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 06-4878-8590	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 30 Jan-19 10:11	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.9969	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0003	Exact	0.0030	Significant Effect
		CM_MC3	0.7991	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	1.0000	Exact	1.0000	Non-Significant Effect
		Control+EDTA	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1_EDTA	0.9998	Exact	1.0000	Non-Significant Effect
		CM_MC2_EDTA	0.9998	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 30 Jan-19 10:13 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 06-4878-8590 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 30 Jan-19 10:11 Analysis: STP 2xK Contingency Tables Status Level: 1

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		47	3	50	0.94	0.06	-38.24%
CM_MC1		42	8	50	0.84	0.16	-23.53%
GH_ER2		47	3	50	0.94	0.06	-38.24%
FR_FRCP1		49	1	50	0.98	0.02	-44.12%
GH_FR1		48	2	50	0.96	0.04	-41.18%
CM_MC2		13	37	50	0.26	0.74	61.76%
CM_MC3		34	16	50	0.68	0.32	0.0%
LC_LCDSSLCC		48	2	50	0.96	0.04	-41.18%
LC_SLC	XC	31	19	50	0.62	0.38	8.82%
Control+EDTA		49	1	50	0.98	0.02	-44.12%
FR_FRCP1_EDTA		45	5	50	0.9	0.1	-32.35%
CM_MC2_EDTA		45	5	50	0.9	0.1	-32.35%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.9000	0.9000	1.0000	0.9000	1.0000
CM_MC1		0.5000	0.9000	0.9000	0.9000	1.0000
GH_ER2		0.9000	1.0000	0.9000	0.9000	1.0000
FR_FRCP1		1.0000	1.0000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.9000	0.9000	1.0000	1.0000
CM_MC2		0.3000	0.3000	0.4000	0.2000	0.1000
CM_MC3		0.1000	0.8000	0.8000	0.8000	0.9000
LC_LCDSSLCC		1.0000	1.0000	0.8000	1.0000	1.0000
LC_SLC	XC	0.9000	0.5000	0.8000	0.1000	0.8000
Control+EDTA		1.0000	1.0000	1.0000	1.0000	0.9000
FR_FRCP1_EDTA		0.8000	1.0000	0.8000	0.9000	1.0000
CM_MC2_EDTA		0.8000	1.0000	0.9000	0.8000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		9/10	9/10	10/10	9/10	10/10
CM_MC1		5/10	9/10	9/10	9/10	10/10
GH_ER2		9/10	10/10	9/10	9/10	10/10
FR_FRCP1		10/10	10/10	9/10	10/10	10/10
GH_FR1		10/10	9/10	9/10	10/10	10/10
CM_MC2		3/10	3/10	4/10	2/10	1/10
CM_MC3		1/10	8/10	8/10	8/10	9/10
LC_LCDSSLCC		10/10	10/10	8/10	10/10	10/10
LC_SLC	XC	9/10	5/10	8/10	1/10	8/10
Control+EDTA		10/10	10/10	10/10	10/10	9/10
FR_FRCP1_EDTA		8/10	10/10	8/10	9/10	10/10
CM_MC2_EDTA		8/10	10/10	9/10	8/10	10/10

Hyaella 28-d Survival and Growth Sediment Test

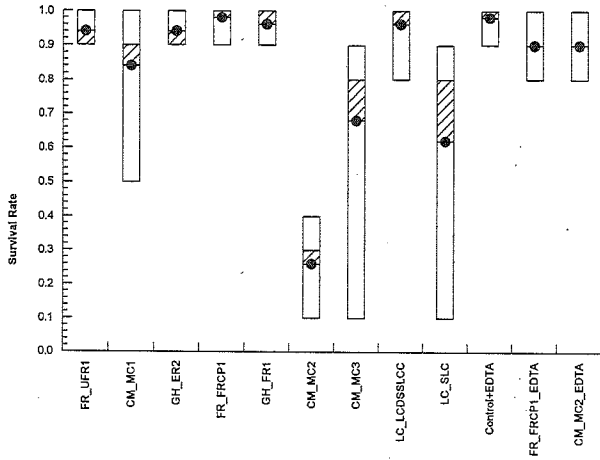
Nautilus Environmental

Analysis ID: 06-4878-8590
Analyzed: 30 Jan-19 10:11

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 30 Jan-19 10:12 (p 1 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 03-7440-3176	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 30 Jan-19 10:12	Analysis: Nonparametric-Control vs. Treatments	Status Level: 1
Batch ID: 06-3223-1332	Test Type: Survival-Growth	Analyst: Mimi Tran
Start Date: 09 Aug-18	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 06 Sep-18	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	06-0887-8834	07 Aug-18 11:48	08 Aug-18 09:30	36h (18.8 °C)	Teck Coal	
CM_MC1	12-3738-4786	07 Aug-18 09:28	08 Aug-18 09:30	39h (17.5 °C)		
GH_ER2	07-8908-2026	07 Aug-18 10:40	08 Aug-18 09:30	37h (17.8 °C)		
FR_FRCP1	05-6605-6524	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
GH_FR1	08-8160-5792	07 Aug-18 13:28	08 Aug-18 09:30	35h (19 °C)		
CM_MC2	10-6280-5051	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		
CM_MC3	01-8464-2339	07 Aug-18 11:42	08 Aug-18 09:30	36h (17.5 °C)		
LC_LCDSSLCC	02-1220-5005	07 Aug-18 09:42	08 Aug-18 09:30	38h (16.5 °C)		
LC_SLC	12-1088-1247	07 Aug-18 09:00	08 Aug-18 09:30	39h (16.5 °C)		
Control+EDTA	17-5451-2705	09 Aug-18	09 Aug-18	n/a		
FR_FRCP1_EDTA	20-0547-0561	07 Aug-18 10:12	08 Aug-18 09:30	38h (17.5 °C)		
CM_MC2_EDTA	02-9904-6176	07 Aug-18 11:15	08 Aug-18 09:30	37h (17.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q3_WS_201808	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-08-07_	
Control+EDTA	Control water	Teck Coal	Control+EDTA	
FR_FRCP1_EDTA	Water Sample	Teck Coal	FR_FRCP1_EDTA	
CM_MC2_EDTA	Water Sample	Teck Coal	CM_MC2_EDTA	

CETIS Analytical Report

Report Date: 30 Jan-19 10:12 (p 2 of 3)
 Test Code/ID: 181278 / 10-1633-9583

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 03-7440-3176 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 30 Jan-19 10:12 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	50.40%
		CM_MC1 passed mean dry weight-mg	50.40%
		GH_ER2 passed mean dry weight-mg	50.40%
		FR_FRCP1 passed mean dry weight-mg	50.40%
		GH_FR1 passed mean dry weight-mg	50.40%
		CM_MC2 passed mean dry weight-mg	50.40%
		CM_MC3 passed mean dry weight-mg	50.40%
		LC_LCDSSLCC passed mean dry weight-mg	50.40%
		Control+EDTA passed mean dry weight-mg	50.40%
		FR_FRCP1_EDTA passed mean dry weight-m	50.40%
		CM_MC2_EDTA passed mean dry weight-mg	50.40%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	33	15	0	8	CDF	0.9977	Non-Significant Effect
<i>LC_SLC</i>		CM_MC1	27	15	0	8	CDF	0.8948	Non-Significant Effect
		GH_ER2	26	15	0	8	CDF	0.8393	Non-Significant Effect
		FR_FRCP1	27	15	0	8	CDF	0.8948	Non-Significant Effect
		GH_FR1	26	15	0	8	CDF	0.8393	Non-Significant Effect
		CM_MC2	17	15	0	8	CDF	0.0955	Non-Significant Effect
		CM_MC3	21	15	0	8	CDF	0.3830	Non-Significant Effect
		LC_LCDSSLCC	28	15	0	8	CDF	0.9350	Non-Significant Effect
		Control+EDTA	32	15	0	8	CDF	0.9949	Non-Significant Effect
		FR_FRCP1_EDTA	27	15	0	8	CDF	0.8948	Non-Significant Effect
		CM_MC2_EDTA	28	15	0	8	CDF	0.9350	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.42324	0.129385	11	11.08	<1.0E-37	Significant Effect
Error	0.560503	0.0116772	48			
Total	1.98374		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	45.95	24.72	3.3E-06	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9383	0.9459	0.0045	Non-Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		5	0.5395	0.4353	0.6437	0.548	0.4367	0.6556	0.03752	15.55%	0.00%
CM_MC1		5	0.4092	0.2411	0.5773	0.4222	0.202	0.5778	0.06054	33.08%	24.15%
GH_ER2		5	0.4341	0.4027	0.4655	0.432	0.402	0.4722	0.01131	5.82%	19.53%
FR_FRCP1		5	0.4312	0.364	0.4983	0.458	0.357	0.4789	0.02418	12.54%	20.08%
GH_FR1		5	0.39	0.2964	0.4835	0.3933	0.2844	0.489	0.03369	19.32%	27.72%
CM_MC2		5	0.02631	0.0003872	0.05223	0.01498	0.009979	0.05994	0.009337	79.35%	95.12%
CM_MC3		5	0.07073	0.04648	0.09498	0.06006	0.0525	0.1	0.008735	27.61%	86.89%
LC_LCDSSLCC		5	0.4505	0.3369	0.5641	0.386	0.382	0.5625	0.04091	20.31%	16.50%
LC_SLC	XC	5	0.3464	0.00555	0.6872	0.4637	0.0199	0.62	0.1228	79.25%	35.80%
Control+EDTA		5	0.5175	0.4311	0.604	0.478	0.458	0.624	0.03114	13.45%	4.07%
FR_FRCP1_EDTA		5	0.4496	0.3881	0.5111	0.45	0.3922	0.505	0.02217	11.02%	16.66%
CM_MC2_EDTA		5	0.4297	0.2844	0.575	0.44	0.298	0.5975	0.05232	27.23%	20.35%

Hyalella 28-d Survival and Growth Sediment Test

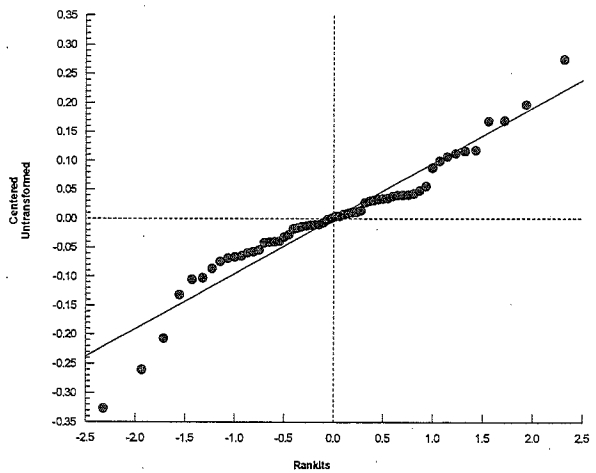
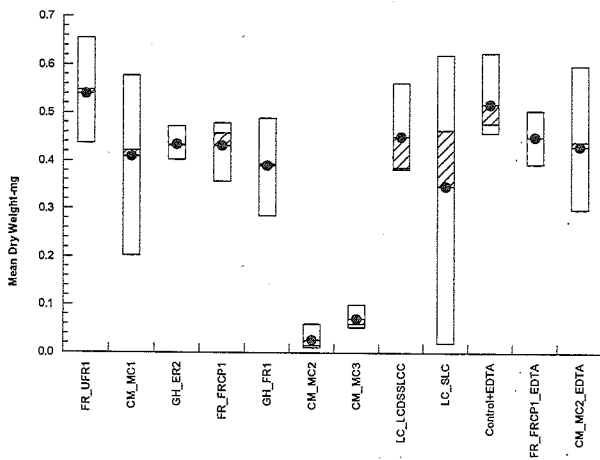
Nautilus Environmental

Analysis ID: 03-7440-3176 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 30 Jan-19 10:12 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1		0.6556	0.5722	0.485	0.4367	0.548
CM_MC1		0.202	0.4489	0.5778	0.4222	0.395
GH_ER2		0.4267	0.432	0.4378	0.4722	0.402
FR_FRCP1		0.471	0.458	0.4789	0.391	0.357
GH_FR1		0.489	0.3933	0.2844	0.421	0.362
CM_MC2		0.03333	0.01333	0.009979	0.01498	0.05994
CM_MC3		0.06006	0.1	0.06	0.0525	0.08111
LC_LCDSSLCC		0.538	0.384	0.5625	0.382	0.386
LC_SLC	XC	0.5422	0.08601	0.4637	0.0199	0.62
Control+EDTA		0.458	0.624	0.478	0.552	0.4756
FR_FRCP1_EDTA		0.45	0.505	0.4088	0.3922	0.492
CM_MC2_EDTA		0.5975	0.343	0.44	0.47	0.298

Graphics



APPENDIX D – *Pimephales promelas* Toxicity Test Data

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Organism Information

Source: Aquatic Batch: 20180801M ELS Egg Stage: 3rd mite Organisms Received in Good Condition: Yes or No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review
					AM	PM		
2018/08/10	0	1400	M/K/B	2	✓	✓	60 mins	ED
2018/08/10	1	1400	M/K/B	2	✓	✓	60 mins	ED
2018/08/11	2	1335	ST/CS	2	✓	✓	60 mins	ML
2018/08/12	3	1330	ST/SS	2	-	-	60 mins	IC
2018/08/13	4	1400	ST/SS	2	-	✓	60 min	AP
2018/08/14	5	1045	ST/LP	2	✓	✓	60 min	KIC
2018/08/15	6	1115	CB	2	✓	✓	60 mins	AP
2018/08/16	7	1100	CB	2	✓	✓	60 mins	ED
2018/08/17	8	1000	CB	2	✓	✓	60 mins	AP
2018/08/18	9	1230	CB	2	✓	✓	75 mins	AP
2018/08/19	10	1300	M/L/V	2	✓	✓	60 min	ED
2018/08/20	11	1125	CB	2	✓	✓	60 mins	MW
2018/08/21	12	1335	ST/ML	2	✓	✓	60 mins	AP
2018/08/22	13	1345	FP/M	2	✓	✓	60 mins	KIL
2018/08/23	14	1215	ST/AP	2	✓	✓	60 mins	ED
2018/08/24	15	1115	CB/EP	2	✓	✓	60 mins	ST
2018/08/25	16	1030	ST	2	✓	✓	60 mins	SS
2018/08/26	17	1050	K/ML	2	✓	✓	60 min	AP
2018/08/27	18	1045	FP/KK	2	✓	✓	60 mins	LF
2018/08/28	19	1220	SS/LP	2	✓	✓	60 mins	KIL
2018/08/29	20	1130	KK/ST	2	✓	✓	60 mins	AP
2018/08/30	21	1130	AP	2	✓	✓	60 mins	ED
2018/08/31	22	1155	CB	2	✓	✓	60 mins	MW
2018/09/01	23	1140	LF	2	✓	✓	60 mins	ST
2018/09/02	24	1230	M/AP	2	✓	✓	60 min	LC
2018/09/03	25	1530	AP	2	✓	✓	60 min	MW
2018/09/04	26	1145	CB	2	✓	✓	60 mins	AP
2018/09/05	27	1115	CB	2	✓	✓	60 mins	ST
2018/09/06	28	1100	CB	2	✓	✓	60 mins	AP
2018/09/07	29	1030	CB	2	✓	✓	60 mins	ED
2018/09/08	30	1130	ST	2	✓	✓	60 mins	LF
2018/09/09	31	1200	IC	2	✓	✓	60 mins	ED
2018/09/10	32	1400	M/EP	2	✓	✓	60 mins	KIL

Reviewed By: 2018/09/17 Date Reviewed: OP

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	CTL		CTL 20 ug/L		CTL 10 ug/L		1718-1557 20 ug/L		1718-1559 20 ug/L		1718-1561 20 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	14	1	12	3	13	2	10	5	11	4	14	1
b	13	2	14	1	10	5	13	2	14	1	9	6
c	14	1	12	3	11	4	12	3	10	5	12	3
d	14	1	10	5	12	3	11	4	12	3	9	6
e	24	6	29	1	24	6	24	0	29	1	28	2
f	26	4	26	4	25	5	27	3	23	7	29	1

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL			CTL 20 ug/L			CTL 10 ug/L			1718-1557 20 ug/L		
	Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	14	0	✓	12	0	✓	13	0	✓	10	0	✓
b	13	0	✓	14	0	✓	20	0	✓	12	1	✓
c	14	0	✓	12	0	✓	11	0	✓	11	1	✓
d	14	0	✓	12	0	✓	12	0	✓	11	0	✓
e	24	2	✓	24	0	✓	24	0	✓	22	2	✓
f	26	0	✓	25	1	✓	25	0	✓	27	0	✓

replicate	1718-1559 20 ug/L			1718-1561 20 ug/L		
	Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	10	1	✓	14	0	✓
b	13	1	✓	9	0	✓
c	10	0	✓	11	1	✓
d	12	0	✓	9	0	✓
e	27	2	✓	28	0	✓
f	27	3	✓	28	1	✓

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:
 Day 2, Rep D - 1 hatched - 1557 20 ug/L * 1561 - 20 ug/L - Day 2 - microbial growth
 Day 2 CTL UNT - Rep C - 1 hatched

Reviewed By: STP Date Reviewed: 2018/09/17

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L CTL 10 ug/L 1718-1557 20 ug/L 1718-1559 20 ug/L 1718-1561 20 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

CTL
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	9	0	6	0
d	10	0	5	0

CTL 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	0	4	0
b	15	0	2	0
c	13	0	2	0
d	10	0	9	1

SS SS

CTL 10 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	13	0	2	0
d	10	0	5	0

1718-1557 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	8	0	7	0
b	6	0	9	0
c	13	0	2	0
d	5	0	10	0

1718-1559 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	14	0	1	0
d	13	0	2	0

1718-1561 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	0	2	0
b	14	0	1	0
c	13	0	2	0
d	15	0	0	0

CTL
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	13	0
b	1	1	13	0
c	3	0	12	0
d	1	0	14	0

CTL 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	58	0	7	0
b	5	0	9	1
c	10	0	10	0
d	6	0	8	0

SS

CTL 10 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	13	1
b	2	0	13	0
c	3	0	12	0
d	0	0	15	0

1718-1557 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	13	0
b	0	0	15	0
c	3	0	12	0
d	1	0	14	0

1718-1559 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	1	13	0
b	2	0	12	0
c	3	0	12	0
d	5	0	10	0

1718-1561 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	2	0	13	0
c	0	0	15	0
d	2	0	13	0

0%
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a				
b				
c				
d				

KCL

Comments/Observations

Reviewed By: DP

Date Reviewed: 2018/10/14

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	1	0	14	0
d	0	0	15(0)	0

CTL 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	15	0
d	1	0	13	0

CTL 10 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	13	0
b	0	0	15	0
c	1	0	14	0
d	0	0	15	0

1718-1557 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15(0)	0
d	0	0	15	0

1718-1559 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	0
b	0	0	14	0
c	0	0	15	0
d	1	0	14	0

1718-1561 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0



CTL
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	14	1
d	0	0	15(0)	0

CTL 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	1
b	0	0	14	0
c	0	0	15	0
d	1	0	13	0

CTL 10 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	1	13	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

1718-1557 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14 ⁵ 15	0
b	0	0	14 ⁵ 15	0
c	0	0	15(1)	0
d	0	0	14 ⁵ 15	0

1718-1559 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	13	1
b	0	0	14	0
c	0	0	15	0
d	0	1	14	0

1718-1561 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 7	CTL 20 ug/L Day 7	CTL 10 ug/L Day 7	1718-1557 20 ug/L Day 7	1718-1559 20 ug/L Day 7	1718-1561 20 ug/L Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13	13	13	15
b	14	14	15	9	14	13 4
c	13	15	14	10	15	15
d	14	14	15	11	14	15

Comments/Observations:

	CTL Day 8	CTL 20 ug/L Day 8	CTL 10 ug/L Day 8	1718-1557 20 ug/L Day 8	1718-1559 20 ug/L Day 8	1718-1561 20 ug/L Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13	5 * ①	13	14
b	14	14	15	4	14 (1)	10
c	13	14	14	3	14	11
d	14	14	15	5 * ②	14	15 (3)

Comments/Observations: * ① v. slight microbial growth on 2/8 bodies
* ② v. slight microbial growth on 2/5 bodies

	CTL Day 9	CTL 20 ug/L Day 9	CTL 10 ug/L Day 9	1718-1557 20 ug/L Day 9	1718-1559 20 ug/L Day 9	1718-1561 20 ug/L Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13 (1)	1	13	11
b	14	14	15	1	14 (1)	8
c	13	14	14	0	14	9
d	14	14	15 (1)	2	14 (1)	14 (1)

Comments/Observations:

	CTL Day 10	CTL 20 ug/L Day 10	CTL 10 ug/L Day 10	1718-1557 20 ug/L Day 10	1718-1559 20 ug/L Day 10	1718-1561 20 ug/L Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	13 4 ①	13 (1)	1	13	10
b	14	14	14	0	14 (1)	6 *
c	12	14	14	0	14	7
d	14	14 (1)	14	0	14 (2)	12 4 (1)

Comments/Observations: * Microbial growth on 1/2 bodies

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164 Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 11	CTL 20 ug/L Day 11	CTL 10 ug/L Day 11	1718-1557 20 ug/L Day 11	1718-1559 20 ug/L Day 11	1718-1561 20 ug/L Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	13(1)	BCD	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	7
d	14	14(1)	14(1)	0	13(1)	11

Comments/Observations:

	CTL Day 12	CTL 20 ug/L Day 12	CTL 10 ug/L Day 12	1718-1557 20 ug/L Day 12	1718-1559 20 ug/L Day 12	1718-1561 20 ug/L Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14*	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	*5(1)
d	14	14	14(1)	0	13(1)	11

Comments/Observations:

	CTL Day 13	CTL 20 ug/L Day 13	CTL 10 ug/L Day 13	1718-1557 20 ug/L Day 13	1718-1559 20 ug/L Day 13	1718-1561 20 ug/L Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	4*
d	14	14	14(1)	0	13(1)	7*

Comments/Observations: *microbial growth

	CTL Day 14	CTL 20 ug/L Day 14	CTL 10 ug/L Day 14	1718-1557 20 ug/L Day 14	1718-1559 20 ug/L Day 14	1718-1561 20 ug/L Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	4
d	14	14	14(1)	0	13(1)	7

Comments/Observations: * CTL DAY 12 - microbial growth / 1561 Day 12 - microbial growth

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 15	CTL 20 ug/L Day 15	CTL 10 ug/L Day 15	1718-1557 20 ug/L Day 15	1718-1559 20 ug/L Day 15	1718-1561 20 ug/L Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12	14	14	0	14	4
d	14	14	14(1)	0	13(1)	7

Comments/Observations:

	CTL Day 16	CTL 20 ug/L Day 16	CTL 10 ug/L Day 16	1718-1557 20 ug/L Day 16	1718-1559 20 ug/L Day 16	1718-1561 20 ug/L Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14(1)	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12	14	14(1)	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations:

	CTL Day 17	CTL 20 ug/L Day 17	CTL 10 ug/L Day 17	1718-1557 20 ug/L Day 17	1718-1559 20 ug/L Day 17	1718-1561 20 ug/L Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	13	10
b	14	14	14	0	13/14	5
c	12	14(1)	14(1)	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations:

	CTL Day 18	CTL 20 ug/L Day 18	CTL 10 ug/L Day 18	1718-1557 20 ug/L Day 18	1718-1559 20 ug/L Day 18	1718-1561 20 ug/L Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	13/14	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12/11	14(1)	14(1)	0	14	4
d	14	14/13	13	0	13(1)	7

Comments/Observations:

Reviewed By: OP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 19	CTL 20 ug/L Day 19	CTL 10 ug/L Day 19	1718-1557 20 ug/L Day 19	1718-1559 20 ug/L Day 19	1718-1561 20 ug/L Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	14	5
c	11	14 13(1)	13	0	14	4
d	14	14 13 ⁵	13	0	13(0)	7

Comments/Observations:

	CTL Day 20	CTL 20 ug/L Day 20	CTL 10 ug/L Day 20	1718-1557 20 ug/L Day 20	1718-1559 20 ug/L Day 20	1718-1561 20 ug/L Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12*	9
b	14	14	14	0	14	5
c	11	14(1)	13	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations: *killed by tech. → not included in mortality calc.

	CTL Day 21	CTL 20 ug/L Day 21	CTL 10 ug/L Day 21	1718-1557 20 ug/L Day 21	1718-1559 20 ug/L Day 21	1718-1561 20 ug/L Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(0)	1	12	9
b	14	14	14	0	14	5
c	11	14(1)	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 22	CTL 20 ug/L Day 22	CTL 10 ug/L Day 22	1718-1557 20 ug/L Day 22	1718-1559 20 ug/L Day 22	1718-1561 20 ug/L Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12	9
b	14	14	14	0	14	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: GP

Date Reviewed: 2018/10/11

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 20 ug/L CTL 10 ug/L 1718-1557 20 ug/L 1718-1559 20 ug/L 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12	9
b	14	14	14	0	14	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	14	5
c	14	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

*killed by tech
↳ not included in mortality.

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: SP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 27	CTL 20 ug/L Day 27	CTL 10 ug/L Day 27	1718-1557 20 ug/L Day 27	1718-1559 20 ug/L Day 27	1718-1561 20 ug/L Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 28	CTL 20 ug/L Day 28	CTL 10 ug/L Day 28	1718-1557 20 ug/L Day 28	1718-1559 20 ug/L Day 28	1718-1561 20 ug/L Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	12	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 29	CTL 20 ug/L Day 29	CTL 10 ug/L Day 29	1718-1557 20 ug/L Day 29	1718-1559 20 ug/L Day 29	1718-1561 20 ug/L Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	12	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 30	CTL 20 ug/L Day 30	CTL 10 ug/L Day 30	1718-1557 20 ug/L Day 30	1718-1559 20 ug/L Day 30	1718-1561 20 ug/L Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	1	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

replicate	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	1	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

replicate	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	7	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: JPP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Old Solutions					
CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Day	pH (units)					
0	8.2	8.2	8.2	8.1	8.3	8.2
1	8.0	8.1	8.1	8.1	8.2	8.2
2	8.1	8.3	8.3	8.2	8.3	8.1
3	8.3	8.3	8.3	8.3	8.4	8.1
4	8.2	8.2	8.2	8.3	8.4	8.3
5	8.3	8.2	8.1	8.2	8.3	8.2
6	8.3	8.3	8.4	8.2	8.4	8.3
7	8.2	8.4	8.4	8.1	8.3	8.3
8	7.9	8.4	8.3	8.1	8.3	8.3

Day	pH (units)					
0						
1	8.1	8.1	8.2	8.1	8.3	8.2
2	8.3	8.2	8.2	8.1	8.2	8.2
3	7.5	8.0	8.1	8.0	8.1	8.0
4	7.2	8.2	8.2	8.0	8.2	8.0
5	8.2	8.1	8.1	8.0	8.1	7.9
6	8.2	8.1	8.1	8.0	8.1	8.0
7	8.2	8.2	8.0	8.0	8.1	8.1
8	8.2	8.2	8.2	8.1	8.1	8.1

Day	Conductance (µS/cm)					
0	417	420	412	905	883	1109
1	413	389	410	998	821	1198
2	373	378	391	957	868	1133
3	411	369	367	945	856	1098
4	439	373	388	987	863	1129
5	429	377	388	984	860	1129
6	400	420	422	953	828	1087
7	400	422	425	1020	782	1075
8	416	421	428	1025	772	1068

Day	Conductance (µS/cm)					
0						
1	410	424	448	979	904	1154
2	419	405	434	962	886	1113
3	389	385	408	916	819	1097
4	389	375	396	949	831	1110
5	417	396	408	929	861	1066
6	433	372	376	903	818	1051
7	407	416	406	908	830	1075
8	443	431	433	955	796	1064

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.3	7.3	7.3	7.2
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
0						
1	7.0	7.1	7.1	7.1	7.1	7.7
2	7.3	7.2	7.2	7.2	7.5	7.7
3	7.0	7.0	7.1	7.2	7.3	7.2
4	7.2	7.2	7.2	7.7	7.5	7.5
5	7.2	7.2	7.2	7.1	7.3	7.2
6	7.2	7.0	7.0	7.0	7.0	7.0
7	7.2	6.8	6.8	6.8	6.7	6.8
8	6.6	6.8	6.8	6.8	6.8	6.9

Day	Temperature (°C)					
0	24	24	24	24	24	24
1	24	24	24	24	24	25
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

Day	Temperature (°C)					
0						
1	24	24	24	24	24	24
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Conc. (%)	New Solutions					
	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Conc. (%)	Old Solutions					
	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Day	pH (units)					
	9	7.9	8.3	8.3	8.1	8.3
10	8.3	8.3	8.3	8.2	8.2	8.2
11	8.3	8.3	8.3	8.2	8.3	7.9
12	8.1	8.2	8.2	8.2	8.3	8.3
13	7.9	8.2	8.2	8.1	8.2	8.1
14	8.1	8.2	8.1	8.1	8.1	8.1
15	8.2	8.3	8.3	8.3	8.3	8.3
16	8.2	8.2	8.2	8.2	8.3	8.3
17	8.1	8.2	8.2	8.2	8.3	8.2

Day	pH (units)					
	9	8.2	8.2	8.2	8.1	8.2
10	8.0	8.0	8.0	8.0	8.0	8.0
11	8.2	8.2	8.2	8.0	8.1	8.0
12	8.1	8.1	8.1	8.0	8.1	8.0
13	7.9	7.6	7.7	7.9	8.0	7.9
14	7.7	7.7	7.7	7.7	7.8	7.8
15	8.0	7.9	8.0	7.9	8.1	8.0
16	7.9	7.6	7.6	7.9	8.0	7.9
17	7.7	7.7	7.6	7.8	8.1	8.0

Day	Conductance (µS/cm)					
	9	435	425	428	1019	772
10	421	431	415	1017	771	1071
11	403	418	417	1010	771	1110
12	404	412	416	1010	773	1066
13	417	428	428	1018	746	1054
14	358	369	372	1102	760	1105
15	360	368	360	1101	760	1113
16	341	337	324	1093	752	1109
17	351	371	401	1101	751	1110

Day	Conductance (µS/cm)					
	9	441	434	434	953	796
10	413	423	432	972	785	1054
11	425	435	434	984	805	1060
12	403	420	428	966	745	1071
13	417	419	428	936	789	1058
14	401	409	415	963	752	999
15	401	387	403	1080	808	1101
16	382	347	385	1027	761	1090
17	373	381	379	1020	744	1101

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
	9	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
	9	7.0	6.9	7.1	6.8	7.0
10	6.6	6.6	6.6	6.7	6.7	6.7
11	7.0	6.9	7.0	6.9	7.0	7.1
12	6.7	6.9	6.8	6.8	6.8	6.9
13	5.8	5.7	5.6	5.5	5.7	5.8
14	5.9	5.8	5.6	5.4	5.8	5.8
15	6.0	5.8	6.0	6.3	6.2	6.1
16	6.3	6.3	5.8	6.0	6.9	6.0
17	5.8	5.4	5.4	5.3	5.8	5.5

Day	Temperature (°C)					
	9	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

Day	Temperature (°C)					
	9	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS

Client TEC164

Sample CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions

Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
-----------	-----	-------------	-------------	-------------------	-------------------	-------------------

Day	pH (units)					
18	8.2	8.2	8.2	8.1	8.2	8.2
19	8.5	8.5	8.5	8.5	8.6	8.5
20	8.3	8.3	8.3	8.3	8.3	8.2
21	8.4	8.4	8.4	8.3	8.4	8.3
22	8.3	8.5	8.5	8.5	8.4	8.4
23	8.4	8.4	8.2	8.3	8.4	8.3
24	8.3	8.3	8.2	8.3	8.3	8.3
25	8.3	8.3	8.5	8.4	8.4	8.3
26	8.0	8.5	8.4	8.3	8.4	8.3

Conductance (µS/cm)

18	353	373	370	10910	528	1099
19	362	364	373	10661	750	1101
20	371	385	367	1107	733	1117
21	375	371	403	923	821	1010
22	400	373	396	1087	819	1004
23	364	385	351	896	819	1005
24	374	367	350	903	822	1004
25	359	368	378	901	812	985
26	348	376	337	921	814	994

Dissolved Oxygen (mg/L) (40-100% saturation)

18	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.3
24	7.3	7.3	7.3	7.3	7.3	7.3
25	7.3	7.3	7.3	7.3	7.3	7.3
26	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)

18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

DO Levels (60-100% saturation) -

4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions

CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
-----	-------------	-------------	-------------------	-------------------	-------------------

Day	pH (units)					
18	7.6	7.6	7.5	7.8	8.0	7.9
19	8.2	8.2	8.2	8.3	8.4	8.2
20	7.7	7.9	7.8	8.0	8.1	8.0
21	7.9	7.9	8.0	8.0	8.1	8.1
22	7.9	7.8	7.8	8.1	8.1	8.0
23	7.8	7.8	7.8	8.1	8.1	8.0
24	7.7	7.8	7.8	7.9	8.0	8.0
25	7.7	7.8	7.8	7.9	8.1	8.0
26	8.1	8.1	8.0	8.1	8.1	8.2

Conductance (µS/cm)

18	379	375	380	779	780	1111
19	381	394	386	1066	792	1003
20	363	382	386	1051	763	1095
21	385	395	382	1024	761	1110
22	396	383	404	907	835	1037
23	396	389	406	1045	856	1015
24	407	383	397	1018	878	996
25	406	383	396	968	849	1013
26	379	382	390	864	840	1018

Dissolved Oxygen (mg/L) (40-100% saturation)

18	6.3	6.3	5.9	6.0	6.1	6.1
19	6.1	5.9	6.0	5.7	6.0	5.9
20	6.1	6.0	6.0	6.0	6.1	6.0
21	6.1	6.1	5.9	5.9	6.0	5.8
22	5.1	5.0	5.0	5.3	6.0	5.8
23	5.8	5.8	5.8	5.8	6.1	5.8
24	5.6	5.6	5.6	5.3	5.2	5.2
25	6.1	6.0	6.1	6.0	5.9	5.8
26	6.0	6.1	6.2	6.4	6.5	6.2

Temperature (°C)

18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

Reviewed By: JP

Date Reviewed: 2008/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Conc. (%)	New Solutions					
	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
Day						
	pH (units)					
27	8.4	8.5	8.5	8.3	8.4	8.3
28	8.5	8.5	8.5	8.5	8.4	8.5
29	8.3	8.3	8.3	8.2	8.3	8.3
30	8.4	8.4	8.5	8.3	8.4	8.3
31	8.3	8.5	8.5	8.3	8.4	8.3
32						
	Conductance (µS/cm)					
27	363	418	411	907	817	993
28	435	402	401	1134	781	1155
29	452	393	393	1146	778	1160
30	360	371	384	1131	771	1154
31	309	381	368	1130	771	1170
32						
	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3
29	7.3	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3
32						
	Temperature (°C)					
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32						

Conc. (%)	Old Solutions					
	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
Day						
	pH (units)					
27	7.9	7.9	7.9	8.0	8.2	8.0
28	8.0	8.0	8.0	8.2	8.2	8.2
29	7.9	7.8	7.8	8.0	8.0	8.0
30	7.6	8.0	7.9	8.1	7.0	8.0
31	7.9	8.0	7.9	8.0	8.1	8.0
32	8.1	8.1	8.0	8.1	8.2	8.1
	Conductance (µS/cm)					
27	393	363	386	850	829	1003
28	385	402	415	8104	842	1002
29	417	406	412	1238	835	1119
30	402	412	400	1094	837	1153
31	413	394	379	1080	825	1170
32	354	365	378	1051	811	1116
	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	5.5	5.4	5.0	5.6	5.6	5.5
28	5.8	5.9	5.6	6.0	6.1	5.5
29	6.1	6.0	5.6	6.4	6.3	6.0
30	5.8	6.6	6.0	6.4	6.7	5.8
31	5.4	5.5	5.2	5.4	5.5	5.3
32	6.1	6.1	6.1	6.2	6.4	6.5
	Temperature (°C)					
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/07/25

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=**head, **O=**oral, **E=**eyes, **G=**gills, **F=**fins, **S=**spine

Conc.
CTL 10 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	13	N	1	9	N	1	13	N	1	13	N
2	12		2	14		2	13		2	13	
3	10		3	13		3	11		3	12	
4	13		4	12		4	14		4	11	
5	13		5	12		5	13		5	12	
6	13		6	13		6	12		6	12	
7	13		7	13		7	14		7	13	
8	14		8	13		8	14		8	13	
9	14		9	13		9	13		9	10	
10	13		10	11		10	13		10	12	
11	14		11	12		11	11		11	11	
12	14		12	10		12	12		12	13	
13	-	-	13	11		13	12		13	14	
14	-	-	14	11		14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

CTL 20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	N	1	13	N	1	12	N	1	12	N
2	13		2	12		2	13		2	13	
3	13		3	13		3	15		3	13	
4	10		4	12		4	13		4	14	
5	13		5	14		5	11		5	12	
6	13		6	12		6	12		6	12	
7	13		7	12		7	13		7	12	
8	11		8	13		8	12		8	13	
9	12		9	12		9	12		9	14	
10	14		10	11		10	12		10	12	
11	13		11	12		11	12		11	12	
12	12		12	12		12	11		12	12	
13	12		13	11		13	12		13	12	
14	12		14	12		14	12		14	12	
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: JP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
CTL UNT ⁵⁰ ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	12	N	1	9	N	1	13	N	1	13	N
2	12		2	11		2	13		2	13	
3	11		3	11		3	14		3	11	
4	12		4	12		4	13		4	14	
5	11		5	13		5	13		5	13	
6	11		6	13		6	12		6	11	
7	11		7	12		7	10		7	13	
8	14		8	7		8	13		8	13	
9	11		9	11		9	13		9	13	
10	11		10	11		10	13		10	13	
11	11		11	9		11	-		11	13	
12	11		12	11		12	-		12	11	
13	11		13	11		13	-		13	10	
14	-		14	11		14	-		14	12	
15	-		15	-		15	-		15	-	

Comments

I-1557 20

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	17	N	1			1			1		
2	-		2			2			2		
3	-		3			3			3		
4	-		4			4			4		
5	-		5			5			5		
6	-		6			6		E	6		A
7	-		7		F	7			7		
8	-		8			8			8		
9	-		9			9			9		
10	-		10			10			10		
11	-		11			11			11		
12	-		12			12			12		
13	-		13			13			13		
14	-		14			14			14		
15	-		15			15			15		

Comments

Reviewed By: DP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

1718-1559
20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	N	1	11	N	1	12	N	1	14	N
2	12	↓	2	12	↓	2	12	↓	2	11	↓
3	12	↓	3	12	↓	3	11	↓	3	13	↓
4	14	↓	4	13	↓	4	12	↓	4	13	↓
5	14	↓	5	13	↓	5	12	↓	5	12	↓
6	12	↓	6	13	↓	6	13	↓	6	13	↓
7	12	↓	7	13	↓	7	12	↓	7	14	↓
8	13	↓	8	14	↓	8	14	↓	8	13	↓
9	12	↓	9	13	↓	9	12	↓	9	12	↓
10	13	↓	10	12	↓	10	13	↓	10	13	↓
11	12	↓	11	14	↓	11	12	↓	11	12	↓
12	-	-	12	12	↓	12	11	↓	12	12	↓
13	-	-	13	13	↓	13	12	↓	13	-	-
14	-	-	14	-	-	14	12	↓	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

1718-1561
20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	12	N	1	14	N	1	16	N	1	14	N
2	13	↓	2	14	↓	2	15	↓	2	14	↓
3	12	↓	3	14	↓	3	15	↓	3	13	↓
4	12	↓	4	15	↓	4	14	↓	4	14	↓
5	12	↓	5	14	↓	5	-	-	5	13	↓
6	14	↓	6	-	-	6	-	-	6	14	↓
7	13	↓	7	-	-	7	-	-	7	13	↓
8	12	↓	8	-	-	8	-	-	8	-	-
9	13	↓	9	-	-	9	-	-	9	-	-
10	-	-	10	-	-	10	-	-	10	-	-
11	-	-	11	-	-	11	-	-	11	-	-
12	-	-	12	-	-	12	-	-	12	-	-
13	-	-	13	-	-	13	-	-	13	-	-
14	-	-	14	-	-	14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: DP Date Reviewed: 2018/10/04

Organism Weights Bench Sheet

Client IEC 154 1819-1557, 1559 Batch 20180809 FM ELS
 Sample 1561 20ug/L Organism FMD

Item Weighed	Date	Initials	Balance*
dried pan	2018/09/08	SC	Mettler 1
dried pan + organisms	2018/09/12	KL	Mettler 1

* same balance must be used for initial and final weights
 ** for FM/HA/CT, must use scale with 0.01 mg accuracy

Replicate	CTL	
	Initial	Final
a	1044.94	1011.17
b	994.55	107.30
c	1027.38	1075.13
d	1049.91	1102.00
e		

④ 9154.22

CTL 10	
Initial	Final
1043.74	1097.54
994.04	1055.94
992.558	1035.15
968.40	1027.84

CTL 20	
Initial	Final
1068.65	1130.70
989.73	1048.68
980.35	1044.32
988.21	1043.81

1557.20 A	
Initial	Final
990.12	1003.66

1559.20	
Initial	Final
1010.96	1057.78
1026.61	1075.63
995.80	1050.54
1033.30	1090.13

1561.20	
Initial	Final
1033.57	1091.53
1006.120	1040.62
1002.14	1053.14
988.36	1022.55

Replicate		
	Initial	Final
a		
b		
c		
d		
e		

Initial	Final

Initial	Final

Initial	Final

Initial	Final

Initial	Final

Balance Calibration Check:

first pan weighed:

Initial	Final
CTL 0	CTL A
1049.91	1011.17

weight of first pan:

Final
CTL A
1011.17

first pan after all other pans weighed:

Final
1011.16

% difference < 5%: Yes No

% difference = $\frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$

Test Validity Met: Yes No NA

Results are Logical**: Yes No

** no negative numbers, consistent values across replicates

If "no" is circled for any parameter, notify Lab Supervisor/
 QA Group to determine appropriate action

Reviewed By: JP Date Reviewed: 2018/04/17

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Organism Information

Source: Aquatic Batch: 20180801M ELS Egg Stage: 3rd mite Organisms Received in Good Condition: Yes or No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review
					AM	PM		
2018/08/10	0	1400	M/K/B	2	✓	✓	60 mins	ED
2018/08/10	1	1400	M/K/B	2	✓	✓	60 mins	ED
2018/08/11	2	1335	ST/CS	2	✓	✓	60 mins	ML
2018/08/12	3	1330	ST/SS	2	-	-	60 mins	ICC
2018/08/13	4	1400	ST/SS	2	-	✓	60 min	AP
2018/08/14	5	1045	ST/LP	2	✓	✓	60 min	ICC
2018/08/15	6	1115	CB	2	✓	✓	60 mins	AP
2018/08/16	7	1100	CB	2	✓	✓	60 mins	ED
2018/08/17	8	1000	CB	2	✓	✓	60 mins	AP
2018/08/18	9	1230	CB	2	✓	✓	75 mins	AP
2018/08/19	10	1300	M/L/V	2	✓	✓	60 min	ED
2018/08/20	11	1125	CB	2	✓	✓	60 mins	MW
2018/08/21	12	1335	ST/ML	2	✓	✓	60 mins	AP
2018/08/22	13	1345	FP/M	2	✓	✓	60 mins	ICC
2018/08/23	14	1215	ST/AP	2	✓	✓	60 mins	ED
2018/08/24	15	1115	CB/EP	2	✓	✓	60 mins	ST
2018/08/25	16	1030	ST	2	✓	✓	60 mins	SS
2018/08/26	17	1050	IC/M	2	✓	✓	60 min	AP
2018/08/27	18	1045	FP/CK	2	✓	✓	60 mins	LF
2018/08/28	19	1220	SS/LP	2	✓	✓	60 mins	RU
2018/08/29	20	1130	KK/S	2	✓	✓	60 mins	AP
2018/08/30	21	1130	AP	2	✓	✓	60 mins	ED
2018/08/31	22	1155	CB	2	✓	✓	60 mins	MW
2018/09/01	23	1140	LF	2	✓	✓	60 mins	ST
2018/09/02	24	1230	M/AP	2	✓	✓	60 min	LC
2018/09/03	25	1530	AP	2	✓	✓	60 min	MW
2018/09/04	26	1145	CB	2	✓	✓	60 mins	AP
2018/09/05	27	1115	CB	2	✓	✓	60 mins	ST
2018/09/06	28	1100	CB	2	✓	✓	60 mins	AP
2018/09/07	29	1030	CB	2	✓	✓	60 mins	ED
2018/09/08	30	1130	ST	2	✓	✓	60 mins	LF
2018/09/09	31	1200	IC	2	✓	✓	60 mins	AP
2018/09/10	32	1400	M/EP	2	✓	✓	60 mins	ICC

Reviewed By: 2018/09/17 Date Reviewed: OP

Method FMD 32 Day ELS Client TEC164

Sample: CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	CTL		CTL 20 ug/L		CTL 10 ug/L		1718-1557 20 ug/L		1718-1559 20 ug/L		1718-1561 20 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	14	1	12	3	13	2	10	5	11	4	14	1
b	13	2	14	1	10	5	13	2	14	1	9	6
c	14	1	12	3	11	4	12	3	10	5	12	3
d	14	1	10	5	12	3	11	4	12	3	9	6
e	24	6	29	1	24	6	24	0	29	1	28	2
f	26	4	26	4	25	5	27	3	23	7	29	1

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL			CTL 20 ug/L			CTL 10 ug/L			1718-1557 20 ug/L		
	Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	14	0	✓	12	0	✓	13	0	✓	10	0	✓
b	13	0	✓	14	0	✓	20	0	✓	12	1	✓
c	14	0	✓	12	0	✓	11	0	✓	11	1	✓
d	14	0	✓	12	0	✓	12	0	✓	11	0	✓
e	24	2	✓	24	0	✓	24	0	✓	22	2	✓
f	26	0	✓	25	1	✓	25	0	✓	27	0	✓

replicate	1718-1559 20 ug/L			1718-1561 20 ug/L		
	Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	10	1	✓	14	0	✓
b	13	1	✓	9	0	✓
c	10	0	✓	11	1	✓
d	12	0	✓	9	0	✓
e	27	2	✓	28	0	✓
f	27	3	✓	28	1	✓

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:
 Day 2, Rep D - 1 hatched - 1557 20 ug/L * 1561 - 20 ug/L - Day 2 - microbial growth
 Day 2 CTL UNT - Rep C - 1 hatched

Reviewed By: STP Date Reviewed: 2018/09/17

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L CTL 10 ug/L 1718-1557 20 ug/L 1718-1559 20 ug/L 1718-1561 20 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

CTL
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	9	0	6	0
d	10	0	5	0

CTL 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	0	4	0
b	15	0	7	0
c	13	0	2	0
d	10	0	9	1

SS SS

CTL 10 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	13	0	2	0
d	10	0	5	0

1718-1557 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	8	0	7	0
b	6	0	9	0
c	13	0	2	0
d	5	0	10	0

1718-1559 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	13	0	2	0
c	14	0	1	0
d	13	0	2	0

1718-1561 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	0	2	0
b	14	0	1	0
c	13	0	2	0
d	15	0	0	0

CTL
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	13	0
b	1	1	13	0
c	3	0	12	0
d	1	0	14	0

CTL 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	58	0	7	0
b	5	0	9	1
c	10	0	10	0
d	6	0	8	0

SS

CTL 10 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	13	1
b	2	0	13	0
c	3	0	12	0
d	0	0	15	0

1718-1557 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	13	0
b	0	0	15	0
c	3	0	12	0
d	1	0	14	0

1718-1559 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	1	13	0
b	2	0	12	0
c	3	0	12	0
d	5	0	10	0

1718-1561 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	2	0	13	0
c	0	0	15	0
d	2	0	13	0

0%
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a				
b				
c				
d				

KCL

Comments/Observations

Reviewed By: DP

Date Reviewed: 2018/10/14

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	1	0	14	0
d	0	0	15	0

CTL 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	15	0
d	1	0	13	0

CTL 10 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	13	0
b	0	0	15	0
c	1	0	14	0
d	0	0	15	0

1718-1557 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

1718-1559 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	0
b	0	0	14	0
c	0	0	15	0
d	1	0	14	0

1718-1561 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

CTL
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	14	1
d	0	0	15	0

CTL 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	1
b	0	0	14	0
c	0	0	15	0
d	1	0	13	0

CTL 10 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	1	13	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

1718-1557 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	0
b	0	0	14	0
c	0	0	15	0
d	0	0	14	0

1718-1559 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	13	1
b	0	0	14	0
c	0	0	15	0
d	0	1	14	0

1718-1561 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 7	CTL 20 ug/L Day 7	CTL 10 ug/L Day 7	1718-1557 20 ug/L Day 7	1718-1559 20 ug/L Day 7	1718-1561 20 ug/L Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13	13	13	15
b	14	14	15	9	14	13 4
c	13	15	14	10	15	15
d	14	14	15	11	14	15

Comments/Observations:

	CTL Day 8	CTL 20 ug/L Day 8	CTL 10 ug/L Day 8	1718-1557 20 ug/L Day 8	1718-1559 20 ug/L Day 8	1718-1561 20 ug/L Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13	5 * ①	13	14
b	14	14	15	4	14 (1)	10
c	13	14	14	3	14	11
d	14	14	15	5 * ②	14	15 (3)

Comments/Observations: * ① v. slight microbial growth on 2/8 bodies
* ② v. slight microbial growth on 2/5 bodies

	CTL Day 9	CTL 20 ug/L Day 9	CTL 10 ug/L Day 9	1718-1557 20 ug/L Day 9	1718-1559 20 ug/L Day 9	1718-1561 20 ug/L Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	13 (1)	1	13	11
b	14	14	15	1	14 (1)	8
c	13	14	14	0	14	9
d	14	14	15 (1)	2	14 (1)	14 (1)

Comments/Observations:

	CTL Day 10	CTL 20 ug/L Day 10	CTL 10 ug/L Day 10	1718-1557 20 ug/L Day 10	1718-1559 20 ug/L Day 10	1718-1561 20 ug/L Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	13 4 8	13 (1)	1	13	10
b	14	14	14	0	14 (1)	6 *
c	12	14	14	0	14	7
d	14	14 (1)	14	0	14 (2)	12 14 (1)

Comments/Observations: * Microbial growth on 1/2 bodies

Reviewed By: JP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164 Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 11	CTL 20 ug/L Day 11	CTL 10 ug/L Day 11	1718-1557 20 ug/L Day 11	1718-1559 20 ug/L Day 11	1718-1561 20 ug/L Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	13(1)	BCD	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	7
d	14	14(1)	14(1)	0	13(1)	11

Comments/Observations:

	CTL Day 12	CTL 20 ug/L Day 12	CTL 10 ug/L Day 12	1718-1557 20 ug/L Day 12	1718-1559 20 ug/L Day 12	1718-1561 20 ug/L Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14*	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	*5(1)
d	14	14	14(1)	0	13(1)	11

Comments/Observations:

	CTL Day 13	CTL 20 ug/L Day 13	CTL 10 ug/L Day 13	1718-1557 20 ug/L Day 13	1718-1559 20 ug/L Day 13	1718-1561 20 ug/L Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	4*
d	14	14	14(1)	0	13(1)	7*

Comments/Observations: *microbial growth

	CTL Day 14	CTL 20 ug/L Day 14	CTL 10 ug/L Day 14	1718-1557 20 ug/L Day 14	1718-1559 20 ug/L Day 14	1718-1561 20 ug/L Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13	5
c	12	14	14	0	14	4
d	14	14	14(1)	0	13(1)	7

Comments/Observations: * CTL DAY 12 - microbial growth / 1561 Day 12 - microbial growth

Reviewed By: JP Date Reviewed: 2018/06/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 15	CTL 20 ug/L Day 15	CTL 10 ug/L Day 15	1718-1557 20 ug/L Day 15	1718-1559 20 ug/L Day 15	1718-1561 20 ug/L Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12	14	14	0	14	4
d	14	14	14(1)	0	13(1)	7

Comments/Observations:

	CTL Day 16	CTL 20 ug/L Day 16	CTL 10 ug/L Day 16	1718-1557 20 ug/L Day 16	1718-1559 20 ug/L Day 16	1718-1561 20 ug/L Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14(1)	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12	14	14(1)	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations:

	CTL Day 17	CTL 20 ug/L Day 17	CTL 10 ug/L Day 17	1718-1557 20 ug/L Day 17	1718-1559 20 ug/L Day 17	1718-1561 20 ug/L Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	13	10
b	14	14	14	0	13/14	5
c	12	14(1)	14(1)	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations:

	CTL Day 18	CTL 20 ug/L Day 18	CTL 10 ug/L Day 18	1718-1557 20 ug/L Day 18	1718-1559 20 ug/L Day 18	1718-1561 20 ug/L Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	13/14	13(2)	1	13	10
b	14	14	14	0	13/14	5
c	12/11	14(1)	14(1)	0	14	4
d	14	14/13	13	0	13(1)	7

Comments/Observations:

Reviewed By: OP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 19	CTL 20 ug/L Day 19	CTL 10 ug/L Day 19	1718-1557 20 ug/L Day 19	1718-1559 20 ug/L Day 19	1718-1561 20 ug/L Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(2)	1	13	10
b	14	14	14	0	14	5
c	11	14 13(1)	13	0	14	4
d	14	14 13 ⁵	13	0	13(0)	7

Comments/Observations:

	CTL Day 20	CTL 20 ug/L Day 20	CTL 10 ug/L Day 20	1718-1557 20 ug/L Day 20	1718-1559 20 ug/L Day 20	1718-1561 20 ug/L Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12*	9
b	14	14	14	0	14	5
c	11	14(1)	13	0	14	4
d	14	14	13	0	13(1)	7

Comments/Observations: *killed by tech. → not included in mortality calc.

	CTL Day 21	CTL 20 ug/L Day 21	CTL 10 ug/L Day 21	1718-1557 20 ug/L Day 21	1718-1559 20 ug/L Day 21	1718-1561 20 ug/L Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(0)	1	12	9
b	14	14	14	0	14	5
c	11	14(1)	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 22	CTL 20 ug/L Day 22	CTL 10 ug/L Day 22	1718-1557 20 ug/L Day 22	1718-1559 20 ug/L Day 22	1718-1561 20 ug/L Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12	9
b	14	14	14	0	14	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: GP

Date Reviewed: 2018/10/11

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13(1)	1	12	9
b	14	14	14	0	14	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	14	5
c	14	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

*killed by tech
↳ not included in mortality.

	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	11	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: SP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 27	CTL 20 ug/L Day 27	CTL 10 ug/L Day 27	1718-1557 20 ug/L Day 27	1718-1559 20 ug/L Day 27	1718-1561 20 ug/L Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	13	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 28	CTL 20 ug/L Day 28	CTL 10 ug/L Day 28	1718-1557 20 ug/L Day 28	1718-1559 20 ug/L Day 28	1718-1561 20 ug/L Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	12	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 29	CTL 20 ug/L Day 29	CTL 10 ug/L Day 29	1718-1557 20 ug/L Day 29	1718-1559 20 ug/L Day 29	1718-1561 20 ug/L Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	14	12	1	12	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

	CTL Day 30	CTL 20 ug/L Day 30	CTL 10 ug/L Day 30	1718-1557 20 ug/L Day 30	1718-1559 20 ug/L Day 30	1718-1561 20 ug/L Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	1	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Number of Alive Embryos and Hatched Organisms

replicate	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	1	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	12	7

Comments/Observations:

replicate	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	12	7	11	9
b	14	14	14	0	13	5
c	10	14	13	0	14	4
d	14	14	13	0	18	7

Comments/Observations:

Reviewed By: JPP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Old Solutions					
CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L

Day	pH (units)					
0	8.2	8.2	8.2	8.1	8.3	8.2
1	8.0	8.1	8.1	8.1	8.2	8.2
2	8.1	8.3	8.3	8.2	8.3	8.1
3	8.3	8.3	8.3	8.3	8.4	8.1
4	8.2	8.2	8.2	8.3	8.4	8.3
5	8.3	8.2	8.1	8.2	8.3	8.2
6	8.3	8.3	8.4	8.2	8.4	8.3
7	8.2	8.4	8.4	8.1	8.3	8.3
8	7.9	8.4	8.3	8.1	8.3	8.3

Day	pH (units)					
0						
1	8.1	8.1	8.2	8.1	8.3	8.2
2	8.3	8.2	8.2	8.1	8.2	8.2
3	7.5	8.0	8.1	8.0	8.1	8.0
4	7.2	8.2	8.2	8.0	8.2	8.0
5	8.2	8.1	8.1	8.0	8.1	7.9
6	8.2	8.1	8.1	8.0	8.1	8.0
7	8.2	8.2	8.0	8.0	8.1	8.1
8	8.2	8.2	8.2	8.1	8.1	8.1

Day	Conductance (µS/cm)					
0	417	420	412	905	883	1109
1	413	389	410	998	821	1198
2	373	378	371	957	868	1133
3	411	369	367	945	856	1098
4	409	373	368	987	863	1129
5	429	377	378	984	860	1129
6	400	420	422	953	828	1087
7	400	422	425	1020	782	1075
8	416	421	428	1025	772	1068

Day	Conductance (µS/cm)					
0						
1	410	424	448	979	904	1154
2	419	405	434	962	886	1113
3	389	385	408	916	819	1097
4	389	375	346	949	831	1110
5	417	396	408	929	861	1066
6	433	372	376	903	818	1051
7	407	416	406	908	830	1075
8	443	431	433	955	796	1064

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
0	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.3	7.3	7.3	7.2
2	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
0						
1	7.0	7.1	7.1	7.1	7.1	7.7
2	7.3	7.2	7.2	7.2	7.5	7.7
3	7.0	7.0	7.1	7.2	7.3	7.2
4	7.2	7.2	7.2	7.7	7.5	7.5
5	7.2	7.2	7.2	7.1	7.3	7.2
6	7.2	7.0	7.0	7.0	7.0	7.0
7	7.2	6.8	6.8	6.8	6.7	6.8
8	6.6	6.8	6.8	6.8	6.8	6.9

Day	Temperature (°C)					
0	24	24	24	24	24	24
1	24	24	24	24	24	25
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

Day	Temperature (°C)					
0						
1	24	24	24	24	24	24
2	24	24	24	24	24	24
3	24	24	24	24	24	24
4	24	24	24	24	24	24
5	24	24	24	24	24	24
6	24	24	24	24	24	24
7	24	24	24	24	24	24
8	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS

Client TEC164

Sample CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
Day						
	pH (units)					
9	7.9	8.3	8.3	8.1	8.3	8.3
10	8.3	8.3	8.3	8.2	8.2	8.2
11	8.3	8.3	8.3	8.2	8.3	7.9
12	8.1	8.2	8.2	8.2	8.3	8.3
13	7.9	8.2	8.2	8.1	8.2	8.1
14	8.1	8.2	8.1	8.1	8.1	8.1
15	8.2	8.3	8.3	8.3	8.3	8.3
16	8.2	8.2	8.2	8.2	8.3	8.3
17	8.1	8.2	8.2	8.2	8.3	8.2
	Conductance (µS/cm)					
9	435	425	428	1019	772	1063
10	471	431	415	1017	771	1071
11	493	418	417	1010	771	1110
12	404	412	416	1010	773	1066
13	417	428	428	988	746	1054
14	352	369	372	1102	760	1105
15	360	368	360	1101	760	1113
16	341	337	324	1093	752	1109
17	351	371	401	1101	751	1110
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3
	Temperature (°C)					
9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

Old Solutions						
CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L	
	pH (units)					
9	8.2	8.2	8.2	8.1	8.2	8.1
10	8.0	8.0	8.0	8.0	8.0	8.0
11	8.2	8.2	8.2	8.0	8.1	8.0
12	8.1	8.1	8.1	8.0	8.1	8.0
13	7.9	7.6	7.7	7.9	8.0	7.9
14	7.7	7.7	7.7	7.7	7.8	7.8
15	8.0	7.9	8.0	7.9	8.1	8.0
16	7.9	7.6	7.6	7.9	8.0	7.9
17	7.7	7.7	7.6	7.8	8.1	8.0
	Conductance (µS/cm)					
9	441	434	434	953	796	1057
10	413	433	432	972	785	1054
11	425	435	434	984	805	1060
12	408	420	428	966	745	1071
13	417	419	428	936	789	1058
14	401	409	415	963	752	999
15	401	387	403	1080	808	1101
16	382	347	385	1027	761	1090
17	373	381	379	1020	744	1101
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.0	6.9	7.1	6.8	7.0	7.1
10	6.6	6.6	6.6	6.7	6.7	6.7
11	7.0	6.9	7.0	6.9	7.0	7.1
12	6.7	6.9	6.8	6.8	6.8	6.9
13	5.8	5.7	5.6	5.5	5.7	5.8
14	5.9	5.8	5.6	5.4	5.7	5.8
15	6.0	5.8	6.0	6.3	6.2	6.1
16	6.3	6.3	6.8	6.0	6.9	6.0
17	5.8	5.4	5.4	5.3	5.8	5.5
	Temperature (°C)					
9	24	24	24	24	24	24
10	24	24	24	24	24	24
11	24	24	24	24	24	24
12	24	24	24	24	24	24
13	24	24	24	24	24	24
14	24	24	24	24	24	24
15	24	24	24	24	24	24
16	24	24	24	24	24	24
17	24	24	24	24	24	24

*150

6.8

*1012

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions

Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
-----------	-----	-------------	-------------	-------------------	-------------------	-------------------

Day	pH (units)					
18	8.2	8.2	8.1	8.2	8.2	
19	8.5	8.5	8.5	8.5	8.5	
20	8.3	8.3	8.3	8.3	8.2	
21	8.4	8.4	8.4	8.3	8.4	
22	8.3	8.5	8.5	8.5	8.4	
23	8.4	8.4	8.2	8.3	8.4	
24	8.3	8.3	8.3	8.4	8.3	
25	8.3	8.3	8.3	8.4	8.3	
26	8.0	8.5	8.4	8.3	8.4	

Conductance (µS/cm)

18	353	373	370	10910	528	1099
19	362	364	373	10661	750	1101
20	371	385	367	1107	733	1117
21	375	371	403	923	821	1010
22	400	373	396	1087	819	1004
23	364	385	351	896	819	1005
24	374	367	350	903	822	1004
25	359	368	378	901	812	985
26	348	376	337	921	814	994

Dissolved Oxygen (mg/L) (40-100% saturation)

18	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.3
24	7.3	7.3	7.3	7.3	7.3	7.3
25	7.3	7.3	7.3	7.3	7.3	7.3
26	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)

18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Old Solutions

CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
-----	-------------	-------------	-------------------	-------------------	-------------------

Day	pH (units)					
18	7.6	7.6	7.5	7.8	8.0	7.9
19	8.2	8.2	8.2	8.3	8.4	8.2
20	7.7	7.9	7.8	8.0	8.1	8.0
21	7.9	7.9	8.0	8.0	8.1	8.1
22	7.9	7.8	7.8	8.1	8.1	8.0
23	7.8	7.8	7.8	8.1	8.1	8.0
24	7.7	7.8	7.8	7.9	8.0	8.0
25	7.7	7.8	7.8	7.9	8.1	8.0
26	8.1	8.1	8.0	8.1	8.1	8.2

Conductance (µS/cm)

18	379	375	380	779	780	1111
19	381	394	386	1066	792	1003
20	363	382	386	1051	763	1095
21	385	395	382	1024	761	1110
22	396	383	404	907	835	1037
23	396	389	406	1045	856	1015
24	407	383	397	1018	878	996
25	406	383	396	968	849	1013
26	379	382	390	864	840	1018

Dissolved Oxygen (mg/L) (40-100% saturation)

18	6.3	6.3	5.9	6.0	6.1	6.1
19	6.1	5.9	6.0	5.7	6.0	5.9
20	6.1	6.0	6.0	6.0	6.1	6.0
21	6.1	6.1	5.9	5.9	6.0	5.8
22	5.1	5.0	5.0	5.3	6.0	5.8
23	5.8	5.8	5.8	5.8	6.1	5.8
24	5.6	5.6	5.6	5.3	5.2	5.2
25	6.1	6.0	6.1	6.0	5.9	5.8
26	6.0	6.1	6.2	6.4	6.5	6.2

Temperature (°C)

18	24	24	24	24	24	24
19	24	24	24	24	24	24
20	24	24	24	24	24	24
21	24	24	24	24	24	24
22	24	24	24	24	24	24
23	24	24	24	24	24	24
24	24	24	24	24	24	24
25	24	24	24	24	24	24
26	24	24	24	24	24	24

Reviewed By: JP

Date Reviewed: 2008/10/04

Method FMD 32 Day ELS Client TEC164

Sample CTL CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

New Solutions						
Conc. (%)	CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
Day						
	pH (units)					
27	8.4	8.5	8.5	8.3	8.4	8.3
28	8.5	8.5	8.5	8.5	8.4	8.5
29	8.3	8.3	8.3	8.2	8.3	8.3
30	8.4	8.4	8.5	8.3	8.4	8.3
31	8.3	8.5	8.5	8.3	8.4	8.3
32						
	Conductance (µS/cm)					
27	363	418	411	407	817	993
28	435	402	401	1134	781	1155
29	452	393	393	1146	778	1160
30	360	371	384	1131	771	1154
31	309	381	368	1130	771	1170
32						
	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3
29	7.3	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3
32						
	Temperature (°C)					
27	24	24	24	24	24	24
28	24	24	24	24	24	24
29	24	24	24	24	24	24
30	24	24	24	24	24	24
31	24	24	24	24	24	24
32						

Old Solutions					
CTL	CTL 20 ug/L	CTL 10 ug/L	1718-1557 20 ug/L	1718-1559 20 ug/L	1718-1561 20 ug/L
	pH (units)				
27	7.9	7.9	7.9	8.0	8.2
28	8.0	8.0	8.0	8.2	8.2
29	7.9	7.8	7.8	8.0	8.0
30	7.6	8.0	7.9	8.1	8.0
31	7.9	8.0	7.9	8.0	8.0
32	8.1	8.1	8.0	8.1	8.2
	Conductance (µS/cm)				
27	393	363	386	850	829
28	385	402	415	804	842
29	417	406	412	1038	835
30	402	412	400	1094	837
31	413	394	379	1080	825
32	354	365	378	1051	811
	Dissolved Oxygen (mg/L) (40-100% saturation)				
27	5.5	5.4	5.0	5.6	5.5
28	5.8	5.9	5.6	6.0	6.0
29	6.1	6.0	5.6	6.4	6.0
30	5.8	6.6	6.0	6.4	5.7
31	5.4	5.5	5.2	5.4	5.3
32	6.1	6.1	6.1	6.2	6.5
	Temperature (°C)				
27	24	24	24	24	24
28	24	24	24	24	24
29	24	24	24	24	24
30	24	24	24	24	24
31	24	24	24	24	24
32	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/07/25

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=**head, **O=**oral, **E=**eyes, **G=**gills, **F=**fins, **S=**spine

Conc.
CTL
CTL 10ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	13	N	1	9	N	1	13	N	1	13	N
2	12		2	14		2	13		2	13	
3	10		3	13		3	11		3	12	
4	13		4	12		4	14		4	11	
5	13		5	12		5	13		5	12	
6	13		6	13		6	12		6	12	
7	13		7	13		7	14		7	13	
8	14		8	13		8	14		8	13	
9	14		9	13		9	13		9	10	
10	13		10	11		10	13		10	12	
11	14		11	12		11	11		11	11	
12	14		12	10		12	12		12	13	
13	-	-	13	11		13	12		13	14	
14	-	-	14	11		14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

CTL 20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	N	1	13	N	1	12	N	1	12	N
2	13		2	12		2	13		2	13	
3	13		3	13		3	15		3	13	
4	10		4	12		4	13		4	14	
5	13		5	14		5	11		5	12	
6	13		6	12		6	12		6	12	
7	13		7	12		7	13		7	12	
8	11		8	13		8	12		8	13	
9	12		9	12		9	12		9	14	
10	14		10	11		10	12		10	12	
11	13		11	12		11	12		11	12	
12	12		12	12		12	11		12	12	
13	12		13	11		13	12		13	12	
14	12		14	12		14	12		14	12	
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: JP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
CTL UNT ⁵⁰ ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	12	N	1	9	N	1	13	N	1	13	N
2	12		2	11		2	13		2	13	
3	11		3	11		3	14		3	11	
4	12		4	12		4	13		4	14	
5	11		5	13		5	13		5	13	
6	11		6	13		6	12		6	11	
7	11		7	12		7	10		7	13	
8	14		8	7		8	13		8	13	
9	11		9	11		9	13		9	13	
10	11		10	11		10	13		10	13	
11	11		11	9		11	-		11	13	
12	11		12	11		12	-		12	11	
13	11		13	11		13	-		13	10	
14	-		14	11		14	-		14	12	
15	-		15	-		15	-		15	-	

Comments

I-1557 20

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	17	N	1			1			1		
2	-		2			2			2		
3	-		3			3			3		
4	-		4			4			4		
5	-		5			5			5		
6	-		6			6		E	6		A
7	-		7		F	7			7		
8	-		8			8			8		
9	-		9			9			9		
10	-		10			10			10		
11	-		11			11			11		
12	-		12			12			12		
13	-		13			13			13		
14	-		14			14			14		
15	-		15			15			15		

Comments

Reviewed By: DP Date Reviewed: 2018/10/04

Method FMD 32 Day ELS Client TEC164

Sample: CTL, CTL 20 ug/L, CTL 10 ug/L, 1718-1557 20 ug/L, 1718-1559 20 ug/L, 1718-1561 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

1718-1559
20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	N	1	11	N	1	12	N	1	14	N
2	12	↓	2	12	↓	2	12	↓	2	11	↓
3	12	↓	3	12	↓	3	11	↓	3	13	↓
4	14	↓	4	13	↓	4	12	↓	4	13	↓
5	14	↓	5	13	↓	5	13	↓	5	12	↓
6	12	↓	6	13	↓	6	13	↓	6	13	↓
7	12	↓	7	13	↓	7	12	↓	7	14	↓
8	13	↓	8	14	↓	8	14	↓	8	13	↓
9	12	↓	9	13	↓	9	12	↓	9	12	↓
10	13	↓	10	12	↓	10	13	↓	10	13	↓
11	12	↓	11	14	↓	11	12	↓	11	12	↓
12	-	-	12	13	↓	12	11	↓	12	12	↓
13	-	-	13	13	↓	13	12	↓	13	-	-
14	-	-	14	-	-	14	12	↓	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

1718-1561
20 ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	12	N	1	14	N	1	16	N	1	14	N
2	13	↓	2	14	↓	2	15	↓	2	14	↓
3	12	↓	3	14	↓	3	15	↓	3	13	↓
4	12	↓	4	15	↓	4	14	↓	4	14	↓
5	12	↓	5	14	↓	5	-	-	5	13	↓
6	14	↓	6	-	-	6	-	-	6	14	↓
7	13	↓	7	-	-	7	-	-	7	13	↓
8	12	↓	8	-	-	8	-	-	8	-	-
9	13	↓	9	-	-	9	-	-	9	-	-
10	-	-	10	-	-	10	-	-	10	-	-
11	-	-	11	-	-	11	-	-	11	-	-
12	-	-	12	-	-	12	-	-	12	-	-
13	-	-	13	-	-	13	-	-	13	-	-
14	-	-	14	-	-	14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: DP Date Reviewed: 2018/10/04

Organism Weights Bench Sheet

Client IEC 154 1819-1557, 1559 Batch 20180809 FM ELS
 Sample 1561 20ug/L Organism FMB

Item Weighed	Date	Initials	Balance*
dried pan	2018/09/08	SC	Mettler 1
dried pan + organisms	2018/09/12	KL	Mettler 1

* same balance must be used for initial and final weights
 ** for FM/HA/CT, must use scale with 0.01 mg accuracy

Replicate	CTL	
	Initial	Final
a	1049.94	1011.17
b	989.55	107.30
c	1027.38	1075.13
d	1049.91	1102.00
e		

④ 9159.22

CTL 10	
Initial	Final
1043.74	1097.54
994.04	1055.94
992.558	1035.15
968.40	1027.84

CTL 20	
Initial	Final
1068.65	1130.70
989.73	1048.68
980.35	1044.32
988.21	1043.81

1557.20 A	
Initial	Final
990.12	1003.66

1559.20	
Initial	Final
1010.96	1057.78
1026.61	1075.63
995.80	1050.54
1033.30	1090.13

1561.20	
Initial	Final
1033.57	1091.53
1006.120	1040.62
1002.14	1053.19
988.36	1022.55

Replicate	Initial	
	Initial	Final
a		
b		
c		
d		
e		

Initial	
Initial	Final

Initial	
Initial	Final

Initial	
Initial	Final

Initial	
Initial	Final

Initial	
Initial	Final

Balance Calibration Check:

first pan weighed:

Initial	Final
CTL 0	CTL A
1049.91	1011.17

weight of first pan:

Final
1011.17

first pan after all other pans weighed:

Final
1011.17

% difference < 5%: Yes No

% difference = $\frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$

Test Validity Met: Yes No NA

Results are Logical**: Yes No

** no negative numbers, consistent values across replicates

If "no" is circled for any parameter, notify Lab Supervisor/
 QA Group to determine appropriate action

Reviewed By: JP Date Reviewed: 2018/04/17

CETIS Summary Report

Report Date: 19 Dec-18 12:36 (p 1 of 26)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	CM_MC1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	FR_FRCP1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	Lab Control passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	GH_FR1 20 µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	Cu Ctrl 10µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	FR_FRCP120µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	CM_MC2 20 µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	Cu Ctrl 20µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	CM_MC2 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	FR_UFR1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	GH_FR1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.1873	GH_ER2 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	CM_MC2 20 µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	GH_FR1 20 µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	Cu Ctrl 10µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	Lab Control passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	GH_FR1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	FR_FRCP120µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	Cu Ctrl 20µg/L passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	GH_ER2 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	FR_FRCP1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	CM_MC1 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	CM_MC2 passed length-mm	1
06-9145-1052	Length-mm	Equal Variance t Two-Sample Test	0.2569	FR_UFR1 passed length-mm	1

CETIS Summary Report

Report Date: 19 Dec-18 12:36 (p 24 of 26)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
① Lab Control	N	4	11.88	10.66	13.11	11.07	12.8	0.386	0.7719	6.50%	0.00%
Cu Ctrl 10µg/L	LC	4	12.3	11.69	12.92	11.79	12.62	0.1927	0.3854	3.13%	-3.53%
Cu Ctrl 20µg/L	U	4	12.11	11.51	12.71	11.57	12.43	0.1887	0.3774	3.12%	-1.87%
FR_UFR1		4	11.97	11.07	12.88	11.33	12.69	0.285	0.57	4.76%	-0.76%
GH_ER2		4	11.65	8.708	14.59	9.87	13.67	0.9244	1.849	15.87%	1.98%
CM_MC1	XC	4	11.42	10.7	12.14	11	11.92	0.2276	0.4553	3.99%	3.91%
FR_FRCP1		3	17.5	14.21	20.79	16.5	19	0.7638	1.323	7.56%	-47.24%
GH_FR1		4	12.12	10.97	13.28	11.07	12.71	0.3623	0.7247	5.98%	-2.02%
CM_MC2		4	12.53	10.62	14.43	11.5	14	0.5991	1.198	9.57%	-5.38%
FR_FRCP120µg/L		1	17			17	17	0	0	0.00%	-43.04%
CM_MC2 20 µg/L		4	13.83	12.19	15.47	12.56	15	0.5153	1.031	7.45%	-16.39%
GH_FR1 20 µg/L		4	12.49	12.08	12.9	12.14	12.69	0.1277	0.2555	2.05%	-5.09%

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	4	3.326	3.064	3.588	3.183	3.477	0.08234	0.1647	4.95%	0.00%
Cu Ctrl 10µg/L	LC	4	3.627	2.709	4.544	2.831	4.127	0.2882	0.5765	15.90%	-9.05%
Cu Ctrl 20µg/L	U	4	4.002	3.624	4.38	3.711	4.265	0.1189	0.2377	5.94%	-20.33%
FR_UFR1		4	3.167	2.751	3.583	2.794	3.389	0.1307	0.2613	8.25%	4.78%
GH_ER2		4	1.967	1.074	2.859	1.487	2.597	0.2804	0.5608	28.52%	40.87%
CM_MC1	XC	4	3.364	2.826	3.903	3.064	3.817	0.1691	0.3383	10.05%	-1.16%
FR_FRCP1		4	0.9223	-0.1098	1.954	0	1.395	0.3243	0.6486	70.32%	72.27%
GH_FR1		4	2.543	1.768	3.318	2.104	3.131	0.2436	0.4872	19.16%	23.54%
CM_MC2		4	1.629	-0.1731	3.43	0.5887	2.669	0.5661	1.132	69.52%	51.03%
FR_FRCP120µg/L		4	0.2257	-0.4925	0.9438	0	0.9027	0.2257	0.4513	200.00%	93.21%
CM_MC2 20 µg/L		4	2.46	1.662	3.259	2.07	3.197	0.251	0.5019	20.40%	26.02%
GH_FR1 20 µg/L		4	3.571	3.267	3.875	3.344	3.789	0.09564	0.1913	5.36%	-7.37%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	4	0.8500	0.6492	1.0000	0.6667	0.9333	0.0631	0.1262	14.85%	0.00%
Cu Ctrl 10µg/L	LC	4	0.8667	0.7801	0.9533	0.8000	0.9333	0.0272	0.0544	6.28%	-1.96%
Cu Ctrl 20µg/L	U	4	0.9333	0.9333	0.9333	0.9333	0.9333	0.0000	0.0000	0.00%	-9.80%
FR_UFR1		4	0.8833	0.7022	1.0000	0.7333	1.0000	0.0569	0.1139	12.89%	-3.92%
GH_ER2		4	0.5988	0.0000	1.0000	0.2000	1.0000	0.2119	0.4239	70.79%	29.55%
CM_MC1	XC	4	0.9167	0.8151	1.0000	0.8667	1.0000	0.0319	0.0638	6.96%	-7.84%
FR_FRCP1		4	0.0833	0.0000	0.1849	0.0000	0.1333	0.0319	0.0638	76.59%	90.20%
GH_FR1		4	0.6833	0.2139	1.0000	0.4000	1.0000	0.1475	0.2950	43.17%	19.61%
CM_MC2		4	0.3500	0.0000	0.8724	0.0667	0.6667	0.1641	0.3283	93.80%	58.82%
FR_FRCP120µg/L		4	0.0167	0.0000	0.0697	0.0000	0.0667	0.0167	0.0333	200.00%	98.04%
CM_MC2 20 µg/L		4	0.4167	0.1814	0.6519	0.2667	0.6000	0.0739	0.1478	35.48%	50.98%
GH_FR1 20 µg/L		4	0.8619	0.7347	0.9891	0.7857	0.9333	0.0400	0.0800	9.28%	-1.40%

① lab control = lab control no Cu
 Cu Ctrl 10µg/L = 10µg/L Cu control
 Cu Ctrl 20µg/L = 20µg/L Cu control

FR_UFR1 } reference site controls
 GH_ER2 }
 CM_MC1 }

CETIS Summary Report

Report Date: 19 Dec-18 12:36 (p 25 of 26)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	11.46	11.07	12.8	12.21
Cu Ctrl 10µg/L	LC	12.58	11.79	12.62	12.23
Cu Ctrl 20µg/L	U	11.57	12.14	12.29	12.43
FR_UFR1		12.69	11.33	11.79	12.09
GH_ER2		10.31	9.87	12.75	13.67
CM_MC1	XC	11.69	11.07	11.92	11
FR_FRCP1		17		19	16.5
GH_FR1		11.07	12.71	12.29	12.43
CM_MC2		11.6	11.5	14	13
FR_FRCP120µg/L		17			
CM_MC2 20 µg/L		12.56	14.2	15	13.57
GH_FR1 20 µg/L		12.46	12.69	12.14	12.67

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	3.46	3.183	3.183	3.477
Cu Ctrl 10µg/L	LC	3.587	4.127	2.831	3.963
Cu Ctrl 20µg/L	U	4.103	3.929	4.265	3.711
FR_UFR1		3.293	2.794	3.192	3.389
GH_ER2		2.597	2.281	1.487	1.501
CM_MC1	XC	3.817	3.064	3.153	3.425
FR_FRCP1		1.395	0	0.9387	1.356
GH_FR1		3.131	2.104	2.753	2.183
CM_MC2		2.669	2.546	0.7113	0.5887
FR_FRCP120µg/L		0.9027	0	0	0
CM_MC2 20 µg/L		3.197	2.295	2.07	2.279
GH_FR1 20 µg/L		3.344	3.501	3.649	3.789

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	0.8667	0.9333	0.6667	0.9333
Cu Ctrl 10µg/L	LC	0.8000	0.9333	0.8667	0.8667
Cu Ctrl 20µg/L	U	0.9333	0.9333	0.9333	0.9333
FR_UFR1		0.8667	1.0000	0.9333	0.7333
GH_ER2		0.9286	1.0000	0.2667	0.2000
CM_MC1	XC	0.8667	0.9333	0.8667	1.0000
FR_FRCP1		0.1333	0.0000	0.0667	0.1333
GH_FR1		1.0000	0.4667	0.8667	0.4000
CM_MC2		0.6667	0.6000	0.0667	0.0667
FR_FRCP120µg/L		0.0667	0.0000	0.0000	0.0000
CM_MC2 20 µg/L		0.6000	0.3333	0.2667	0.4667
GH_FR1 20 µg/L		0.7857	0.9286	0.9333	0.8000

CETIS Summary Report

Report Date: 19 Dec-18 12:36 (p 26 of 26)
Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	13/15	14/15	10/15	14/15
Cu Ctrl 10µg/L	LC	12/15	14/15	13/15	13/15
Cu Ctrl 20µg/L	U	14/15	14/15	14/15	14/15
FR_UFR1		13/15	15/15	14/15	11/15
GH_ER2		13/14	15/15	4/15	3/15
CM_MC1	XC	13/15	14/15	13/15	15/15
FR_FRCP1		2/15	0/15	1/15	2/15
GH_FR1		15/15	7/15	13/15	6/15
CM_MC2		10/15	9/15	1/15	1/15
FR_FRCP120µg/L		1/15	0/15	0/15	0/15
CM_MC2 20 µg/L		9/15	5/15	4/15	7/15
GH_FR1 20 µg/L		11/14	13/14	14/15	12/15

CETIS Summary Report

Report Date: 05 Dec-18 17:59 (p 1 of 9)

Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP120µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20 µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20 µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20 µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20 µg/L passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed hatched rate	1
05-2332-2153	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP120µg/L passed hatched rate	1

CETIS Summary Report

Report Date: 05 Dec-18 17:59 (p 8 of 9)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	FR_FRCP1 passed hatched rate	1
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	Cu Ctrl 10µg/L passed hatched rate	1
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	GH_FR1 20 µg/L passed hatched rate	1
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	GH_FR1 passed hatched rate	1
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	FR_FRCP120µg/L passed hatched rate	1
03-1504-5742	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	0.3655	CM_MC2 20 µg/L passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20 µg/L passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20 µg/L passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP120µg/L passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed hatched rate	1
14-6502-5547	Hatched Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	0.00%
Cu Ctrl 10µg/L		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	0.00%
Cu Ctrl 20µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
FR_UFR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
GH_ER2		4	0.9667	0.8606	1.0000	0.8667	1.0000	0.0333	0.0667	6.90%	1.69%
CM_MC1		4	0.9667	0.8606	1.0000	0.8667	1.0000	0.0333	0.0667	6.90%	1.69%
FR_FRCP1	N	4	0.9500	0.8484	1.0000	0.8667	1.0000	0.0319	0.0638	6.72%	3.39%
GH_FR1	U	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
CM_MC2	XC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
FR_FRCP120µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
CM_MC2 20 µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.69%
GH_FR1 20 µg/L		4	0.9500	0.8970	1.0000	0.9333	1.0000	0.0167	0.0333	3.51%	3.39%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control		1.0000	0.9333	1.0000	1.0000
Cu Ctrl 10µg/L		0.9333	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	0.8667	1.0000
CM_MC1		0.8667	1.0000	1.0000	1.0000
FR_FRCP1	N	0.9333	1.0000	0.8667	1.0000
GH_FR1	U	1.0000	1.0000	1.0000	1.0000
CM_MC2	XC	1.0000	1.0000	1.0000	1.0000
FR_FRCP120µg/L		1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20 µg/L		0.9333	0.9333	1.0000	0.9333

CETIS Summary Report

Report Date: 05 Dec-18 17:59 (p 9 of 9)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control		15/15	14/15	15/15	15/15
Cu Ctrl 10µg/L		14/15	15/15	15/15	15/15
Cu Ctrl 20µg/L		15/15	15/15	15/15	15/15
FR_UFR1		15/15	15/15	15/15	15/15
GH_ER2		15/15	15/15	13/15	15/15
CM_MC1		13/15	15/15	15/15	15/15
FR_FRCP1	N	14/15	15/15	13/15	15/15
GH_FR1	U	15/15	15/15	15/15	15/15
CM_MC2	XC	15/15	15/15	15/15	15/15
FR_FRCP120µg/L		15/15	15/15	15/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20 µg/L		14/15	14/15	15/15	14/15

CETIS Analytical Report

Report Date: 19 Dec-18 12:03 (p 3 of 8)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 07-9578-2696	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:02	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-4995-5437	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h		
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed length-mm	7.02%
		Cu Ctrl 20µg/L passed length-mm	7.02%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control (no Cu)		Lab Control (10µg/L)	-0.9735	1.943	0.838	6	CDF	0.8161	Non-Significant Effect
		Upstream Control (20µg/L)	-0.5179	1.943	0.835	6	CDF	0.6885	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.353216	0.176608	2	0.5974	0.5707	Non-Significant Effect
Error	2.66068	0.295631	9			
Total	3.01389		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.875	9.21	0.3917	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.944	0.8025	0.5510	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (no Cu)	N	4	11.88	10.66	13.11	11.84	11.07	12.8	0.386	6.50%	0.00%
Cu Ctrl 10µg/L	LC	4	12.3	11.69	12.92	12.4	11.79	12.62	0.1927	3.13%	-3.53%
Cu Ctrl 20µg/L	U	4	12.11	11.51	12.71	12.22	11.57	12.43	0.1887	3.12%	-1.87%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control (no Cu)	N	11.46	11.07	12.8	12.21
Cu Ctrl 10µg/L	LC	12.58	11.79	12.62	12.23
Cu Ctrl 20µg/L	U	11.57	12.14	12.29	12.43

Dec-19/18

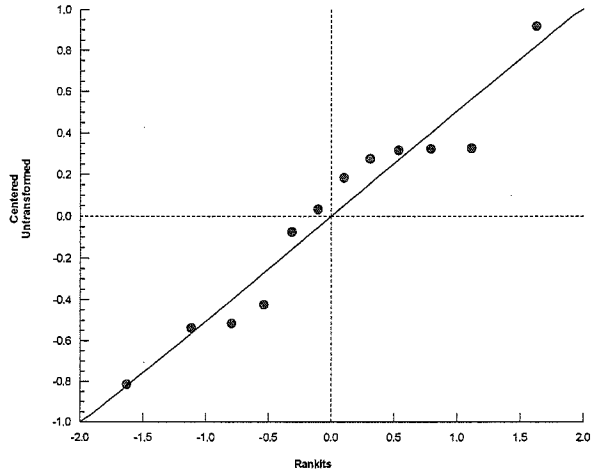
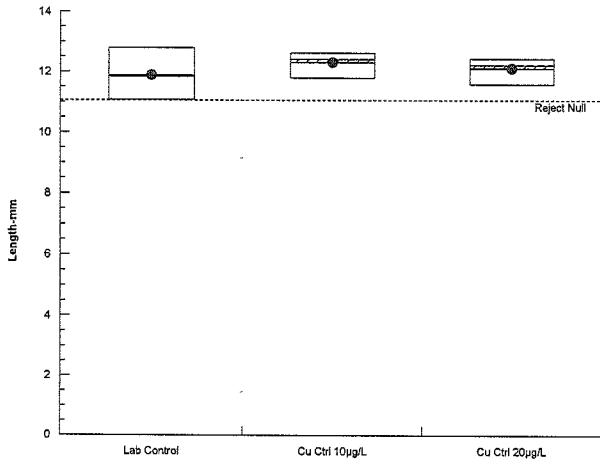
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-9578-2696 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:02 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 20 Dec-18 16:37 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2216-1255	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 20 Dec-18 16:37	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	12-6752-4514	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h		
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed mean dry biomass-mg	8.45%
		Cu Ctrl 20µg/L passed mean dry biomass-mg	8.45%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control (no Cu)		Lab Control (10µg/L)	-1.004	1.943	0.583	6	CDF	0.8229	Non-Significant Effect
		Upstream Control (20µg/L)	-4.675	1.943	0.281	6	CDF	0.9983	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.917597	0.458798	2	3.309	0.0837	Non-Significant Effect
Error	1.24792	0.138658	9			
Total	2.16552		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.325	9.21	0.1150	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9395	0.8025	0.4911	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (no Cu)	N	4	3.326	3.064	3.588	3.322	3.183	3.477	0.08234	4.95%	0.00%
Cu Ctrl 10µg/L	LC	4	3.627	2.709	4.544	3.775	2.831	4.127	0.2882	15.90%	-9.05%
Cu Ctrl 20µg/L	U	4	4.002	3.624	4.38	4.016	3.711	4.265	0.1189	5.94%	-20.33%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	3.46	3.183	3.183	3.477
Cu Ctrl 10µg/L	LC	3.587	4.127	2.831	3.963
Cu Ctrl 20µg/L	U	4.103	3.929	4.265	3.711

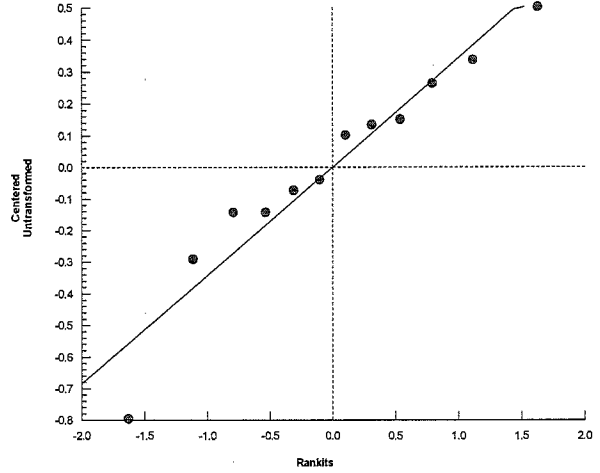
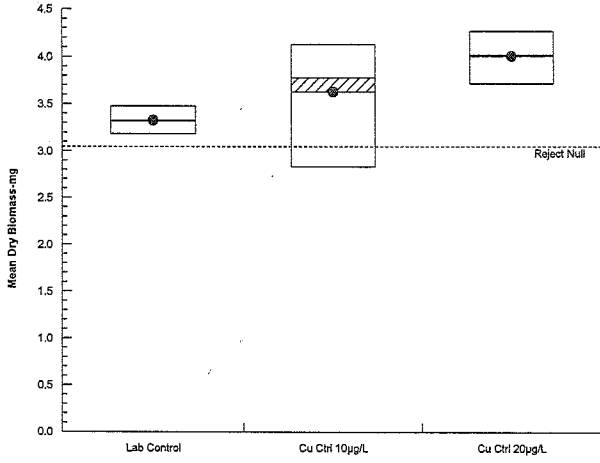
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2216-1255 Endpoint: Mean Dry Biomass-mg
Analyzed: 20 Dec-18 16:37 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:03 (p 7 of 8)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 19-9354-4146	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:02	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-4995-5437	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h		
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Cu Ctrl 10µg/L passed survival rate	13.47%
		Cu Ctrl 20µg/L passed survival rate	13.47%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control (no Cu)		Lab Control (10 µg/L)	-0.1051	1.943	0.181	6	CDF	0.5401	Non-Significant Effect
		Upstream Control (20 µg/L)	-1.398	1.943	0.162	6	CDF	0.8941	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.033547	0.0167735	2	1.447	0.2852	Non-Significant Effect
Error	0.10435	0.0115944	9			
Total	0.137897		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	3.494	8.022	0.0753	Equal Variances
Variances	Mod Levene Equality of Variance Test	2.271	8.022	0.1590	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8202	0.8025	0.0160	Normal Distribution

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (No Cu)	N	4	0.8500	0.6492	1.0000	0.9000	0.6667	0.9333	0.0631	14.85%	0.00%
Cu Ctrl 10µg/L	LC	4	0.8667	0.7801	0.9533	0.8667	0.8000	0.9333	0.0272	6.28%	-1.96%
Cu Ctrl 20µg/L	U	4	0.9333	0.9331	0.9336	0.9333	0.9333	0.9333	0.0000	0.00%	-9.80%

Angular (Corrected) Transformed Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (No Cu)	N	4	1.193	0.9271	1.459	1.253	0.9553	1.31	0.08353	14.00%	0.00%
Cu Ctrl 10µg/L	LC	4	1.203	1.071	1.335	1.197	1.107	1.31	0.04146	6.90%	-0.82%
Cu Ctrl 20µg/L	U	4	1.31	1.31	1.31	1.31	1.31	1.31	0	0.00%	-9.79%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control (No Cu)	N	0.8667	0.9333	0.6667	0.9333
Cu Ctrl 10µg/L	LC	0.8000	0.9333	0.8667	0.8667
Cu Ctrl 20µg/L	U	0.9333	0.9333	0.9333	0.9333

CETIS Analytical Report

Report Date: 19 Dec-18 12:03 (p 8 of 8)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-9354-4146 Endpoint: Survival Rate
 Analyzed: 19 Dec-18 12:02 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

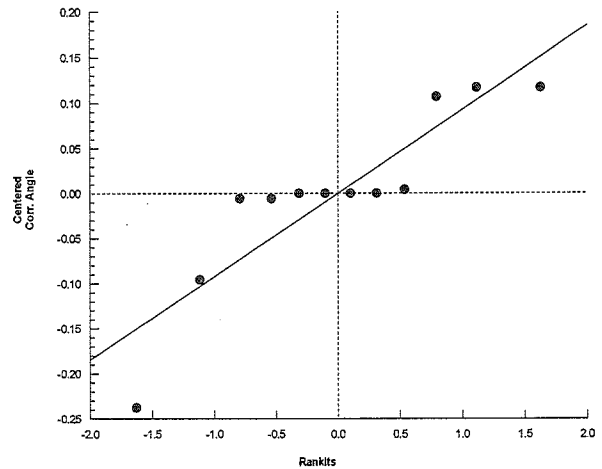
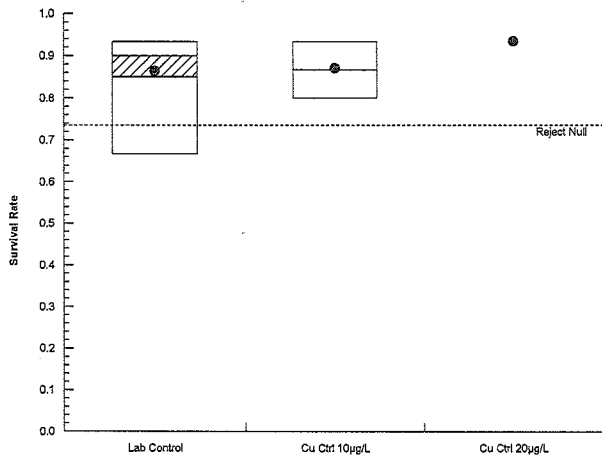
Angular (Corrected) Transformed Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	1.197	1.31	0.9553	1.31
Cu Ctrl 10µg/L	LC	1.107	1.31	1.197	1.197
Cu Ctrl 20µg/L	U	1.31	1.31	1.31	1.31

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	N	13/15	14/15	10/15	14/15
Cu Ctrl 10µg/L	LC	12/15	14/15	13/15	13/15
Cu Ctrl 20µg/L	U	14/15	14/15	14/15	14/15

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:03 (p 1 of 8)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-1649-9604	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:03	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-4995-5437	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h		
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Cu Ctrl 10µg/L passed hatched rate	4.04%
		Cu Ctrl 20µg/L passed hatched rate	4.04%

Unequal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control (No Cu)		Lab Control (0 µg/L)	0	1.943	0.090	6	CDF	0.5000	Non-Significant Effect
		Upstream Control (20 µg/L)	-1	2.353	0.077	3	CDF	0.8045	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0028907	0.0014453	2	0.5	0.6224	Non-Significant Effect
Error	0.026016	0.0028907	9			
Total	0.0289067		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	4.5	8.022	0.0442	Equal Variances
Variances	Mod Levene Equality of Variance Test	0.5	8.022	0.6224	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.6788	0.8025	5.3E-04	Non-Normal Distribution

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (No Cu)	N	4	0.9833	0.9303	1.0000	1.0000	0.9333	1.0000	0.0167	3.39%	0.00%
Cu Ctrl 10µg/L	LC	4	0.9833	0.9303	1.0000	1.0000	0.9333	1.0000	0.0167	3.39%	0.00%
Cu Ctrl 20µg/L	U	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-1.69%

Angular (Corrected) Transformed Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control (No Cu)	N	4	1.408	1.304	1.513	1.441	1.31	1.441	0.03292	4.68%	0.00%
Cu Ctrl 10µg/L	LC	4	1.408	1.304	1.513	1.441	1.31	1.441	0.03292	4.68%	0.00%
Cu Ctrl 20µg/L	U	4	1.441	1.441	1.442	1.441	1.441	1.441	0	0.00%	-2.34%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control (No Cu)	N	1.0000	0.9333	1.0000	1.0000
Cu Ctrl 10µg/L	LC	0.9333	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L	U	1.0000	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 19 Dec-18 12:03 (p 2 of 8)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-1649-9604 Endpoint: Hatched Rate
 Analyzed: 19 Dec-18 12:03 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

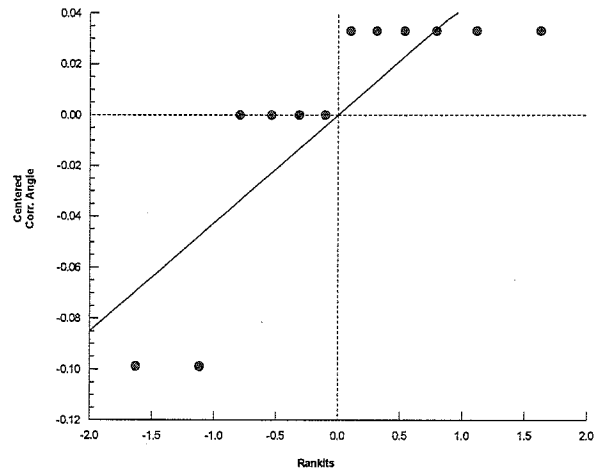
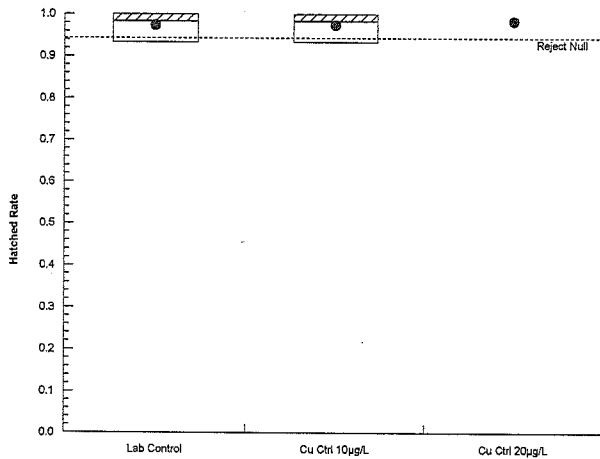
Angular (Corrected) Transformed Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control (NoCu)	N	1.441	1.31	1.441	1.441
Cu Ctrl 10µg/L	LC	1.31	1.441	1.441	1.441
Cu Ctrl 20µg/L	U	1.441	1.441	1.441	1.441

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control (NoCu)	N	15/15	14/15	15/15	15/15
Cu Ctrl 10µg/L	LC	14/15	15/15	15/15	15/15
Cu Ctrl 20µg/L	U	15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:17 (p 1 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-9145-1052 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 19 Dec-18 12:14 Analysis: Parametric-Two Sample Status Level: 1

Batch ID: 18-9588-2348 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 10 Aug-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent:
 Ending Date: 10 Sep-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 31d 0h Taxon: Actinopterygii Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	9.94%
		GH_ER2 passed length-mm	9.94%
		CM_MC1 failed length-mm	9.94%
		FR_FRCP1 passed length-mm	9.94%
		GH_FR1 passed length-mm	9.94%
		CM_MC2 passed length-mm	9.94%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Control (Cu Ctrl 10µg/L)		FR_UFR1	0.9592	1.943	0.669	6	CDF	0.1873	Non-Significant Effect
		GH_ER2	0.6936	1.943	1.835	6	CDF	0.2569	Non-Significant Effect
		CM_MC1*	2.967	1.943	0.58	6	CDF	0.0125	Significant Effect
		FR_FRCP1	-7.657	2.015	1.367	5	CDF	0.9997	Non-Significant Effect
		GH_FR1	0.4386	1.943	0.798	6	CDF	0.3382	Non-Significant Effect
		CM_MC2	-0.3496	1.943	1.223	6	CDF	0.6307	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	84.0419	14.007	6	12.92	5.7E-06	Significant Effect
Error	21.6796	1.08398	20			
Total	105.721		26			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	10.09	16.81	0.1208	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9833	0.8944	0.9288	Normal Distribution

CETIS Analytical Report

Report Date: 19 Dec-18 12:17 (p 2 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-9145-1052 Endpoint: Length-mm
 Analyzed: 19 Dec-18 12:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

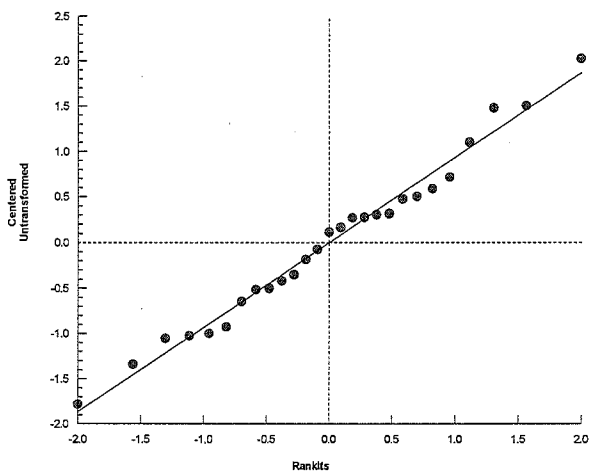
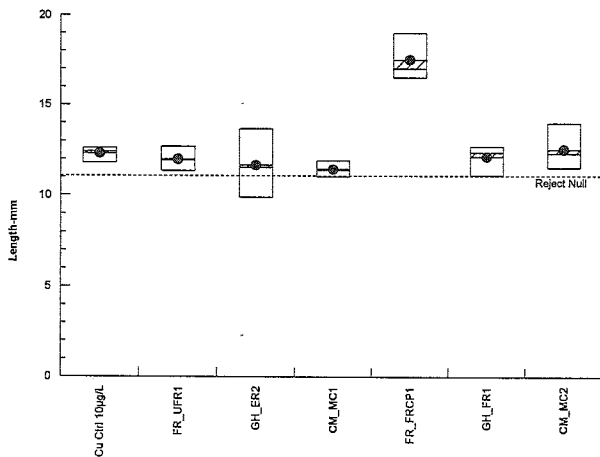
Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	LC	4	12.3	11.69	12.92	12.4	11.79	12.62	0.1927	3.13%	0.00%
FR_UFR1		4	11.97	11.07	12.88	11.94	11.33	12.69	0.285	4.76%	2.68%
GH_ER2		4	11.65	8.708	14.59	11.53	9.87	13.67	0.9244	15.87%	5.32%
CM_MC1		4	11.42	10.7	12.14	11.38	11	11.92	0.2276	3.99%	7.19%
FR_FRCP1		3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	-42.22%
GH_FR1		4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	1.46%
CM_MC2		4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	-1.79%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	LC	12.58	11.79	12.62	12.23
FR_UFR1		12.69	11.33	11.79	12.09
GH_ER2		10.31	9.87	12.75	13.67
CM_MC1		11.69	11.07	11.92	11
FR_FRCP1		17	19	16.5	
GH_FR1		11.07	12.71	12.29	12.43
CM_MC2		11.6	11.5	14	13

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:17 (p 3 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-1237-4969	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:14	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pinephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry biomass-mg	34.04%
		GH_ER2 failed mean dry biomass-mg	34.04%
		CM_MC1 passed mean dry biomass-mg	34.04%
		FR_FRCP1 failed mean dry biomass-mg	34.04%
		GH_FR1 failed mean dry biomass-mg	34.04%
		CM_MC2 failed mean dry biomass-mg	34.04%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Control		FR_UFR1	1.453	1.943	0.615	6	CDF	0.0982	Non-Significant Effect
(Cu Ctrl 10µg/L)		GH_ER2*	4.129	1.943	0.781	6	CDF	0.0031	Significant Effect
		CM_MC1	0.785	1.943	0.649	6	CDF	0.2312	Non-Significant Effect
		FR_FRCP1*	6.233	1.943	0.843	6	CDF	3.9E-04	Significant Effect
		GH_FR1*	2.872	1.943	0.733	6	CDF	0.0142	Significant Effect
		CM_MC2*	3.145	1.943	1.234	6	CDF	0.0100	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	23.9412	3.99019	6	10.08	2.8E-05	Significant Effect
Error	8.30908	0.39567	21			
Total	32.2502		27			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.122	16.81	0.3097	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9729	0.8975	0.6600	Normal Distribution

CETIS Analytical Report

Report Date: 19 Dec-18 12:17 (p 4 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-1237-4969 Endpoint: Mean Dry Biomass-mg
 Analyzed: 19 Dec-18 12:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

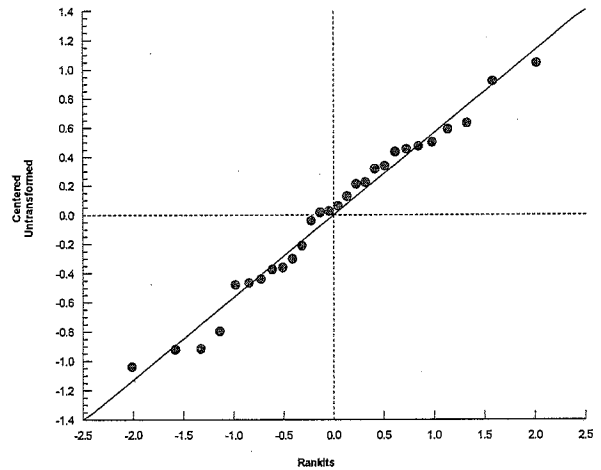
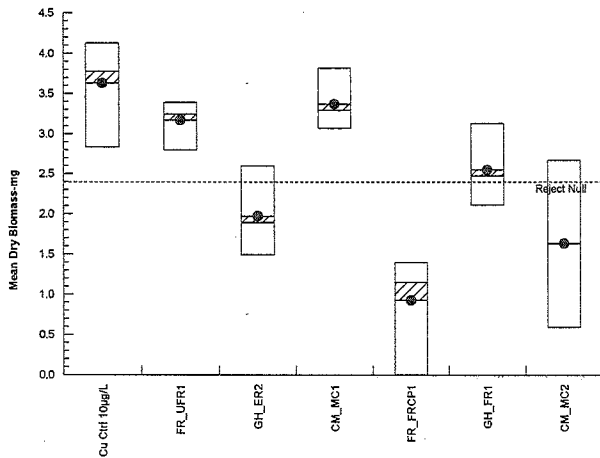
Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	LC	4	3.627	2.709	4.544	3.775	2.831	4.127	0.2882	15.90%	0.00%
FR_UFR1		4	3.167	2.751	3.583	3.243	2.794	3.389	0.1307	8.25%	12.68%
GH_ER2		4	1.967	1.074	2.859	1.891	1.487	2.597	0.2804	28.52%	45.78%
CM_MC1		4	3.364	2.826	3.903	3.289	3.064	3.817	0.1691	10.05%	7.23%
FR_FRCP1		4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	74.57%
GH_FR1		4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	29.89%
CM_MC2		4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	55.09%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	LC	3.587	4.127	2.831	3.963
FR_UFR1		3.293	2.794	3.192	3.389
GH_ER2		2.597	2.281	1.487	1.501
CM_MC1		3.817	3.064	3.153	3.425
FR_FRCP1		1.395	0	0.9387	1.356
GH_FR1		3.131	2.104	2.753	2.183
CM_MC2		2.669	2.546	0.7113	0.5887

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 14:12 (p 3 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-8427-7525	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 14:12	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
(Cu Ctrl 10µg/L)		FR_UFR1	0.7089	Exact	1.0000	Non-Significant Effect
		GH_ER2*	0.0007	Exact	0.0028	Significant Effect
		CM_MC1	0.8803	Exact	0.8803	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	1.0E-18	Significant Effect
		GH_FR1*	0.0138	Exact	0.0415	Significant Effect
		CM_MC2*	0.0000	Exact	1.9E-08	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	52	8	60	0.8667	0.1333	-46.1%
FR_UFR1		53	7	60	0.8833	0.1167	-48.9%
GH_ER2		35	24	59	0.5932	0.4068	0.0%
CM_MC1		55	5	60	0.9167	0.08333	-54.52%
FR_FRCP1		5	55	60	0.08333	0.9167	85.95%
GH_FR1		41	19	60	0.6833	0.3167	-15.19%
CM_MC2		21	39	60	0.35	0.65	41.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	0.8000	0.9333	0.8667	0.8667
FR_UFR1		0.8667	1.0000	0.9333	0.7333
GH_ER2		0.9286	1.0000	0.2667	0.2000
CM_MC1		0.8667	0.9333	0.8667	1.0000
FR_FRCP1		0.1333	0.0000	0.0667	0.1333
GH_FR1		1.0000	0.4667	0.8667	0.4000
CM_MC2		0.6667	0.6000	0.0667	0.0667

CETIS Analytical Report

Report Date: 05 Dec-18 14:12 (p 4 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

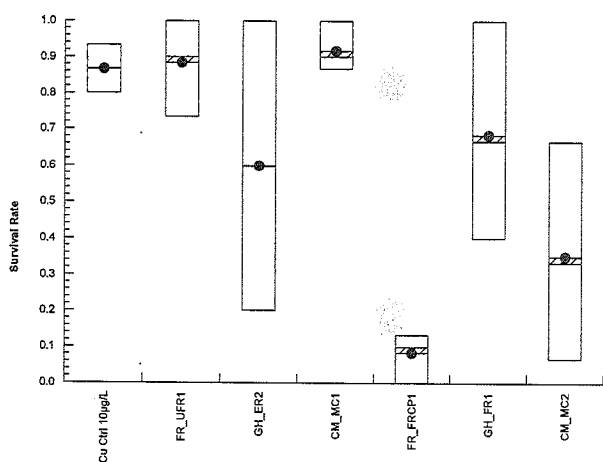
Analysis ID: 06-8427-7525 Endpoint: Survival Rate
 Analyzed: 05 Dec-18 14:12 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	12/15	14/15	13/15	13/15
FR_UFR1		13/15	15/15	14/15	11/15
GH_ER2		13/14	15/15	4/15	3/15
CM_MC1		13/15	14/15	13/15	15/15
FR_FRCP1		2/15	0/15	1/15	2/15
GH_FR1		15/15	7/15	13/15	6/15
CM_MC2		10/15	9/15	1/15	1/15

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 14:14 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-2332-2153	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 14:13	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	01-4004-2493	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h		
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h		
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h		
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
(Cu Ctrl 10µg/L)		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.3093	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	59	1	60	0.9833	0.01667	-1.72%
FR_UFR1		60	0	60	1	0	-3.45%
GH_ER2		58	2	60	0.9667	0.03333	0.0%
CM_MC1		58	2	60	0.9667	0.03333	0.0%
FR_FRCP1		57	3	60	0.95	0.05	1.72%
GH_FR1		60	0	60	1	0	-3.45%
CM_MC2		60	0	60	1	0	-3.45%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	0.9333	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	0.8667	1.0000
CM_MC1		0.8667	1.0000	1.0000	1.0000
FR_FRCP1		0.9333	1.0000	0.8667	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 05 Dec-18 14:14 (p 2 of 2)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

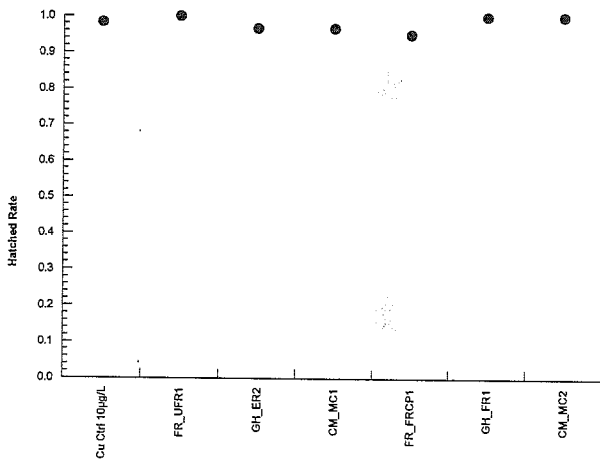
Analysis ID: 05-2332-2153 Endpoint: Hatched Rate
Analyzed: 05 Dec-18 14:13 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	14/15	15/15	15/15	15/15
FR_UFR1		15/15	15/15	15/15	15/15
GH_ER2		15/15	15/15	13/15	15/15
CM_MC1		13/15	15/15	15/15	15/15
FR_FRCP1		14/15	15/15	13/15	15/15
GH_FR1		15/15	15/15	15/15	15/15
CM_MC2		15/15	15/15	15/15	15/15

Graphics



Dec-19/18

CETIS Analytical Report

Report Date: 19 Dec-18 12:20 (p 1 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test			Nautilus Environmental		
Analysis ID: 05-9656-7380	Endpoint: Length-mm	CETIS Version: CETISv1.9.4			
Analyzed: 19 Dec-18 12:19	Analysis: Parametric-Two Sample	Status Level: 1			
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus			
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:			
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:			
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox	Age:		

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed length-mm	10.77%
		GH_FR1 passed length-mm	10.77%
		CM_MC2 passed length-mm	10.77%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Site Control (FR_UFR1)		FR_FRCP1	-7.647	2.015	1.456	5	CDF	0.9997	Non-Significant Effect
		GH_FR1	-0.3254	1.943	0.896	6	CDF	0.6220	Non-Significant Effect
		CM_MC2	-0.829	1.943	1.289	6	CDF	0.7806	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	67.8508	22.6169	3	24.02	3.9E-05	Significant Effect
Error	10.3577	0.941609	11			
Total	78.2085		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.108	11.34	0.5502	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9228	0.8328	0.2127	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1	XC	4	11.97	11.07	12.88	11.94	11.33	12.69	0.285	4.76%	0.00%
FR_FRCP1		3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	-46.14%
GH_FR1		4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	-1.25%
CM_MC2		4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	-4.59%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	XC	12.69	11.33	11.79	12.09
FR_FRCP1		17	19	16.5	
GH_FR1		11.07	12.71	12.29	12.43
CM_MC2		11.6	11.5	14	13

① FR_UFR1 = negative control (reference site)

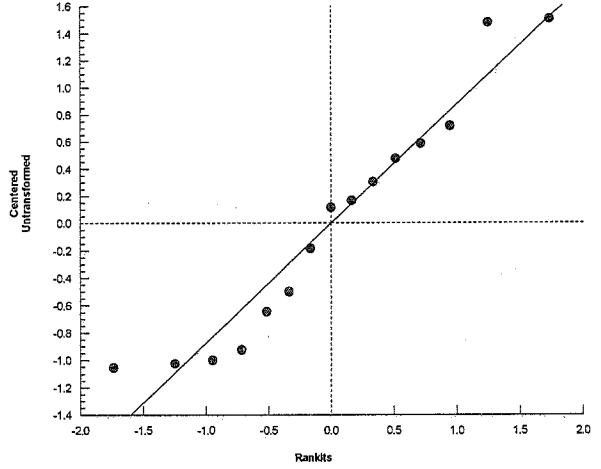
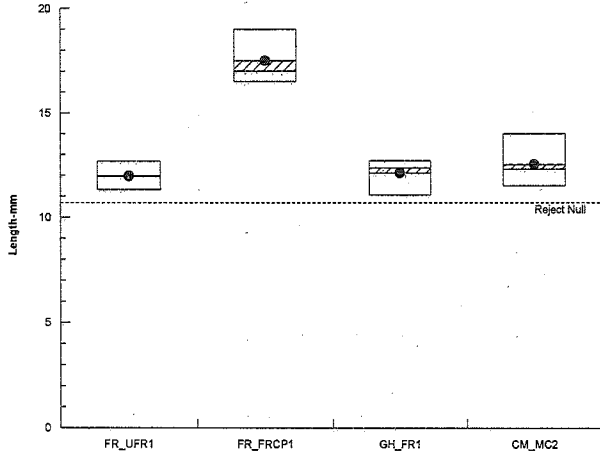
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-9656-7380 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:20 (p 3 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 00-8500-1315	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	35.65%
		GH_FR1 failed mean dry biomass-mg	35.65%
		CM_MC2 failed mean dry biomass-mg	35.65%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Site Control FR_UFR1		FR_FRCP1*	6.42	1.943	0.679	6	CDF	3.4E-04	Significant Effect
		GH_FR1*	2.258	1.943	0.537	6	CDF	0.0324	Significant Effect
		CM_MC2*	2.648	1.943	1.129	6	CDF	0.0191	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	11.7552	3.91841	3	7.804	0.0037	Significant Effect
Error	6.02536	0.502113	12			
Total	17.7806		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.225	11.34	0.1560	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9574	0.8408	0.6153	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1	XC	4	3.167	2.751	3.583	3.243	2.794	3.389	0.1307	8.25%	0.00%
FR_FRCP1		4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	70.88%
GH_FR1		4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	19.71%
CM_MC2		4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	48.57%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_UFR1	XC	3.293	2.794	3.192	3.389
FR_FRCP1		1.395	0	0.9387	1.356
GH_FR1		3.131	2.104	2.753	2.183
CM_MC2		2.669	2.546	0.7113	0.5887

① FR_UFR1 = negative control (reference site)

EMM
 Dec 20/18

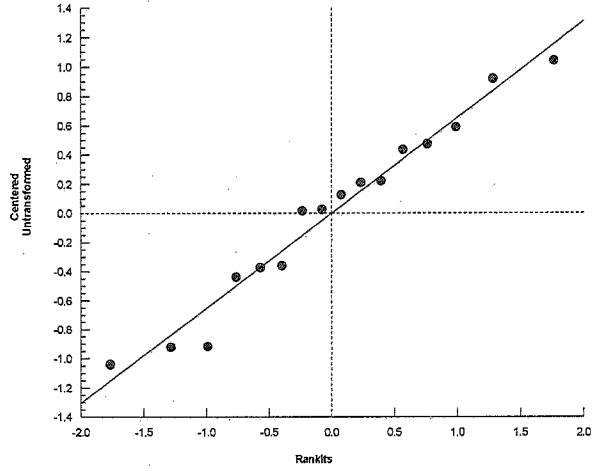
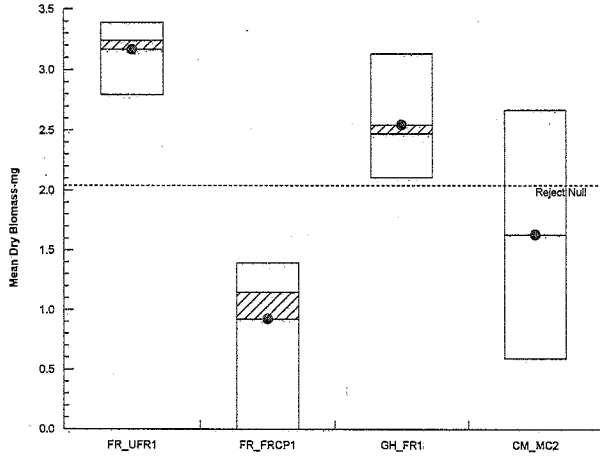
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-8500-1315 Endpoint: Mean Dry Biomass-mg
Analyzed: 19 Dec-18 12:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



[Handwritten signature]
Dec-20/18

CETIS Analytical Report

Report Date: 05 Dec-18 15:36 (p 2 of 3)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-8078-8459	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 15:35	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1*	0.0000	Exact	7.1E-20	Significant Effect
FR_UFR1		GH_FR1*	0.0069	Exact	0.0069	Significant Effect
		CM_MC2*	0.0000	Exact	1.8E-09	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	N	53	7	60	0.8833	0.1167	0.0%
FR_FRCP1		5	55	60	0.08333	0.9167	90.57%
GH_FR1		41	19	60	0.6833	0.3167	22.64%
CM_MC2		21	39	60	0.35	0.65	60.38%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	0.8667	1.0000	0.9333	0.7333
FR_FRCP1		0.1333	0.0000	0.0667	0.1333
GH_FR1		1.0000	0.4667	0.8667	0.4000
CM_MC2		0.6667	0.6000	0.0667	0.0667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	13/15	15/15	14/15	11/15
FR_FRCP1		2/15	0/15	1/15	2/15
GH_FR1		15/15	7/15	13/15	6/15
CM_MC2		10/15	9/15	1/15	1/15

① FR_UFR1 = negative control (reference site control)

Fathead Minnow 32-d Survival and Growth Test

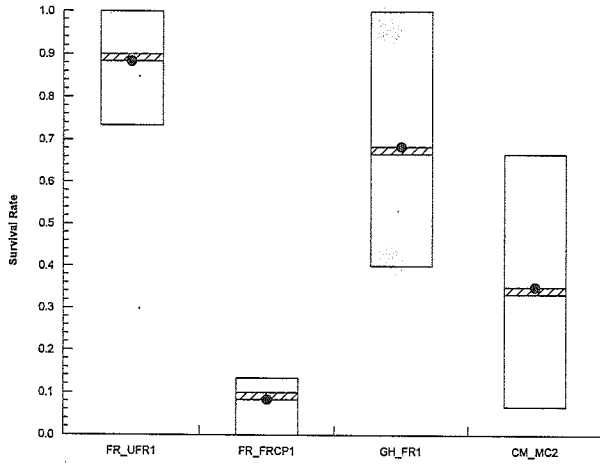
Nautilus Environmental

Analysis ID: 10-8078-8459
Analyzed: 05 Dec-18 15:35

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 15:44 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-4533-8393	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 15:44	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	01-0933-3853	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2018-08-0	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	0.1218	Exact	0.3655	Non-Significant Effect
FR_UFR1		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	N	60	0	60	1	0	0.0%
FR_FRCP1		57	3	60	0.95	0.05	5.0%
GH_FR1		60	0	60	1	0	0.0%
CM_MC2		60	0	60	1	0	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.9333	1.0000	0.8667	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	N	15/15	15/15	15/15	15/15
FR_FRCP1		14/15	15/15	13/15	15/15
GH_FR1		15/15	15/15	15/15	15/15
CM_MC2		15/15	15/15	15/15	15/15

① FR_UFR1 = negative control (reference site control)

CETIS Analytical Report

Report Date: 05 Dec-18 15:44 (p 2 of 2)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

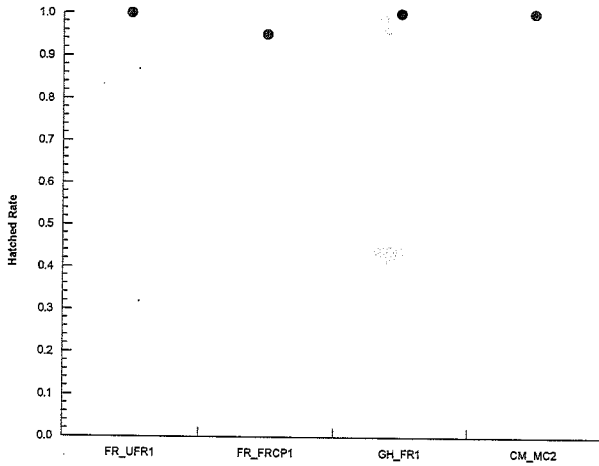
Nautilus Environmental

Analysis ID: 12-4533-8393
Analyzed: 05 Dec-18 15:44

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:23 (p 1 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-9751-7581	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:23	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed length-mm	18.37%
		GH_FR1 passed length-mm	18.37%
		CM_MC2 passed length-mm	18.37%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control GH _{ER2}		FR_FRCP1	-4.618	2.015	2.553	5	CDF	0.9971	Non-Significant Effect
		GH_FR1	-0.4784	1.943	1.929	6	CDF	0.6754	Non-Significant Effect
		CM_MC2	-0.7943	1.943	2.141	6	CDF	0.7714	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	71.519	23.8397	3	13.35	5.5E-04	Significant Effect
Error	19.6374	1.78522	11			
Total	91.1564		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.088	11.34	0.5543	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9411	0.8328	0.3967	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	XC	4	11.65	8.708	14.59	11.53	9.87	13.67	0.9244	15.87%	0.00%
FR_FRCP1		3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	-50.21%
GH_FR1		4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	-4.08%
CM_MC2		4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	-7.51%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	10.31	9.87	12.75	13.67
FR_FRCP1		17	19	16.5	
GH_FR1		11.07	12.71	12.29	12.43
CM_MC2		11.6	11.5	14	13

① GH_{ER2} = negative control (reference site)

CETIS Analytical Report

Report Date: 19 Dec-18 12:23 (p 2 of 4)
Test Code/ID: 181279-78 / 19-5297-1136

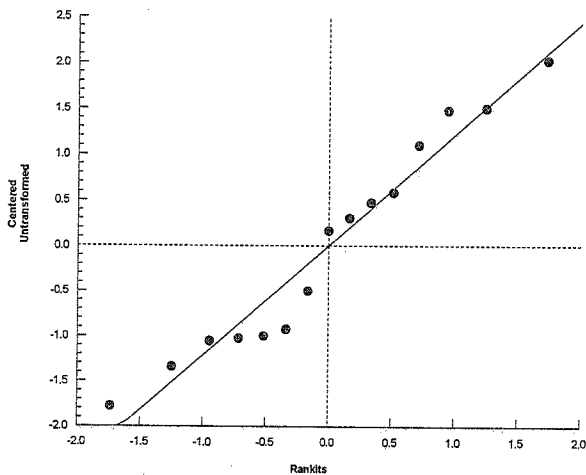
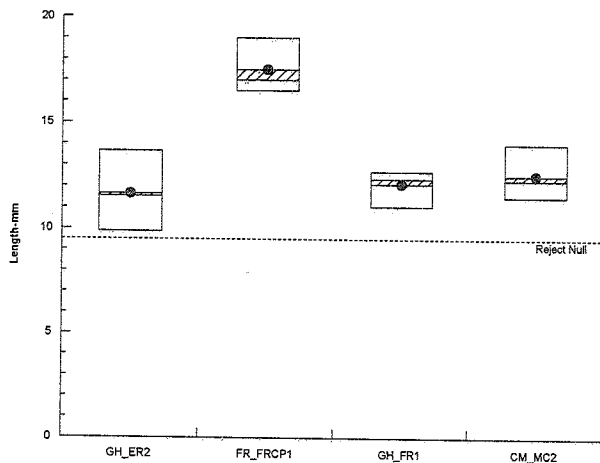
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-9751-7581 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:23 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



Handwritten signature
Dec 19/18

CETIS Analytical Report

Report Date: 19 Dec-18 12:23 (p 3 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-1438-7543	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:23	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	62.42%
		GH_FR1 passed mean dry biomass-mg	62.42%
		CM_MC2 passed mean dry biomass-mg	62.42%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	2.436	1.943	0.833	6	CDF	0.0254	Significant Effect
GH_ER2		GH_FR1	-1.551	1.943	0.722	6	CDF	0.9141	Non-Significant Effect
		CM_MC2	0.5349	1.943	1.228	6	CDF	0.3060	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	5.4974	1.83247	3	3.251	0.0599	Non-Significant Effect
Error	6.76394	0.563661	12			
Total	12.2613		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.421	11.34	0.4898	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.94	0.8408	0.3491	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	XC	4	1.967	1.074	2.859	1.891	1.487	2.597	0.2804	28.52%	0.00%
FR_FRCP1		4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	53.10%
GH_FR1		4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	-29.30%
CM_MC2		4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	17.18%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	2.597	2.281	1.487	1.501
FR_FRCP1		1.395	0	0.9387	1.356
GH_FR1		3.131	2.104	2.753	2.183
CM_MC2		2.669	2.546	0.7113	0.5887

① GH_ER2 = negative control (reference site)

Dec 21/18

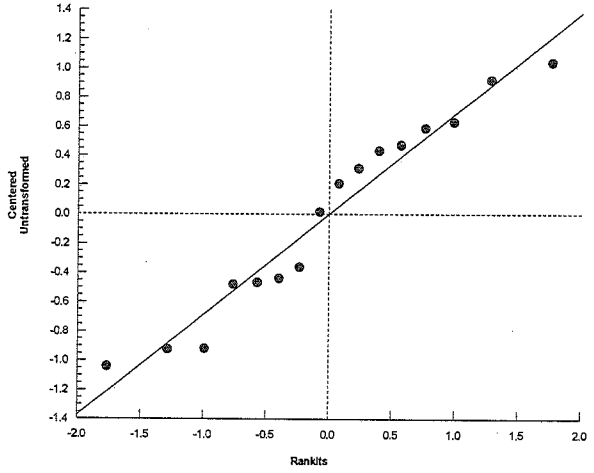
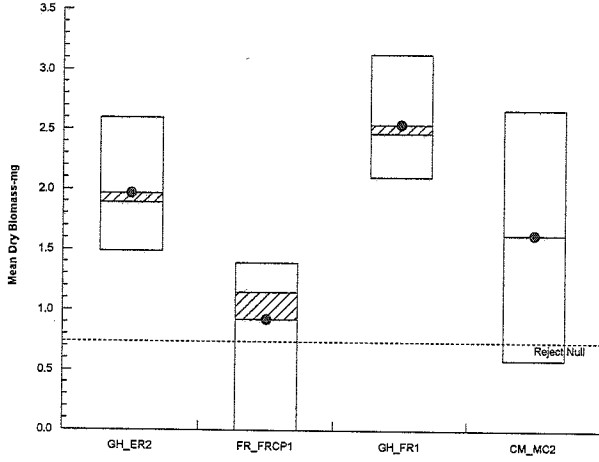
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-1438-7543 Endpoint: Mean Dry Biomass-mg
Analyzed: 19 Dec-18 12:23 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 15:49 (p 2 of 3)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5331-6486	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 15:48	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1*	0.0000	Exact	4.9E-09	Significant Effect
GH_ER2		GH_FR1	0.8877	Exact	0.8877	Non-Significant Effect
		CM_MC2*	0.0065	Exact	0.0130	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	N	35	24	59	0.5932	0.4068	0.0%
FR_FRCP1		5	55	60	0.08333	0.9167	85.95%
GH_FR1		41	19	60	0.6833	0.3167	-15.19%
CM_MC2		21	39	60	0.35	0.65	41.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	0.9286	1.0000	0.2667	0.2000
FR_FRCP1		0.1333	0.0000	0.0667	0.1333
GH_FR1		1.0000	0.4667	0.8667	0.4000
CM_MC2		0.6667	0.6000	0.0667	0.0667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	13/14	15/15	4/15	3/15
FR_FRCP1		2/15	0/15	1/15	2/15
GH_FR1		15/15	7/15	13/15	6/15
CM_MC2		10/15	9/15	1/15	1/15

GH_ER2 = negative control (reference site)

Fathead Minnow 32-d Survival and Growth Test

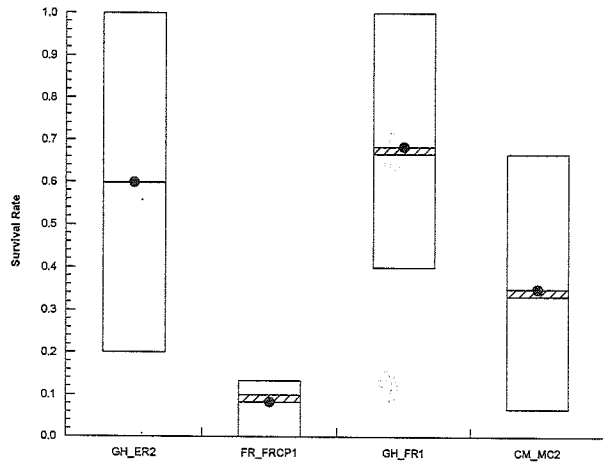
Nautilus Environmental

Analysis ID: 11-5331-6486
Analyzed: 05 Dec-18 15:48

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 15:51 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-4095-9334	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 15:51	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	00-6094-2920	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-08-07_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
GH_ER2		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	N	58	2	60	0.9667	0.03333	0.0%
FR_FRCP1		57	3	60	0.95	0.05	1.72%
GH_FR1		60	0	60	1	0	-3.45%
CM_MC2		60	0	60	1	0	-3.45%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	1.0000	1.0000	0.8667	1.0000
FR_FRCP1		0.9333	1.0000	0.8667	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	N	15/15	15/15	13/15	15/15
FR_FRCP1		14/15	15/15	13/15	15/15
GH_FR1		15/15	15/15	15/15	15/15
CM_MC2		15/15	15/15	15/15	15/15

GH_ER2 = negative control (reference site)

CETIS Analytical Report

Report Date: 05 Dec-18 15:51 (p 2 of 2)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

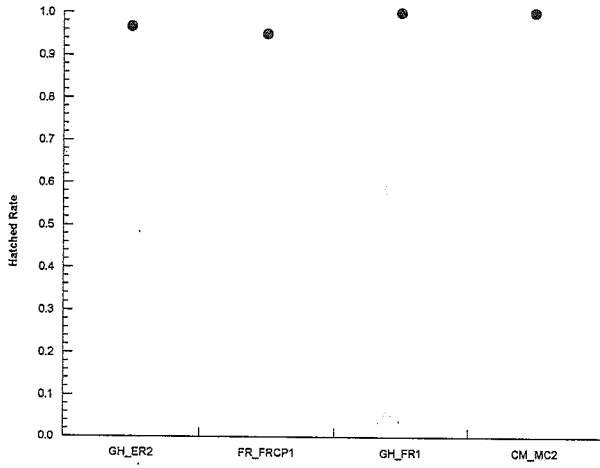
Nautilus Environmental

Analysis ID: 14-4095-9334
Analyzed: 05 Dec-18 15:51

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:26 (p 1 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-7908-3478	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:25	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed length-mm	10.91%
		GH_FR1 passed length-mm	10.91%
		CM_MC2 passed length-mm	10.91%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	-8.768	2.015	1.397	5	CDF	0.9998	Non-Significant Effect
CM_MC1		GH_FR1	-1.648	1.943	0.832	6	CDF	0.9247	Non-Significant Effect
		CM_MC2	-1.724	1.943	1.245	6	CDF	0.9323	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	74.4894	24.8298	3	27.3	2.1E-05	Significant Effect
Error	10.0048	0.909527	11			
Total	84.4942		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	2.945	11.34	0.4002	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9166	0.8328	0.1712	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	XC	4	11.42	10.7	12.14	11.38	11	11.92	0.2276	3.99%	0.00%
FR_FRCP1		3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	-53.24%
GH_FR1		4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	-6.17%
CM_MC2		4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	-9.68%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	11.69	11.07	11.92	11
FR_FRCP1		17	19	16.5	
GH_FR1		11.07	12.71	12.29	12.43
CM_MC2		11.6	11.5	14	13

① cm_mc1 = negative control (reference site)

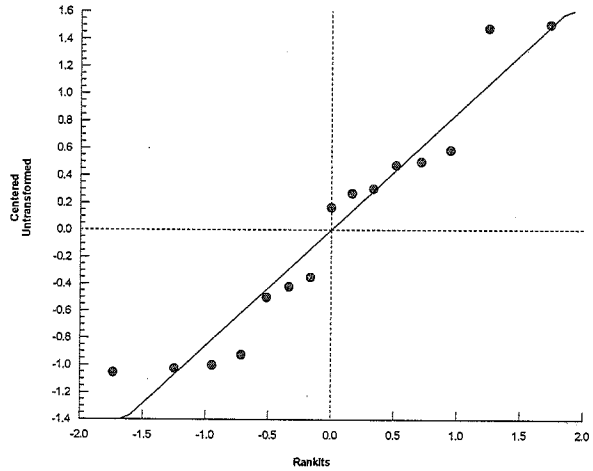
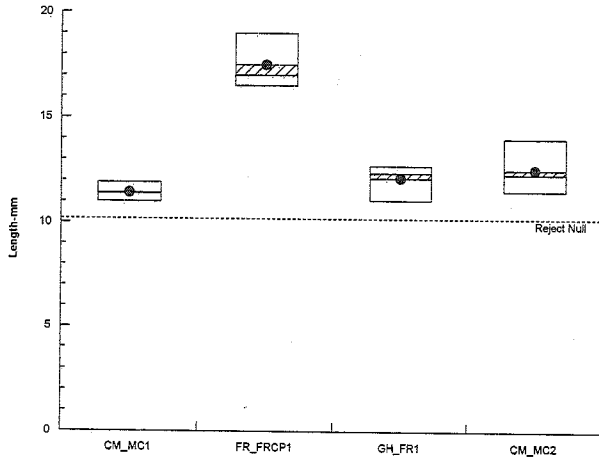
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-7908-3478 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:25 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:26 (p 3 of 4)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-5970-9144	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:25	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	34.13%
		GH_FR1 failed mean dry biomass-mg	34.13%
		CM_MC2 failed mean dry biomass-mg	34.13%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	6.677	1.943	0.711	6	CDF	2.7E-04	Significant Effect
<i>CMMCI</i>		GH_FR1*	2.771	1.943	0.576	6	CDF	0.0162	Significant Effect
		CM_MC2*	2.938	1.943	1.148	6	CDF	0.0130	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	13.6131	4.53769	3	8.834	0.0023	Significant Effect
Error	6.16375	0.513646	12			
Total	19.7768		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.105	11.34	0.2503	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9583	0.8408	0.6313	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	XC	4	3.364	2.826	3.903	3.289	3.064	3.817	0.1691	10.05%	0.00%
FR_FRCP1		4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	72.59%
GH_FR1		4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	24.42%
CM_MC2		4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	51.59%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	3.817	3.064	3.153	3.425
FR_FRCP1		1.395	0	0.9387	1.356
GH_FR1		3.131	2.104	2.753	2.183
CM_MC2		2.669	2.546	0.7113	0.5887

CMMCI = negative control (reference site)

EMM
Dec-20/18

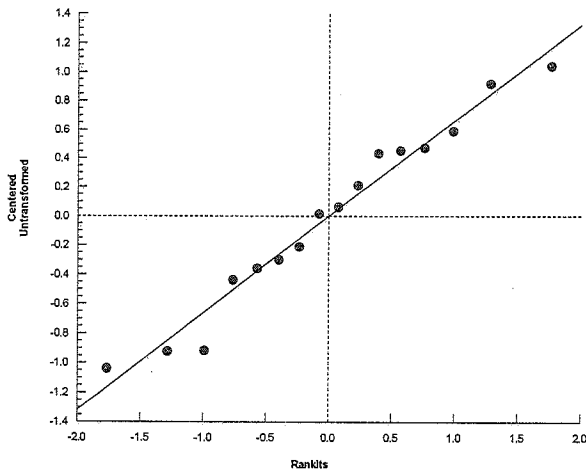
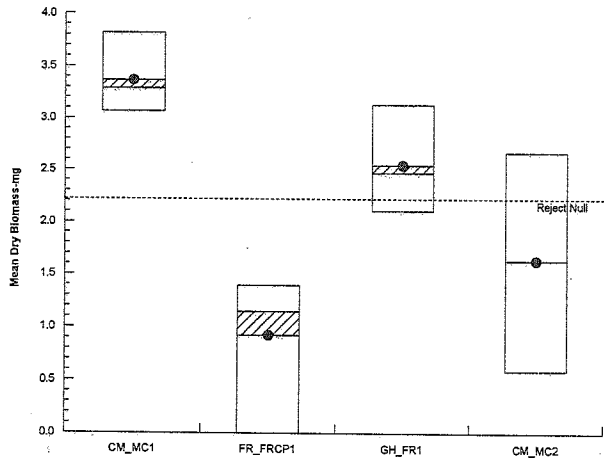
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-5970-9144 Endpoint: Mean Dry Biomass-mg
Analyzed: 19 Dec-18 12:25 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:03 (p 2 of 3)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-5274-7706	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:02	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control	FR_FRCP1*	0.0000	Exact	9.3E-22	Significant Effect
<i>CM_MC1</i>	GH_FR1*	0.0012	Exact	0.0012	Significant Effect
	CM_MC2*	0.0000	Exact	6.9E-11	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① CM_MC1	N	55	5	60	0.9167	0.08333	-161.9%
FR_FRCP1		5	55	60	0.08333	0.9167	76.19%
GH_FR1		41	19	60	0.6833	0.3167	-95.24%
CM_MC2		21	39	60	0.35	0.65	0.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC1	N	0.8667	0.9333	0.8667	1.0000
FR_FRCP1		0.1333	0.0000	0.0667	0.1333
GH_FR1		1.0000	0.4667	0.8667	0.4000
CM_MC2		0.6667	0.6000	0.0667	0.0667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC1	N	13/15	14/15	13/15	15/15
FR_FRCP1		2/15	0/15	1/15	2/15
GH_FR1		15/15	7/15	13/15	6/15
CM_MC2		10/15	9/15	1/15	1/15

① *cm mc1 = negative control (reference site)*

Fathead Minnow 32-d Survival and Growth Test

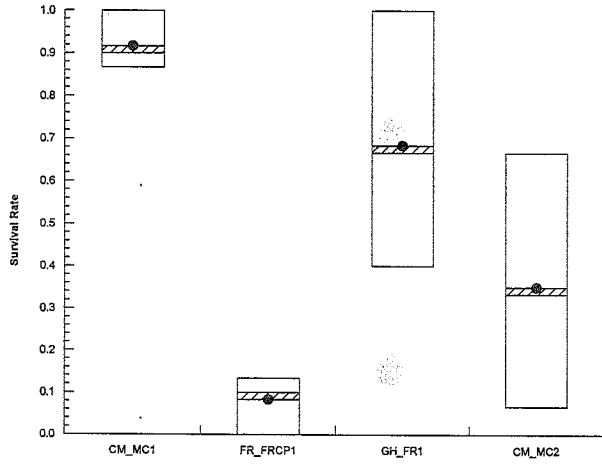
Nautilus Environmental

Analysis ID: 08-5274-7706
Analyzed: 05 Dec-18 16:02

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:04 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-2693-2469	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:04	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① CM_MC1	05-8736-7499	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h		
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h		
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q3_WS_201808	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
CM_MC1		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① CM_MC1	N	58	2	60	0.9667	0.03333	3.33%
FR_FRCP1		57	3	60	0.95	0.05	5.0%
GH_FR1		60	0	60	1	0	0.0%
CM_MC2		60	0	60	1	0	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC1	N	0.8667	1.0000	1.0000	1.0000
FR_FRCP1		0.9333	1.0000	0.8667	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000
CM_MC2		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC1	N	13/15	15/15	15/15	15/15
FR_FRCP1		14/15	15/15	13/15	15/15
GH_FR1		15/15	15/15	15/15	15/15
CM_MC2		15/15	15/15	15/15	15/15

① CM_MC1 = negative control (reference site)

CETIS Analytical Report

Report Date: 05 Dec-18 16:04 (p 2 of 2)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

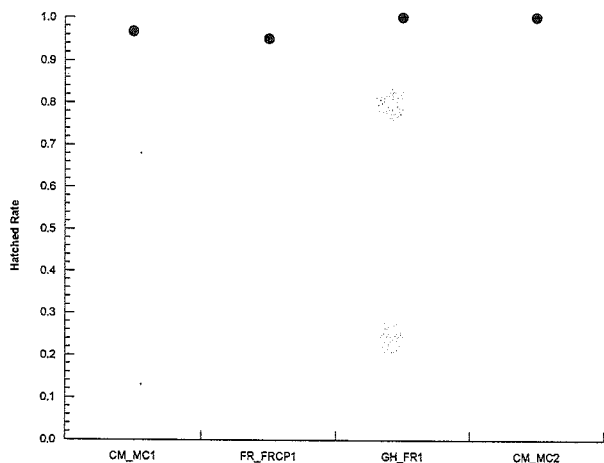
Nautilus Environmental

Analysis ID: 06-2693-2469
Analyzed: 05 Dec-18 16:04

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:29 (p 3 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-8947-5584	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:28	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L passed length-mm	3.66%
		CM_MC2 20 µg/L passed length-mm	3.66%
		GH_FR1 20 µg/L passed length-mm	3.66%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Upstream Control		FR_FRCP120µg/L	-11.6	2.353	0.993	3	CDF	0.9993	Non-Significant Effect
Cu Ctrl		CM_MC2 20 µg/L	-3.143	1.943	1.066	6	CDF	0.9900	Non-Significant Effect
(20µg/L)		GH_FR1 20 µg/L	-1.679	1.943	0.443	6	CDF	0.9279	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	22.7713	7.59043	3	17.93	3.9E-04	Significant Effect
Error	3.80935	0.423261	9			
Total	26.5806		12			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.762	6.992	0.1037	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9303	0.8138	0.3443	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① Cu Ctrl 20µg/L	U	4	12.11	11.51	12.71	12.22	11.57	12.43	0.1887	3.12%	0.00%
FR_FRCP120µg/L		1	17			17	17	17	0	0.00%	-40.41%
CM_MC2 20 µg/L		4	13.83	12.19	15.47	13.89	12.56	15	0.5153	7.45%	-14.25%
GH_FR1 20 µg/L		4	12.49	12.08	12.9	12.57	12.14	12.69	0.1277	2.05%	-3.16%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	U	11.57	12.14	12.29	12.43
FR_FRCP120µg/L		17			
CM_MC2 20 µg/L		12.56	14.2	15	13.57
GH_FR1 20 µg/L		12.46	12.69	12.14	12.67

① Cu Ctrl 20µg/L = negative control (lab control w/ 20µg/L Cu)

Dec. 19/18

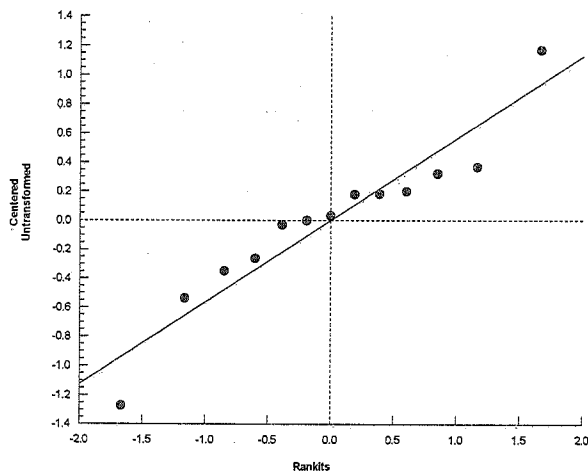
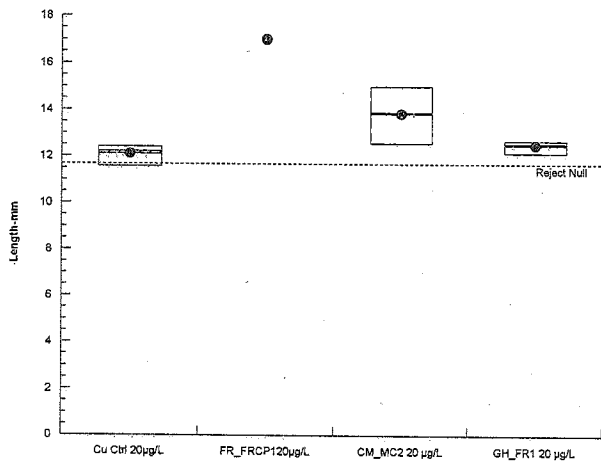
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-8947-5584 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:28 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:29 (p 5 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4256-0389	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:29	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L failed mean dry biomass-m 7.41%	
		CM_MC2 20 µg/L failed mean dry biomass-m 7.41%	
		GH_FR1 20 µg/L failed mean dry biomass-mg 7.41%	

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Upstream Control		FR_FRCP120µg/L*	14.81	1.943	0.496	6	CDF	3.0E-06	Significant Effect
FR - ① Cu Ctrl 20µg/L		CM_MC2 20 µg/L*	5.551	1.943	0.54	6	CDF	7.2E-04	Significant Effect
		GH_FR1 20 µg/L*	2.825	1.943	0.296	6	CDF	0.0151	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	34.2393	11.4131	3	83.2	<1.0E-37	Significant Effect
Error	1.64612	0.137176	12			
Total	35.8854		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.175	11.34	0.3654	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8522	0.8408	0.0147	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① Cu Ctrl 20µg/L	U	4	4.002	3.624	4.38	4.016	3.711	4.265	0.1189	5.94%	0.00%
FR_FRCP120µg/L		4	0.2257	-0.4925	0.9438	0	0	0.9027	0.2257	200.00%	94.36%
CM_MC2 20 µg/L		4	2.46	1.662	3.259	2.287	2.07	3.197	0.251	20.40%	38.52%
GH_FR1 20 µg/L		4	3.571	3.267	3.875	3.575	3.344	3.789	0.09564	5.36%	10.77%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	U	4.103	3.929	4.265	3.711
FR_FRCP120µg/L		0.9027	0	0	0
CM_MC2 20 µg/L		3.197	2.295	2.07	2.279
GH_FR1 20 µg/L		3.344	3.501	3.649	3.789

① Cu Ctrl 20µg/L = negative control (lab control w/ 20µg/L Cu)

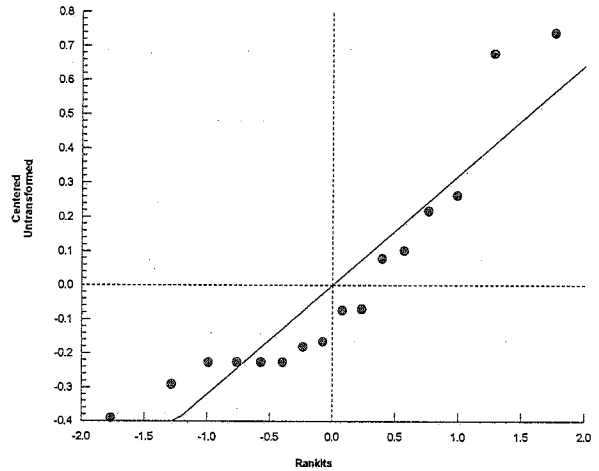
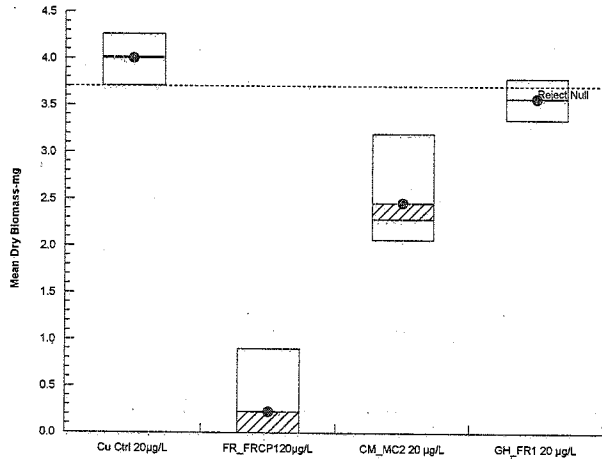
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4256-0389 Endpoint: Mean Dry Biomass-mg
Analyzed: 19 Dec-18 12:29 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:09 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-7767-2050	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:08	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control		FR_FRCP120µg/L*	0.0000	Exact	1.1E-27	Significant Effect
		CM_MC2 20 µg/L*	0.0000	Exact	9.4E-10	Significant Effect
		GH_FR1 20 µg/L	0.1648	Exact	0.1648	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① Cu Ctrl 20µg/L	N	56	4	60	0.9333	0.06667	-8.27%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	98.07%
CM_MC2 20 µg/L		25	35	60	0.4167	0.5833	51.67%
GH_FR1 20 µg/L		50	8	58	0.8621	0.1379	0.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	N	0.9333	0.9333	0.9333	0.9333
FR_FRCP120µg/L		0.0667	0.0000	0.0000	0.0000
CM_MC2 20 µg/L		0.6000	0.3333	0.2667	0.4667
GH_FR1 20 µg/L		0.7857	0.9286	0.9333	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	N	14/15	14/15	14/15	14/15
FR_FRCP120µg/L		1/15	0/15	0/15	0/15
CM_MC2 20 µg/L		9/15	5/15	4/15	7/15
GH_FR1 20 µg/L		11/14	13/14	14/15	12/15

① Cu Ctrl 20µg/L = negative control (lab control w/ 20 µg/L Cu)

CETIS Analytical Report

Report Date: 05 Dec-18 16:09 (p 2 of 2)
Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

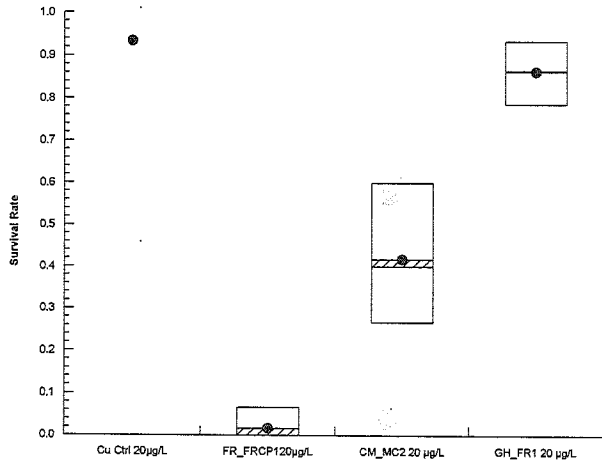
Nautilus Environmental

Analysis ID: 00-7767-2050
Analyzed: 05 Dec-18 16:08

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:13 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-1504-5742	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:12	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect
Cu Ctrl		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
(20µg/L)		GH_FR1 20 µg/L	0.1218	Exact	0.3655	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① Cu Ctrl 20µg/L	N	60	0	60	1	0	-5.26%
FR_FRCP120µg/L		60	0	60	1	0	-5.26%
CM_MC2 20 µg/L		60	0	60	1	0	-5.26%
GH_FR1 20 µg/L		57	3	60	0.95	0.05	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_FRCP120µg/L		1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20 µg/L		0.9333	0.9333	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	N	15/15	15/15	15/15	15/15
FR_FRCP120µg/L		15/15	15/15	15/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20 µg/L		14/15	14/15	15/15	14/15

① Cu Ctrl 20µg/L = negative control (lab control w/ 20µg/L Cu)

Fathead Minnow 32-d Survival and Growth Test

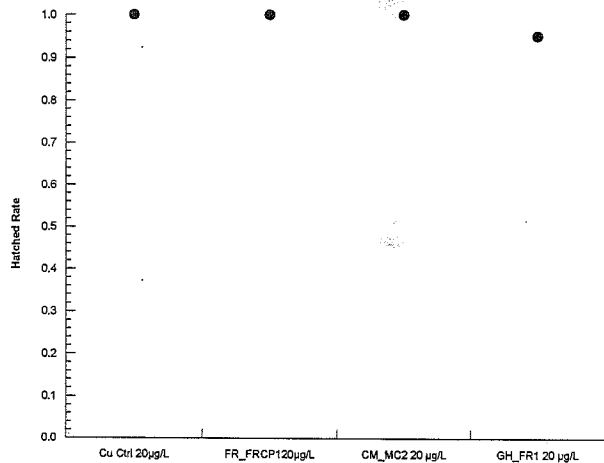
Nautilus Environmental

Analysis ID: 03-1504-5742
Analyzed: 05 Dec-18 16:12

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:34 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-1638-2096	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:29	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L failed length-mm	3.66%
		CM_MC2 20 µg/L failed length-mm	3.66%
		GH_FR1 20 µg/L passed length-mm	3.66%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Upstream Control		FR_FRCP120µg/L*	11.6	2.353	0.993	3	CDF	6.9E-04	Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L*	3.143	1.943	1.066	6	CDF	0.0100	Significant Effect
<i>(20µg/L)</i>		GH_FR1 20 µg/L	1.679	1.943	0.443	6	CDF	0.0721	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	22.7713	7.59043	3	17.93	3.9E-04	Significant Effect
Error	3.80935	0.423261	9			
Total	26.5806		12			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.762	6.992	0.1037	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9303	0.8138	0.3443	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① Cu Ctrl 20µg/L	U	4	12.11	11.51	12.71	12.22	11.57	12.43	0.1887	3.12%	0.00%
FR_FRCP120µg/L		1	17			17	17	17	0	0.00%	-40.41%
CM_MC2 20 µg/L		4	13.83	12.19	15.47	13.89	12.56	15	0.5153	7.45%	-14.25%
GH_FR1 20 µg/L		4	12.49	12.08	12.9	12.57	12.14	12.69	0.1277	2.05%	-3.16%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① Cu Ctrl 20µg/L	U	11.57	12.14	12.29	12.43
FR_FRCP120µg/L		17			
CM_MC2 20 µg/L		12.56	14.2	15	13.57
GH_FR1 20 µg/L		12.46	12.69	12.14	12.67

① Cu Ctrl 20µg/L = negative control *lab control w/ 20µg/L Cu*
~~reference~~

CETIS Analytical Report

Report Date: 19 Dec-18 12:34 (p 2 of 2)
Test Code/ID: 181279-78 / 19-5297-1136

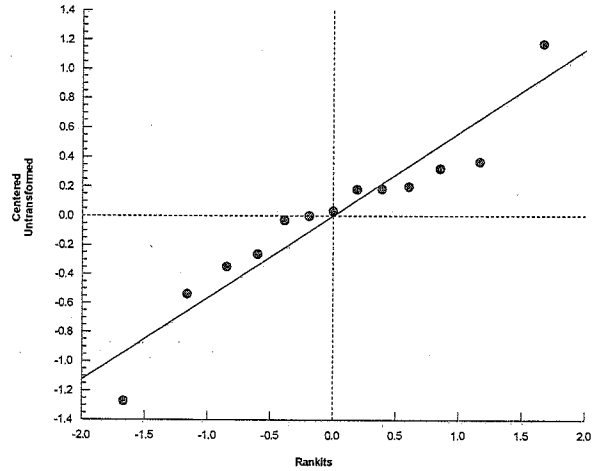
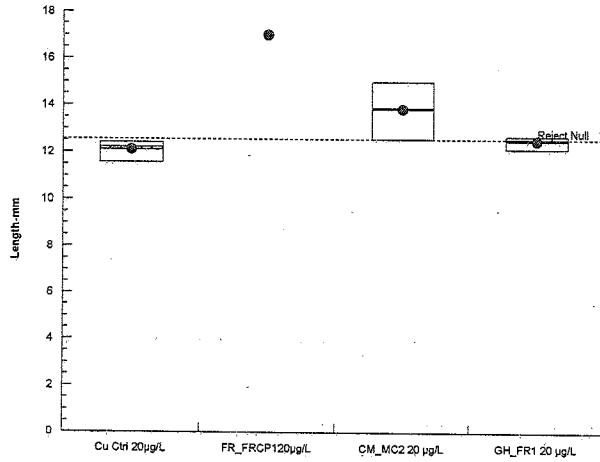
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-1638-2096 Endpoint: Length-mm
Analyzed: 19 Dec-18 12:29 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 19 Dec-18 12:29 (p 7 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-8922-9871	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 19 Dec-18 12:29	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L passed mean dry biomass- 7.41%	
		CM_MC2 20 µg/L passed mean dry biomass- 7.41%	
		GH_FR1 20 µg/L passed mean dry biomass- 7.41%	

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control <i>Cu Ctrl 20µg/L</i>		FR_FRCP120µg/L	-14.81	1.943	0.496	6	CDF	1.0000	Non-Significant Effect
		CM_MC2 20 µg/L	-5.551	1.943	0.54	6	CDF	0.9993	Non-Significant Effect
		GH_FR1 20 µg/L	-2.825	1.943	0.296	6	CDF	0.9849	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	34.2393	11.4131	3	83.2	<1.0E-37	Significant Effect
Error	1.64612	0.137176	12			
Total	35.8854		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.175	11.34	0.3654	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8522	0.8408	0.0147	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	U	4	4.002	3.624	4.38	4.016	3.711	4.265	0.1189	5.94%	0.00%
FR_FRCP120µg/L		4	0.2257	-0.4925	0.9438	0	0	0.9027	0.2257	200.00%	94.36%
CM_MC2 20 µg/L		4	2.46	1.662	3.259	2.287	2.07	3.197	0.251	20.40%	38.52%
GH_FR1 20 µg/L		4	3.571	3.267	3.875	3.575	3.344	3.789	0.09564	5.36%	10.77%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	U	4.103	3.929	4.265	3.711
FR_FRCP120µg/L		0.9027	0	0	0
CM_MC2 20 µg/L		3.197	2.295	2.07	2.279
GH_FR1 20 µg/L		3.344	3.501	3.649	3.789

EMM
 Dec 20/18

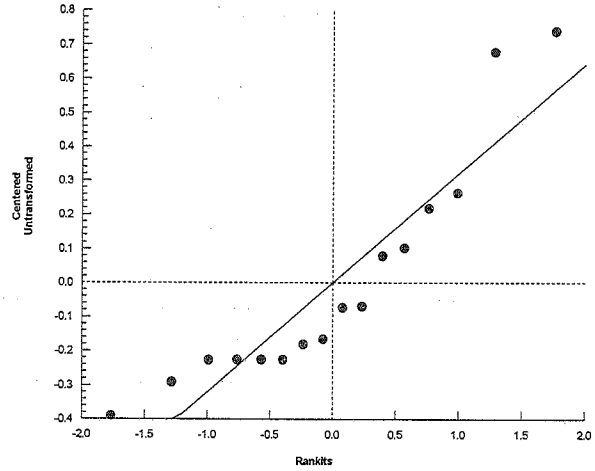
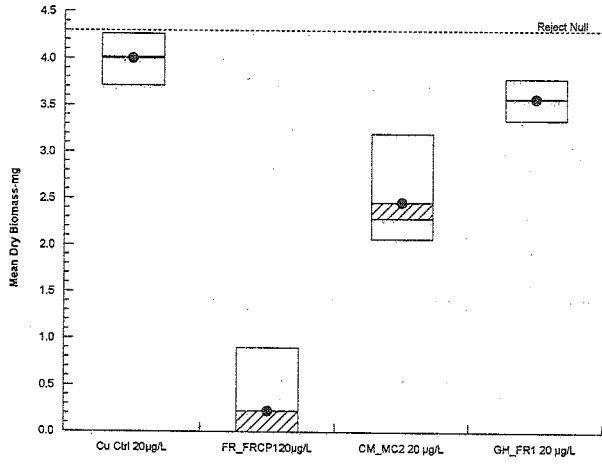
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-8922-9871 Endpoint: Mean Dry Biomass-mg
Analyzed: 19 Dec-18 12:29 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:19 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-6945-4548	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:16	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect
(Cu Ctrl 20µg/L)		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1 20 µg/L	0.9448	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	N	56	4	60	0.9333	0.06667	-8.27%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	98.07%
CM_MC2 20 µg/L		25	35	60	0.4167	0.5833	51.67%
GH_FR1 20 µg/L		50	8	58	0.8621	0.1379	0.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	0.9333	0.9333	0.9333	0.9333
FR_FRCP120µg/L		0.0667	0.0000	0.0000	0.0000
CM_MC2 20 µg/L		0.6000	0.3333	0.2667	0.4667
GH_FR1 20 µg/L		0.7857	0.9286	0.9333	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	14/15	14/15	14/15	14/15
FR_FRCP120µg/L		1/15	0/15	0/15	0/15
CM_MC2 20 µg/L		9/15	5/15	4/15	7/15
GH_FR1 20 µg/L		11/14	13/14	14/15	12/15

CETIS Analytical Report

Report Date: 05 Dec-18 16:19 (p 2 of 2)
Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

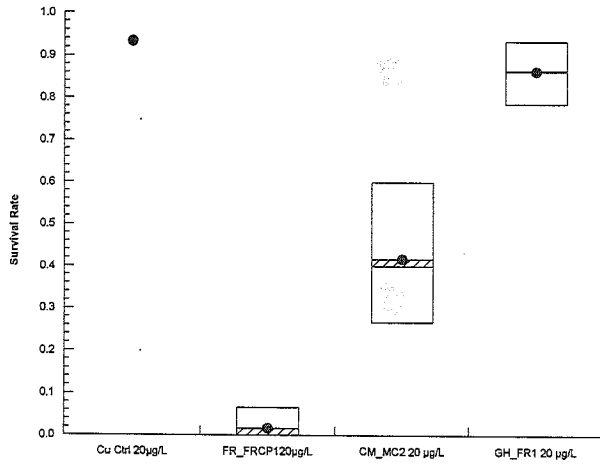
Nautilus Environmental

Analysis ID: 08-6945-4548
Analyzed: 05 Dec-18 16:16

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 16:15 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-6502-5547	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 16:14	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	13-8494-9896	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Water Sample	Teck Coal	Cu Ctrl 20 µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect
(Cu Ctrl 20µg/L)		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	N	60	0	60	1	0	-5.26%
FR_FRCP120µg/L		60	0	60	1	0	-5.26%
CM_MC2 20 µg/L		60	0	60	1	0	-5.26%
GH_FR1 20 µg/L		57	3	60	0.95	0.05	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_FRCP120µg/L		1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20 µg/L		0.9333	0.9333	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	N	15/15	15/15	15/15	15/15
FR_FRCP120µg/L		15/15	15/15	15/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20 µg/L		14/15	14/15	15/15	14/15

CETIS Analytical Report

Report Date: 05 Dec-18 16:15 (p 2 of 2)
Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

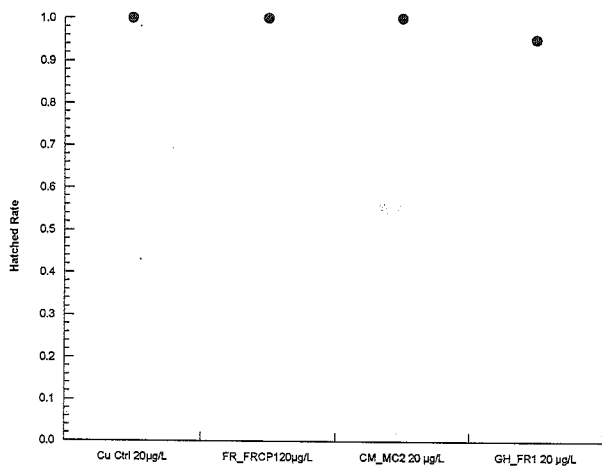
Nautilus Environmental

Analysis ID: 14-6502-5547
Analyzed: 05 Dec-18 16:14

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



Handwritten signature
DEC 19/18

CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 1 of 6)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-9293-6674	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:50	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L passed length-mm	25.49%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	0.3273	2.92	4.46	2	CDF	0.3873	Non-Significant Effect

~~FR_FRCP1~~
ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1875	0.1875	1	0.1071	0.7745	Non-Significant Effect
Error	3.5	1.75	2			
Total	3.6875		3			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Distribution	Shapiro-Wilk W Normality Test	0.9271	-0.3355	0.5774	Normal Distribution

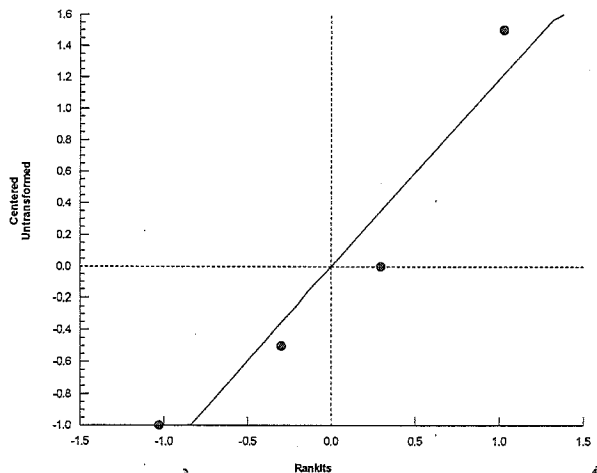
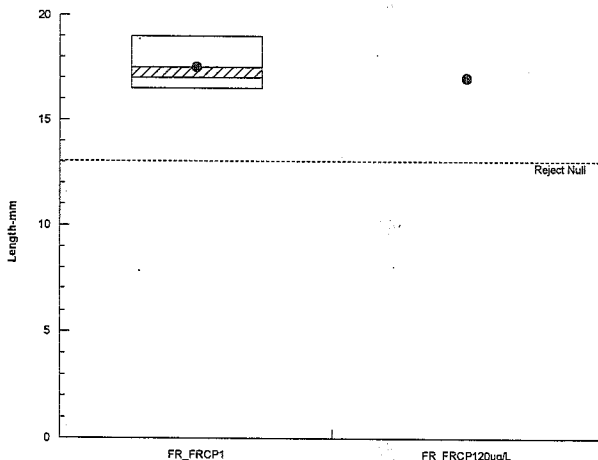
Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	N	3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	0.00%
FR_FRCP120µg/L		1	17			17	17	17	0	0.00%	2.86%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	17	19	16.5	
FR_FRCP120µg/L		17			

Graphics



① FR_FRCP1 (no Cu added) = negative control

CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 3 of 6)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-2481-0425	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:50	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L passed mean dry biomass-	83.24%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	1.763	1.943	0.768	6	CDF	0.0642	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.970688	0.970688	1	3.109	0.1283	Non-Significant Effect
Error	1.87323	0.312206	6			
Total	2.84392		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.065	47.47	0.5666	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9268	0.6451	0.4872	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	N	4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	0.00%
FR_FRCP120µg/L		4	0.2257	-0.4925	0.9438	0	0	0.9027	0.2257	200.00%	75.53%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	1.395	0	0.9387	1.356
FR_FRCP120µg/L		0.9027	0	0	0

① FR_FRCP1 = negative control (Cu added)

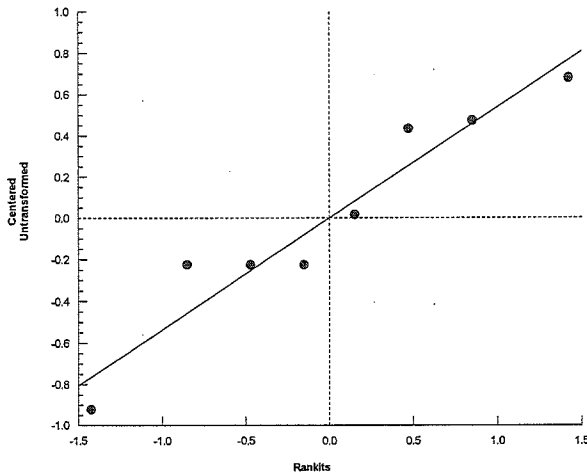
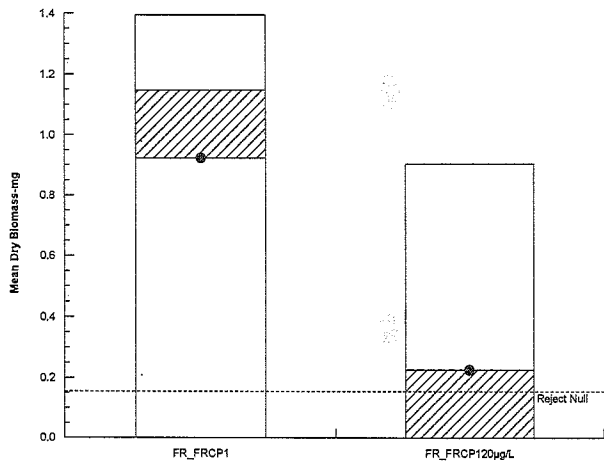
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-2481-0425 Endpoint: Mean Dry Biomass-mg
Analyzed: 05 Dec-18 17:50 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-3242-7919	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:50	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	0.1034	Exact	0.1034	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	N	5	55	60	0.08333	0.9167	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	80.0%

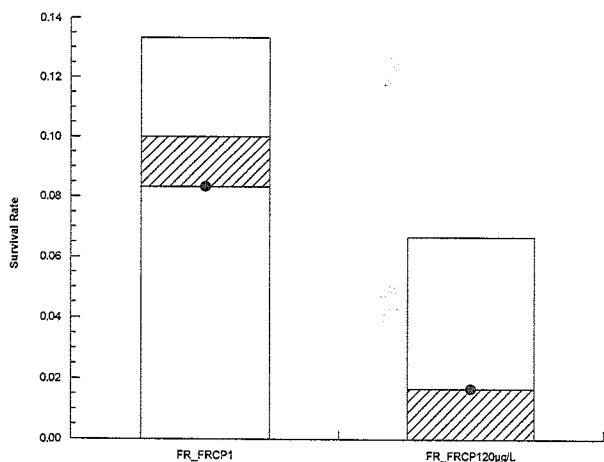
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	0.1333	0.0000	0.0667	0.1333
FR_FRCP120µg/L		0.0667	0.0000	0.0000	0.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	2/15	0/15	1/15	2/15
FR_FRCP120µg/L		1/15	0/15	0/15	0/15

Graphics



① FR_FRCP1 = negative control
 (As Cu added)
 10µg/L

CETIS Analytical Report

Report Date: 05 Dec-18 17:52 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-6197-6633	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:52	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_FRCP1	N	57	3	60	0.95	0.05	0.0%
FR_FRCP120µg/L		60	0	60	1	0	-5.26%

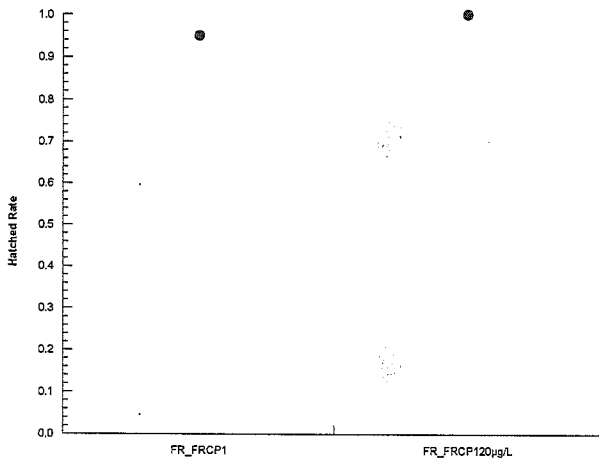
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_FRCP1	N	0.9333	1.0000	0.8667	1.0000
FR_FRCP120µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_FRCP1	N	14/15	15/15	13/15	15/15
FR_FRCP120µg/L		15/15	15/15	15/15	15/15

Graphics



① FR_FRCP1 = negative control (no Cu added)
 10µg/L

CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 2 of 6)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-7583-1835	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:50	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L passed length-mm	25.49%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	-0.3273	2.92	4.46	2	CDF	0.6127	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1875	0.1875	1	0.1071	0.7745	Non-Significant Effect
Error	3.5	1.75	2			
Total	3.6875		3			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Distribution	Shapiro-Wilk W Normality Test	0.9271	-0.3355	0.5774	Normal Distribution

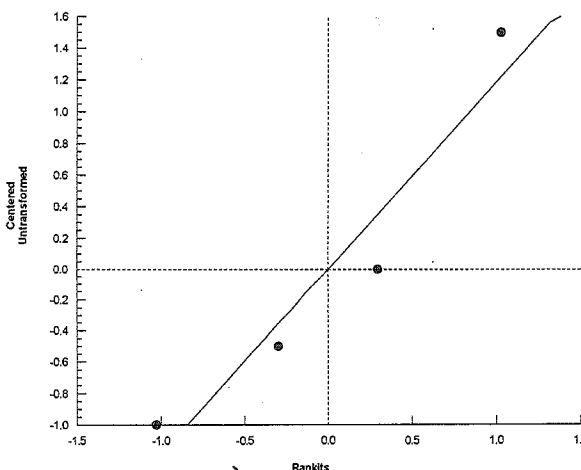
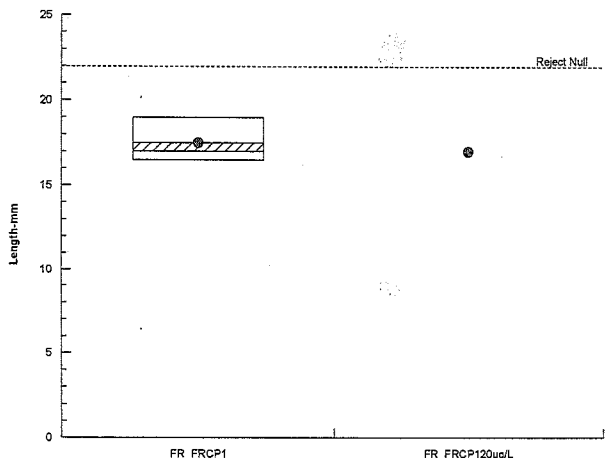
Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	N	3	17.5	14.21	20.79	17	16.5	19	0.7638	7.56%	0.00%
FR_FRCP120µg/L		1	17			17	17	17	0	0.00%	2.86%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	17	19	16.5	
FR_FRCP120µg/L		17			

Graphics



① FR_FRCP1 = negative control
 (no added)
 tank

CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 5 of 6)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-1783-1850	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:50	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L passed mean dry biomass-	83.24%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	-1.763	1.943	0.768	6	CDF	0.9358	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.970688	0.970688	1	3.109	0.1283	Non-Significant Effect
Error	1.87323	0.312206	6			
Total	2.84392		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.065	47.47	0.5666	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9268	0.6451	0.4872	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	N	4	0.9223	-0.1098	1.954	1.147	0	1.395	0.3243	70.32%	0.00%
FR_FRCP120µg/L		4	0.2257	-0.4925	0.9438	0	0	0.9027	0.2257	200.00%	75.53%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	1.395	0	0.9387	1.356
FR_FRCP120µg/L		0.9027	0	0	0

① FR_FRCP1 = negative control (No Cu added)
 10µM

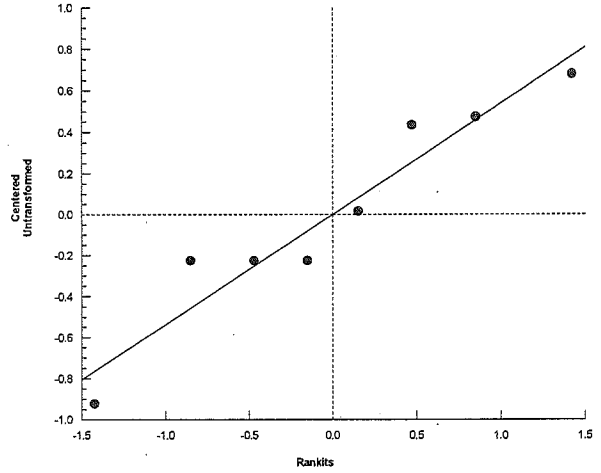
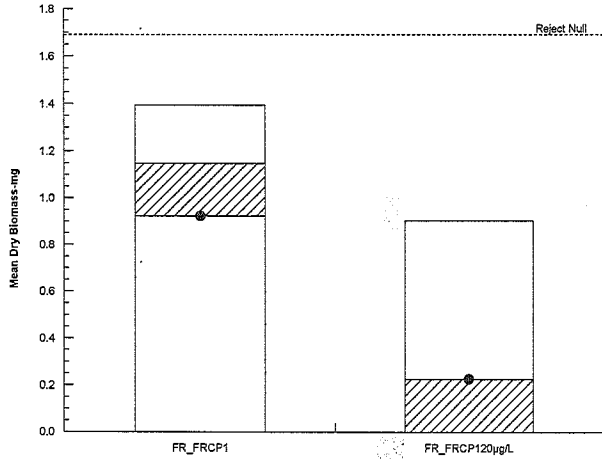
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-1783-1850 Endpoint: Mean Dry Biomass-mg
Analyzed: 05 Dec-18 17:50 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:51 (p 2 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-3899-4873 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 05 Dec-18 17:50 Analysis: Single 2x2 Contingency Table Status Level: 1

Batch ID: 18-9588-2348 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 10 Aug-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent:
 Ending Date: 10 Sep-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 31d 0h Taxon: Actinopterygii Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP120µg/L	0.9863	Exact	0.9863	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	N	5	55	60	0.08333	0.9167	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	80.0%

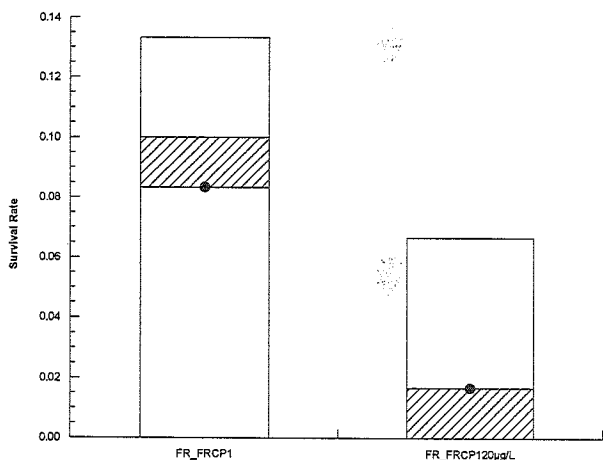
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	0.1333	0.0000	0.0667	0.1333
FR_FRCP120µg/L		0.0667	0.0000	0.0000	0.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	N	2/15	0/15	1/15	2/15
FR_FRCP120µg/L		1/15	0/15	0/15	0/15

Graphics



① FR_FRCP1 = negative control (As Cu added)
 10µg/L

CETIS Analytical Report

Report Date: 05 Dec-18 17:52 (p 2 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-5460-7341	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:52	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_FRCP1	09-7997-6862	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
FR_FRCP120µg/L	18-6443-6427	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2018-08	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Negative Control		FR_FRCP120µg/L	0.1218	Exact	0.1218	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_FRCP1	N	57	3	60	0.95	0.05	0.0%
FR_FRCP120µg/L		60	0	60	1	0	-5.26%

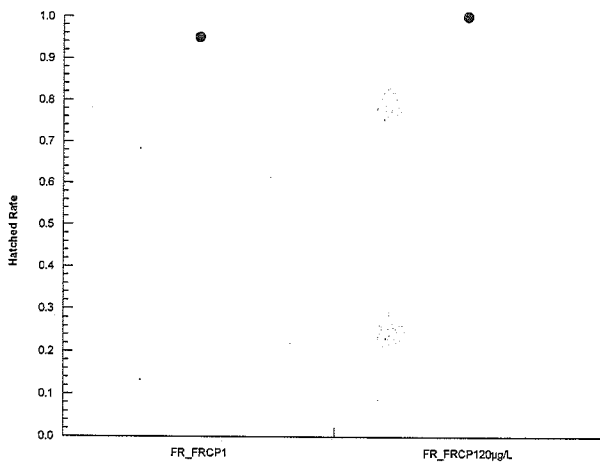
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_FRCP1	N	0.9333	1.0000	0.8667	1.0000
FR_FRCP120µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① FR_FRCP1	N	14/15	15/15	13/15	15/15
FR_FRCP120µg/L		15/15	15/15	15/15	15/15

Graphics



① FR_FRCP1 = negative control (No Cu added)
 10µ/L

CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 1 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test				Nautilus Environmental		
Analysis ID: 03-2864-8717	Endpoint: Length-mm	CETIS Version: CETISv1.9.4				
Analyzed: 05 Dec-18 17:57	Analysis: Parametric-Two Sample	Status Level: 1				
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus				
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:				
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:				
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox		Age:		

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	CM_MC2 20 µg/L passed length-mm	12.26%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control <i>CM MC2</i>		CM_MC2 20 µg/L	-1.655	1.943	1.536	6	CDF	0.9255	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3.41911	3.41911	1	2.738	0.1491	Non-Significant Effect
Error	7.49377	1.24896	6			
Total	10.9129		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.352	47.47	0.8102	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9277	0.6451	0.4952	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	XC	4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	0.00%
CM_MC2 20 µg/L		4	13.83	12.19	15.47	13.89	12.56	15	0.5153	7.45%	-10.44%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	11.6	11.5	14	13
CM_MC2 20 µg/L		12.56	14.2	15	13.57

*CM MC2 = negative control (No Cu added)
10µL*

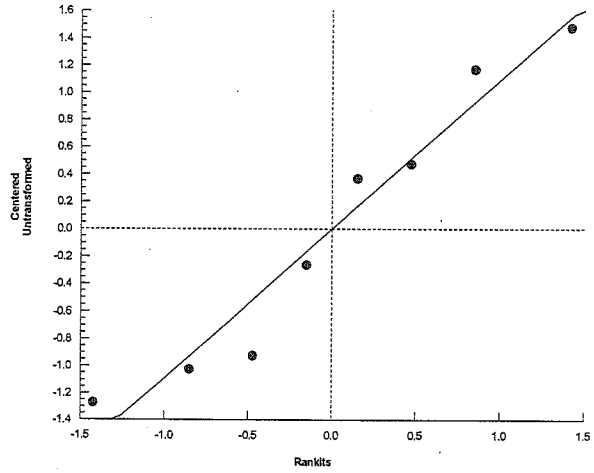
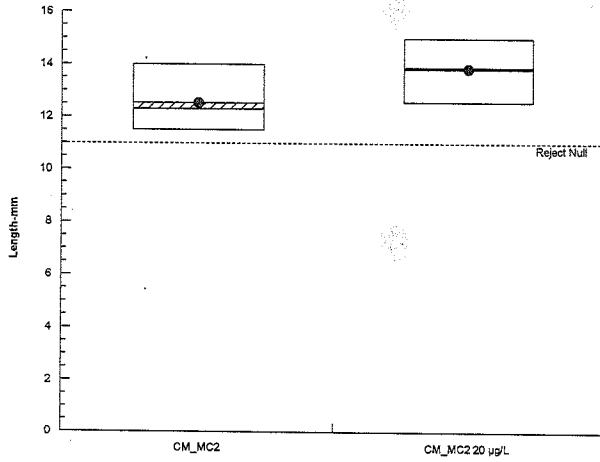
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-2864-8717 Endpoint: Length-mm
Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 3 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-9313-3881	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:57	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	CM_MC2 20 µg/L passed length-mm	12.26%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC2 20 µg/L	1.655	1.943	1.536	6	CDF	0.0745	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3.41911	3.41911	1	2.738	0.1491	Non-Significant Effect
Error	7.49377	1.24896	6			
Total	10.9129		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.352	47.47	0.8102	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9277	0.6451	0.4952	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	XC	4	12.53	10.62	14.43	12.3	11.5	14	0.5991	9.57%	0.00%
CM_MC2 20 µg/L		4	13.83	12.19	15.47	13.89	12.56	15	0.5153	7.45%	-10.44%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	11.6	11.5	14	13
CM_MC2 20 µg/L		12.56	14.2	15	13.57

① cmmc2 = negative control (10µg/L Cu added)

CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 4 of 8)
Test Code/ID: 181279-78 / 19-5297-1136

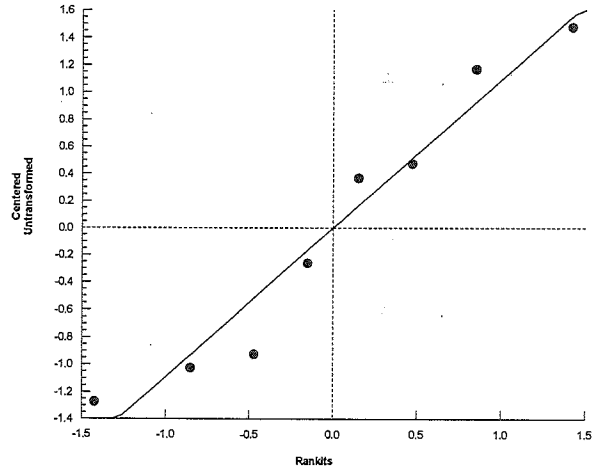
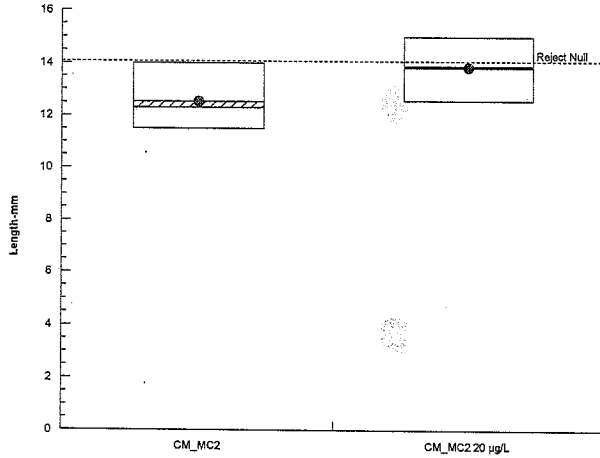
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-9313-3881 Endpoint: Length-mm
Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 5 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-2849-7453 Endpoint: Mean Dry Biomass-mg CETIS Version: CETISv1.9.4
 Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample Status Level: 1

Batch ID: 18-9588-2348 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 10 Aug-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent:
 Ending Date: 10 Sep-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 31d 0h Taxon: Actinopterygii Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	CM_MC2 20 µg/L passed mean dry biomass-	73.89%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC2 20 µg/L	-1.343	1.943	1.203	6	CDF	0.8861	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.38334	1.38334	1	1.804	0.2279	Non-Significant Effect
Error	4.60195	0.766992	6			
Total	5.98529		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	5.089	47.47	0.2145	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9018	0.6451	0.2996	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	XC	4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	0.00%
CM_MC2 20 µg/L		4	2.46	1.662	3.259	2.287	2.07	3.197	0.251	20.40%	-51.06%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	2.669	2.546	0.7113	0.5887
CM_MC2 20 µg/L		3.197	2.295	2.07	2.279

① cmmc2 = negative control (10 µg/L Cu added)

EMM
 Dec 20/18

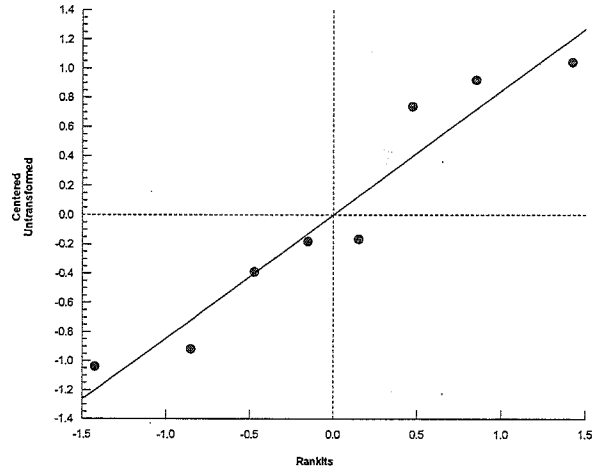
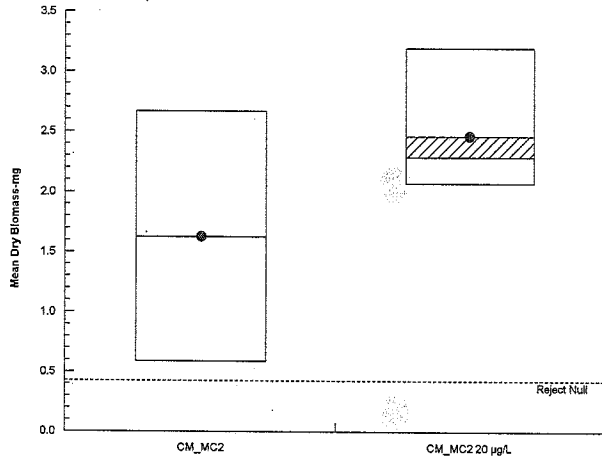
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-2849-7453 Endpoint: Mean Dry Biomass-mg
Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 7 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-2031-5773 Endpoint: Mean Dry Biomass-mg CETIS Version: CETISv1.9.4
 Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample Status Level: 1

Batch ID: 18-9588-2348 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 10 Aug-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent:
 Ending Date: 10 Sep-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 31d. 0h Taxon: Actinopterygii Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	CM_MC2 20 µg/L passed mean dry biomass-	73.89%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control, CM_MC2		CM_MC2 20 µg/L	1.343	1.943	1.203	6	CDF	0.1139	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.38334	1.38334	1	1.804	0.2279	Non-Significant Effect
Error	4.60195	0.766992	6			
Total	5.98529		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	5.089	47.47	0.2145	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9018	0.6451	0.2996	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	XC	4	1.629	-0.173	3.43	1.629	0.5887	2.669	0.5661	69.52%	0.00%
CM_MC2 20 µg/L		4	2.46	1.662	3.259	2.287	2.07	3.197	0.251	20.40%	-51.06%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	2.669	2.546	0.7113	0.5887
CM_MC2 20 µg/L		3.197	2.295	2.07	2.279

① cm mc2 = negative control (10 µg/L Cu added).

Dec 20/18

CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 8 of 8)
Test Code/ID: 181279-78 / 19-5297-1136

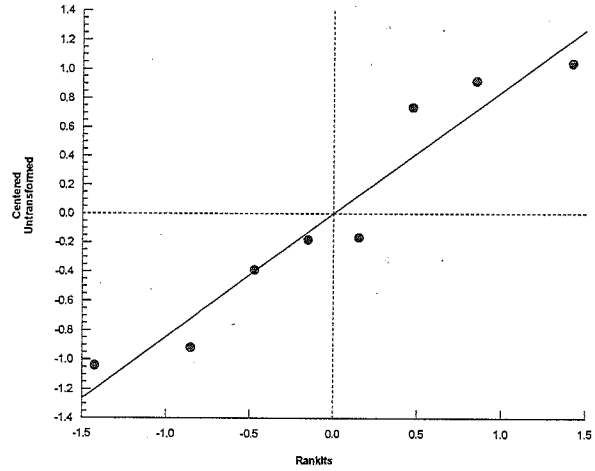
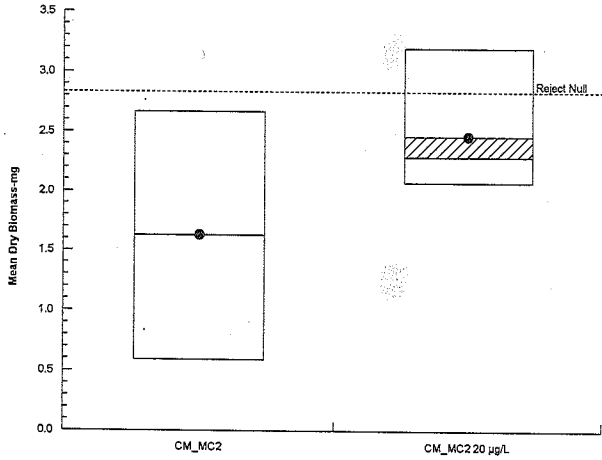
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-2031-5773 Endpoint: Mean Dry Biomass-mg
Analyzed: 05 Dec-18 17:57 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 1 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-7933-0530	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:57	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC2 20 µg/L	0.8260	Exact	0.8260	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	XC	21	39	60	0.35	0.65	0.0%
CM_MC2 20 µg/L		25	35	60	0.4167	0.5833	-19.05%

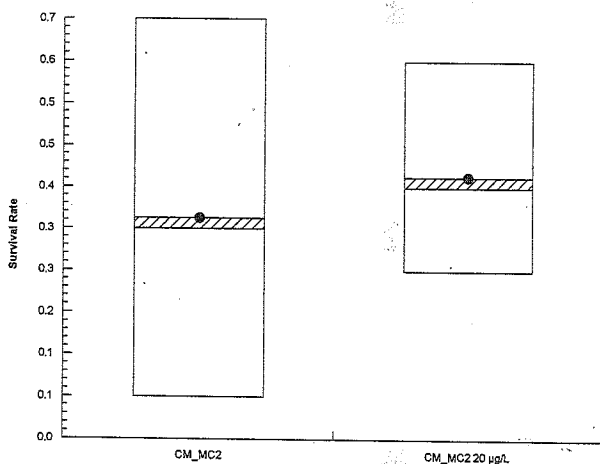
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	0.6667	0.6000	0.0667	0.0667
CM_MC2 20 µg/L		0.6000	0.3333	0.2667	0.4667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	10/15	9/15	1/15	1/15
CM_MC2 20 µg/L		9/15	5/15	4/15	7/15

Graphics



① CM MC2 = negative control (10 µg/L added Cu)

Dec-11/18

CETIS Analytical Report

Report Date: 05 Dec-18 17:58 (p 2 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-4778-2379	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:57	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		CM_MC2 20 µg/L	0.2867	Exact	0.2867	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	XC	21	39	60	0.35	0.65	0.0%
CM_MC2 20 µg/L		25	35	60	0.4167	0.5833	-19.05%

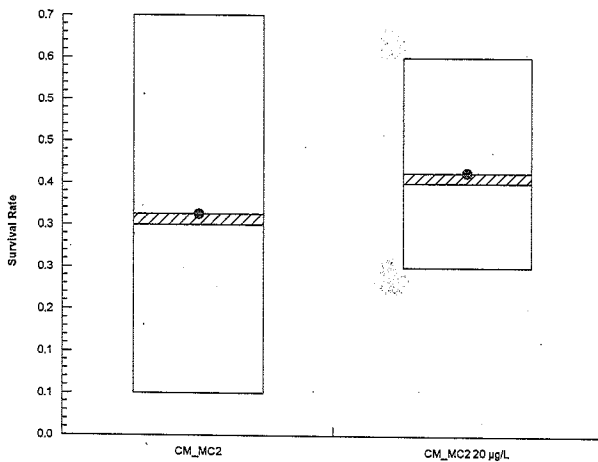
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	0.6667	0.6000	0.0667	0.0667
CM_MC2 20 µg/L		0.6000	0.3333	0.2667	0.4667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	10/15	9/15	1/15	1/15
CM_MC2 20 µg/L		9/15	5/15	4/15	7/15

Graphics



① cm mc2 = negative control (10 mg/L Cu added)

EMM
 Dec-19/18

CETIS Analytical Report

Report Date: 05 Dec-18 17:55 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-8845-2819	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:54	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Site Control <i>cmmca2</i>		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① CM_MC2	XC	60	0	60	1	0	0.0%
CM_MC2 20 µg/L		60	0	60	1	0	0.0%

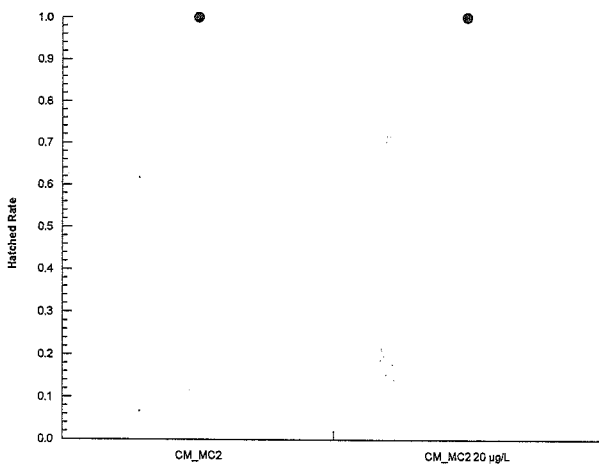
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC2	XC	1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
① CM_MC2	XC	15/15	15/15	15/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15

Graphics



① cmmca2 = negative control (10 µg/L Cu added)

CETIS Analytical Report

Report Date: 05 Dec-18 17:55 (p 2 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-0927-5760	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:54	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	02-9739-4280	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
CM_MC2 20 µg/L	09-0017-5514	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q3_WS_201808	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control <i>CM_MC2</i>		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	XC	60	0	60	1	0	0.0%
CM_MC2 20 µg/L		60	0	60	1	0	0.0%

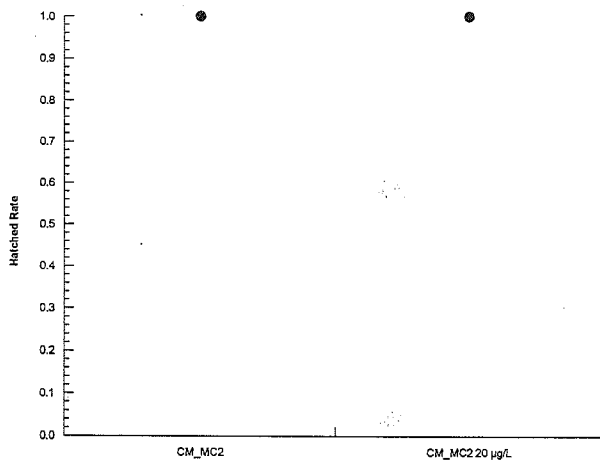
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	XC	15/15	15/15	15/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15

Graphics



① CM_MC2 = negative control (10 µg/L Cu added)

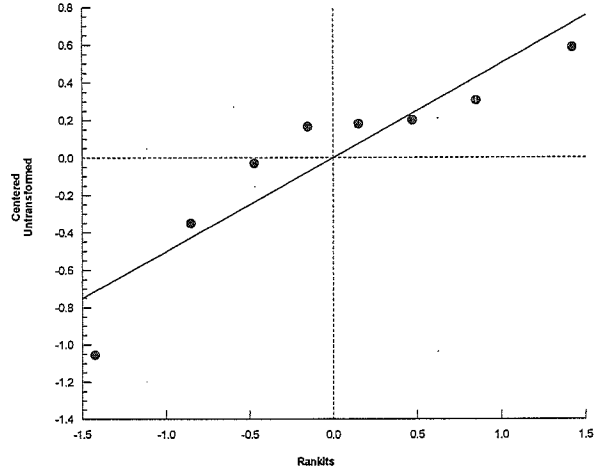
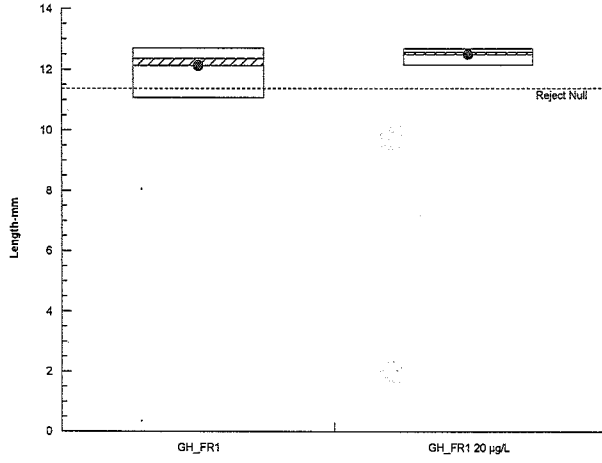
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-4455-9811 Endpoint: Length-mm
Analyzed: 05 Dec-18 17:56 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 1 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-4455-9811	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:56	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_FR1 20 µg/L passed length-mm	6.16%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	-0.95	1.943	0.747	6	CDF	0.8106	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.26645	0.26645	1	0.9026	0.3788	Non-Significant Effect
Error	1.7713	0.295217	6			
Total	2.03775		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	8.046	47.47	0.1206	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8689	0.6451	0.1471	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	U	4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	0.00%
GH_FR1 20 µg/L		4	12.49	12.08	12.9	12.57	12.14	12.69	0.1277	2.05%	-3.01%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	11.07	12.71	12.29	12.43
GH_FR1 20 µg/L		12.46	12.69	12.14	12.67

① GH_FR1 = negative control (10 µg/L Cu added)

CETIS Analytical Report

Report Date: 05 Dec-18 17:54 (p 1 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 05-3857-8138	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:53	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	0.1218	Exact	0.1218	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	U	60	0	60	1	0	-5.26%
GH_FR1 20 µg/L		57	3	60	0.95	0.05	0.0%

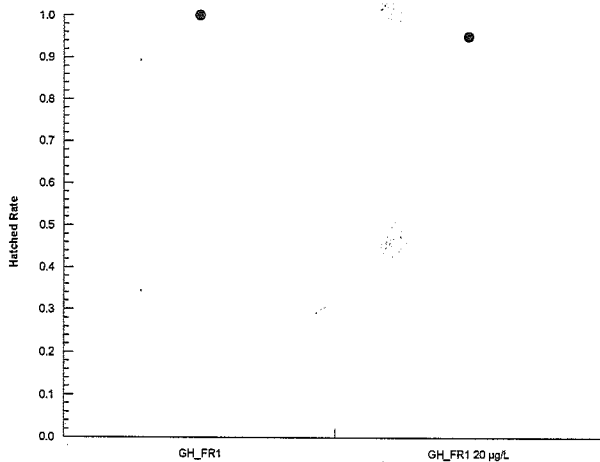
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	1.0000	1.0000	1.0000	1.0000
GH_FR1 20 µg/L		0.9333	0.9333	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	15/15	15/15	15/15	15/15
GH_FR1 20 µg/L		14/15	14/15	15/15	14/15

Graphics



① GH_FR1 = negative control (10 µg/L Cu)

CETIS Analytical Report

Report Date: 05 Dec-18 17:54 (p 2 of 2)
 Test Code/ID: 181279-181278 / 11-7461-0669

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-0989-4291 Endpoint: Hatched Rate CETIS Version: CETISv1.9.4
 Analyzed: 05 Dec-18 17:53 Analysis: Single 2x2 Contingency Table Status Level: 1
 Batch ID: 18-9588-2348 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 10 Aug-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent:
 Ending Date: 10 Sep-18 14:00 Species: Pimephales promelas Brine:
 Test Length: 31d 0h Taxon: Actinopterygii Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	U	60	0	60	1	0	-5.26%
GH_FR1 20 µg/L		57	3	60	0.95	0.05	0.0%

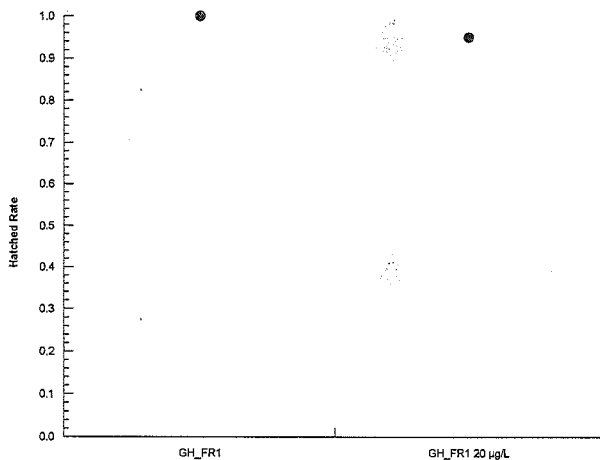
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	1.0000	1.0000	1.0000	1.0000
GH_FR1 20 µg/L		0.9333	0.9333	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	15/15	15/15	15/15	15/15
GH_FR1 20 µg/L		14/15	14/15	15/15	14/15

Graphics



GH_FR1 = negative control (10 µg/L Cu)

CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 3 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4964-3606	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:56	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_FR1 20 µg/L passed length-mm	6.16%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	0.95	1.943	0.747	6	CDF	0.1894	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.26645	0.26645	1	0.9026	0.3788	Non-Significant Effect
Error	1.7713	0.295217	6			
Total	2.03775		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	8.046	47.47	0.1206	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8689	0.6451	0.1471	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	U	4	12.12	10.97	13.28	12.36	11.07	12.71	0.3623	5.98%	0.00%
GH_FR1 20 µg/L		4	12.49	12.08	12.9	12.57	12.14	12.69	0.1277	2.05%	-3.01%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	11.07	12.71	12.29	12.43
GH_FR1 20 µg/L		12.46	12.69	12.14	12.67

① GH-FR1 = negative control (10 µg/L Ca)

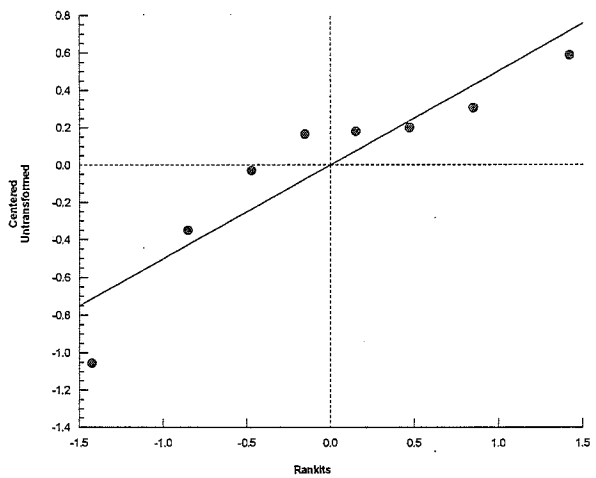
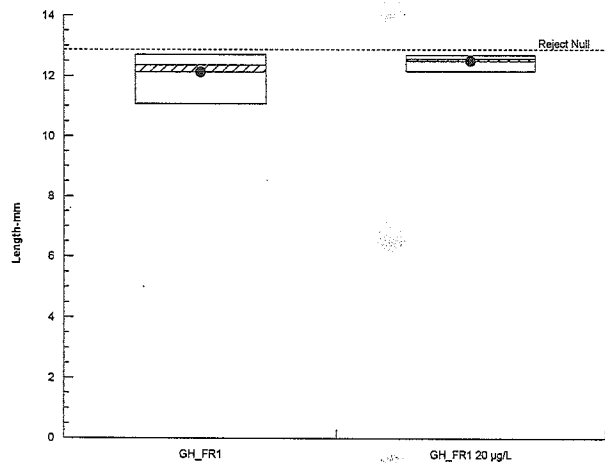
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4964-3606 Endpoint: Length-mm
Analyzed: 05 Dec-18 17:56 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 5 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 01-8027-1495	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4	
Analyzed: 05 Dec-18 17:56	Analysis: Parametric-Two Sample	Status Level: 1	
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus	
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:	
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:	
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox	Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_FR1 20 µg/L passed mean dry biomass-	20.00%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	-3.928	1.943	0.509	6	CDF	0.9961	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.11396	2.11396	1	15.43	0.0077	Significant Effect
Error	0.821921	0.136987	6			
Total	2.93588		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	6.489	47.47	0.1589	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9615	0.6451	0.8240	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	U	4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	0.00%
GH_FR1 20 µg/L		4	3.571	3.267	3.875	3.575	3.344	3.789	0.09564	5.36%	-40.43%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	3.131	2.104	2.753	2.183
GH_FR1 20 µg/L		3.344	3.501	3.649	3.789

① GH_FR1 = negative control (10 µg/L Cu)

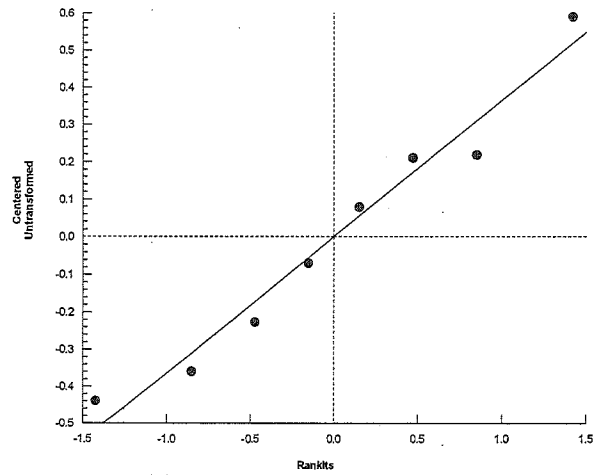
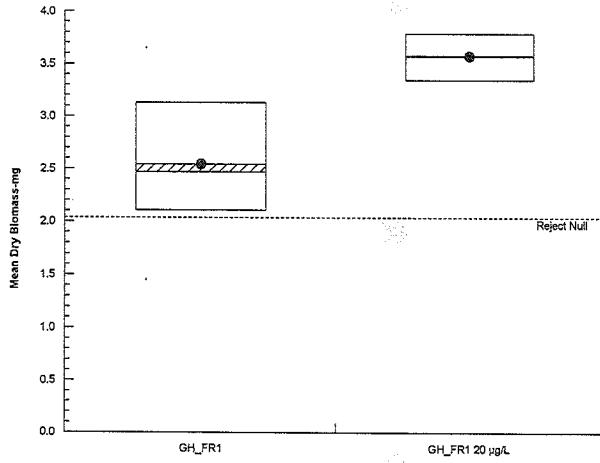
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-8027-1495 Endpoint: Mean Dry Biomass-mg
Analyzed: 05 Dec-18 17:56 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 7 of 8)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-4732-3765	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:56	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox
		Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_FR1 20 µg/L failed mean dry biomass-mg	20.00%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L*	3.928	1.943	0.509	6	CDF	0.0039	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.11396	2.11396	1	15.43	0.0077	Significant Effect
Error	0.821921	0.136987	6			
Total	2.93588		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	6.489	47.47	0.1589	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9615	0.6451	0.8240	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	U	4	2.543	1.768	3.318	2.468	2.104	3.131	0.2436	19.16%	0.00%
GH_FR1 20 µg/L		4	3.571	3.267	3.875	3.575	3.344	3.789	0.09564	5.36%	-40.43%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	3.131	2.104	2.753	2.183
GH_FR1 20 µg/L		3.344	3.501	3.649	3.789

① GH_FR1 = negative control (10 µg/L Cu added)

Dec-21/18

Fathead Minnow 32-d Survival and Growth Test

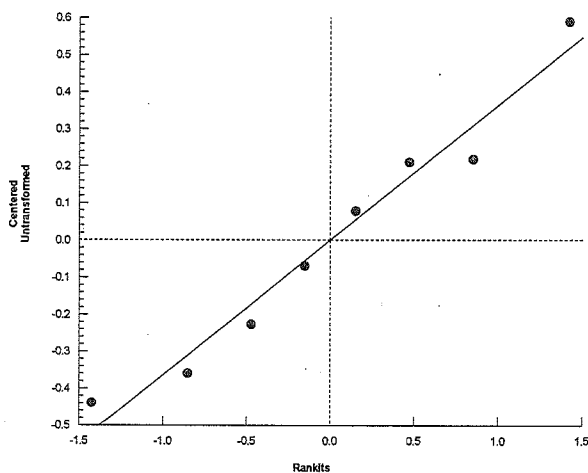
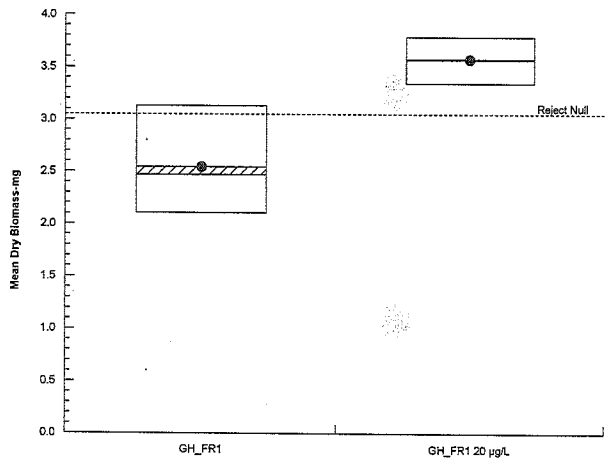
Nautilus Environmental

Analysis ID: 06-4732-3765
Analyzed: 05 Dec-18 17:56

Endpoint: Mean Dry Biomass-mg
Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 1 of 2)

Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4514-3366	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:56	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact Test.

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L	0.9948	Exact	0.9948	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	U	41	19	60	0.6833	0.3167	20.73%
GH_FR1 20 µg/L		50	8	58	0.8621	0.1379	0.0%

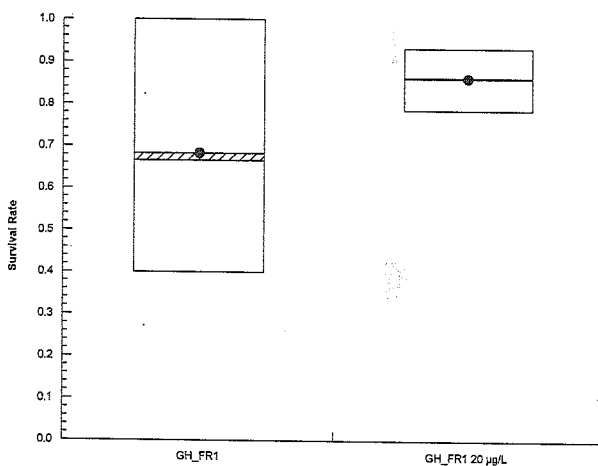
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	1.0000	0.4667	0.8667	0.4000
GH_FR1 20 µg/L		0.7857	0.9286	0.9333	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	15/15	7/15	13/15	6/15
GH_FR1 20 µg/L		11/14	13/14	14/15	12/15

Graphics



① GH_FR1 = negative control (10 µg/L Cu)

CETIS Analytical Report

Report Date: 05 Dec-18 17:57 (p 2 of 2)
 Test Code/ID: 181279-78 / 19-5297-1136

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-3273-8782	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 05 Dec-18 17:56	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 18-9588-2348	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 10 Aug-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 10 Sep-18 14:00	Species: Pimephales promelas	Brine:
Test Length: 31d 0h	Taxon: Actinopterygii	Source: Aquatox Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	12-8775-2594	07 Aug-18	08 Aug-18	86h	Teck Coal	Teck Coal Q3 2018
GH_FR1 20 µg/L	03-8746-5581	07 Aug-18	08 Aug-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-08-07_	
GH_FR1 20 µg/L	Water Sample	Teck Coal	GH_FR1 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_FR1 20 µg/L*	0.0175	Exact	0.0175	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	U	41	19	60	0.6833	0.3167	20.73%
GH_FR1 20 µg/L		50	8	58	0.8621	0.1379	0.0%

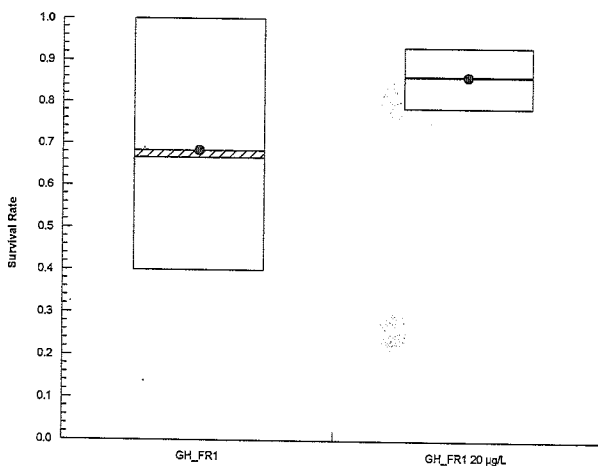
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	1.0000	0.4667	0.8667	0.4000
GH_FR1 20 µg/L		0.7857	0.9286	0.9333	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	U	15/15	7/15	13/15	6/15
GH_FR1 20 µg/L		11/14	13/14	14/15	12/15

Graphics



① GH_FR1 = negative control (10 µg/L Cu added)

EM
 Dec-19/18

APPENDIX E – Chain-of-Custody Forms

COC ID: 20180807-1409

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	BDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.mactdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED															
Sample ID	Sample Location (sys_loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	72 h P. subcapitata P/F	7d C. dubia P/F	28d Hyalella P/F	7d C. dubia P/F with EDTA	28d Hyalella P/F with EDTA	32d FHM P/F-Cu	32d FHM P/F-Cu-20							Temp °C	
FR_FRCP1_MON_2018-08-06_N	FR_FRCP1	WS		2018/08/07	10:12	G	4x20L	181277	X	X	X	X	X	X	X								17.5
FR_UFRI_MON_2018-08-06_N	FR_UFRI	WS		2018/08/07	11:48	C	1820L	181276	X	X	X												18.8

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	07-Aug-18	Nautilus - Burnaby Nori Yamamoto - NY	Aug 08/18 @ 09:30 Q3-week 1

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	<input checked="" type="checkbox"/>	Sampler's Name	Chelsea Jensen/Jason Gravelle
Priority (2-3 business days) - 50% surcharge	<input type="checkbox"/>	Sampler's Signature	<i>Jan Zambelli</i>
Emergency (1 Business Day) - 100% surcharge	<input type="checkbox"/>	Mobile #	250 425 4729
For Emergency <1 Day, ASAP or Weekend - Contact ALS	<input type="checkbox"/>	Date/Time	August 7, 2018

Odeur, sansless, odourless, some particulates

2018 Q3-week 1 (FRO)

Teck

COC ID:	20180807Naut			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		
Job Description	Q3 Chronic Toxicity Sampling			Lab Contact	Emma Marus		
Project Manager	Cameron Griffin			Email	Emma@nautilusenvironmental.ca		
Email	Cameron.Griffin@teck.com			Address	8664 Commerce Court		
Address	RR#1 HWY# 3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Bumaby	Province	BC
Postal Code	V0B 2G1	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8137			Phone Number	604-420-8773		

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dubia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail				Temp (°C)
EV_HC1_WS_2018-08-07_N	EV_HC1	ws	N	8/7/2018	10:20	G	1x20L		/	X	X						15.0
EV_MC2_WS_2018-08-07_N	EV_MC2	ws	N	8/7/2018	11:20	G	1x20L		/	X	X						15.0
Total							2		#	18/277	18/276						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
trout early life stage P/F 30d rainbow	Kimberley Hackett	August 7, 2018	Nautilus - Bumaby NY - Nait Yamamoto	Aug 08/18 @ 09:30 Q3 - week 1

Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Kimberley Hackett	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	<i>Kimberley Hackett</i>	Date/Time	August 7, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Ocean, clearness, odourless, some particulates

2018 Q3 - week 1 (EVO)

COC ID:	20180807-1259			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC		Report Format / Distribution
Project Manager	Chris Blurton			Lab Contact		Email 1:	drake.tymstra@teck.com
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca		Email 2:
Address	Box 2003			Address	8664 Commerce Court		Email 3:
	15km North Hwy 43						Email 4:
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	250-425-3196			Phone Number	604-420-8773		PO number
							EPO00432106

SAMPLE DETAILS							ANALYSIS REQUESTED														
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h P. subcapitata P/F	7d C.dubia P/F	28 d Hyallella P/F											
LC_LCDSSLCC_WS_2018-08-07_N	LC_LCDSSLCC	WS	N	7-Aug-18	0942	G	1x20L	X	X	X											Temp (°C)
LC_SLC_WS_2018-08-07_N	LC_SLC	WS	N	7-Aug-18	0900	G	1x20L	X	X	X											16.5
																					16.5
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS							RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION			DATE/TIME						
Please provide preliminary update as results are available							D.Tymstra/H.Mettler/T. Phillips			May 22, 2018		Nautilus-Burnaby			Aug 08/18 @ 09:30						
												Ny - Wai Yamamoto			@ 3 - week 1						
SERVICE REQUEST (rush - subject to availability)																					
Regular (default) X							Sampler's Name			H. Mettler/		Mobile #									
Priority (2-3 business days) - 50% surcharge							Sampler's Signature					Date/Time			August 7, 2018						
Emergency (1 Business Day) - 100% surcharge																					
For Emergency <1 Day, ASAP or Weekend - Contact ALS																					

Clear, colourless, odourless, some particulates

2018 Q3 week 1 (LCO)

COC ID: **20180814-1249** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - P: Field, L: Lab, PL: Field & Lab, N: None
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS					
FR_FRCPI_WS_20180814_N	FR_FRCPI	WS		2018/08/14	10:49	G	2 x 20L	28 d Hyallella P/F	181278	X	X		
FR_UFRI_WS_20180814_N	FR_UFRI	WS		2018/08/14	09:20	G	1 x 20L	32A FUM PF - Cu 10 Conducted in Calgary.	181279	X			
FR-FRCPI - EDTA								32A FUM PF - Cu 20 Conducted in Calgary.	181280	X			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	14-Aug-18	Nautilus Burnaby	Aug 15/18 @ 09:10
			NY - Nari Yamamoto	Q3 - week 2

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/> Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Chelsea Jensen/Jason Gravelle	250 425 4729
	Sampler's Signature	Date/Time
		August 14, 2018

2018 Q3 Week 2 (FRO)

COC ID: WEEKLY_CHRONIC_08152018_1 TURNAROUND TIME: Regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO						
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental				Report Format / Distribution						
Project Manager Jay Jones				Lab Contact Emma Marus				Email 1:	Scott.Holmgren@teck.com	X	X	X		
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca				Email 2:	teckcoal@equisonline.com			X		
Address PO Box 3000				Address 8664 commerce Court				Email 3:	Karen.Hannan@teck.com	X	X	X		
City Sparwood				Province BC	City Burnaby				Province BC	Email 4:	Don.Sacino@teck.com	X	X	X
Postal Code V0B 2G0				Country Canada	Postal Code V5A 4N7				Country Canada	Email 5:	Jay.jones@teck.com	X	X	X
Phone Number 1-250-425-7321				Phone Number 604-420-8773				PO number 478075						

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PREP.	PREP.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	
CM_MC1_Q3_WS_20180815_N	CM_MC1	WS	n	8/15/2018	11:00	G	1	181278	181279	28 d Hyalalala P/F	32d FHM P/F-CU10	Conducted in Calgary						
CM_MC2_Q3_WS_20180815_N	CM_MC2	WS	n	8/15/2018	11:50	G	2											
CM-MC2 - EDTA																		
CM_MC3_Q3_WS_20180815_NP	CM_MC3	WS	n	8/15/2018	12:20	G	1											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Tyrene Hamilton TH	Aug 16/18 @ 10:44
			Nautilus - Burnaby	Q3-Week 2 Refresh sample

NB OF BOTTLES RETURNED/DESCRIPTION	Regular (default)	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
	X			

Sampler's Name	D5/SB	Mobile #
Sean Bustin		250 425 7518
Sampler's Signature	Date/Time	
	8/15/2018 14:00:00	

2018 Q3-week 2 (mo)

COC ID: 20180821-1435

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begh@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number				

SAMPLE DETAILS							ANALYSIS REQUESTED									
Sample ID	Sample Location (sys_loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PRESERV.	RM	Filterd - F: Field, L: Lab, FL: Field & Lab, N: None					
FR_UFR1_WS_20180821_N	FR_UFR1	WS		2018/08/21	10:40	G	1 x 20L	28-d Hyallicella P/F								
FR_FRCPI_WS_20180821_FB-HG	FR_FRCPI	WS		2018/08/21	12:00	G	2 x 20L	28-d Hyallicella P/F with EDTA								
								32d BHM P/F CND								
								Conducted in Category								
								32d FHM P/F CND #181280								
								Conducted in Category								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle		Tyrone Hamilton TH	Aug 22/18 @ 08:30
			Nautilus - Burnaby	
			Q3 - week 3	

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Chelsea Jensen/Jason Gravelle	250 425 4729
	Sampler's Signature	Date/Time
		August 21, 2018

2018 Q3 - week 3 (FLO)

Teck

address

COC ID:		Q3 Chronic TOX Aug_Naut		TURNAROUND TIME:			regular	RUSH:						
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO						
Facility Name	Greenhills Operations			Lab Name	Nautilus Environmental			EDD delivery:						
Project Manager	Leigh Stickney			Lab Contact	Emma Marus			Site:	leigh.stickney@teck.com		EQUIS:	GHO		
Email	leigh.stickney@teck.com			Email				Report Format / Distribution						
Address	PO Box 5000			Address	8664 Commerce Court			Yes	PDF	Yes	Excel			
City	Elkford		Province	BC		City	Burnaby		Province	BC		Email 1:	leigh.stickney@teck.com	
Postal Code	V0B 1H0		Country	Canada		Postal Code	V5A 4N7		Country	Can		Email 2:	jennifer.kropp@teck.com	
Phone Number	250 865 3274			Phone Number								Email 3:	jeremy.enns@teck.com	
								PO number		540380				

SAMPLE DETAILS								ANALYSIS REQUESTED																					
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																					
								#N/A	#N/A	#N/A	#N/A	#N/A	None	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A										
GH_FR1_WS_2018-08-14_N	GH_FR1	WS	N	Aug 28	11:52	G	1 x 20L	72h P. subcapitata P/F	x	7d C. dubia P/F	x	28 d Hyalella P/F	x	30 d rainbow trout early life stage P/F		7 day Rainbow trout P/F		Rainbow Trout Microbial Testing		32 d FHM P/F Cu10	x	Conducted in Calgary		32 d FHM P/F Cu20	x	Conducted in Calgary		Temp. (°C)	9.8
GH_ER2_WS_2018-08-014_N	GH_ER2	WS	N	Aug 28	10:30	G	1 x 20L	72h P. subcapitata P/F	x	7d C. dubia P/F	x	28 d Hyalella P/F	x	30 d rainbow trout early life stage P/F		7 day Rainbow trout P/F		Rainbow Trout Microbial Testing		32 d FHM P/F Cu10	x	Conducted in Calgary		32 d FHM P/F Cu20	x	Conducted in Calgary		Temp. (°C)	9.8
					7H																								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			Date	Time	Accepted By/Affiliation		Date	Time
								Tyronne Hamilton TH Nautilus Burnaby		Aug. 22/18	@08:30
SERVICE REQUEST (rush - subject to availability)											
Regular (default) X			Sampler's Name			Mobile #					
Priority (2-3 business days) - 50% surcharge			Sampler's Signature			Date/Time					
Emergency (1 Business Day) - 100% surcharge			K.C.								
For Emergency <1 Day, ASAP or Weekend - Contact ALS											

2018 Q3 - week 3 (GHO)

COC ID: WEEKLY_CHRONIC_08212018_1		TURNAROUND TIME: Regular		RUSH:						
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO				
Facility Name / Job# Coal Mountain Operations		Lab Name Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD		
Project Manager Jay Jones		Lab Contact Emma Marus		Email 1:	Scott.Holmgren@teck.com	X	X	X		
Email Jay.Jones@teck.com		Email emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X		
Address PO Box 3000		Address 8664 commerce Court		Email 3:	Karen.Hannan@teck.com	X	X	X		
City Sparwood	Province BC	City Burnaby	Province BC	Email 4:	Don.Sacino@teck.com	X	X	X		
Postal Code V0B 2G0	Country Canada	Postal Code V5A 4N7	Country Canada	Email 5:	Jay.jones@teck.com	X	X	X		
Phone Number 1-250-425-7321		Phone Number 604-420-8773		PO number	478075					
SAMPLE DETAILS				ANALYSIS REQUESTED				Filtered - F: Field; L: Lab; FL: Field & Lab; N: None		
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PRESERV.	Temp (°C)
CM_MC1_Q3_WS_20180821_N	CM_MC1	WS	n	8/21/2018	10:30	G	1 x 20L	28 d Hyalite P/F 181377-TH 181278		12.3
CM_MC2_Q3_WS_20180821_N	CM_MC2	WS	n	8/21/2018	11:37	G	2 x 20L	32d FHM P/F-Cu/D Conducted in Calgary with 181279-TH 181279		12.5
CM_MC2 + EDTA										TH
CM_MC3_Q3_WS_20180821_NP	CM_MC3	WS	n	8/21/2018	11:48	G	1 x 20L	32d FHM P/F-Cu/D Conducted in Calgary with 181279-TH 181280		11.4
										TH
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
							Tyronne Hamilton TH Nautilus - Burnaby Q3-Week 3 Refrash sample		Aug. 22/18 @ 08:30	
NB OF BOTTLES RETURNED/DESCRIPTION			Sampler's Name		DS/SB		Mobile #		250 425 7518	
Regular (default) X			Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time		8/21/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge			For Emergency <1 Day, ASAP or Weekend - Contact ALS		ALAN BUCSIS					

2018 Q3-week 3 (MO)

COC ID: WEEKLY_CHRONIC_08282018_1 TURNAROUND TIME: Regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Emma Marus			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
								Email 3:	Karen.Hannan@teck.com	X	X	X
Address	PO Box 3000			Address	8664 commerce Court			Email 4:	Don.Sacino@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 5:	Jay.jones@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	478075			
Phone Number	1-250-425-7321			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESEV.	ANALYSIS									
CM_MC1_Q3_WS_20180828_N	CM_MC1	WS	n	8/28/2018	9:06	G	1 x 20L	X	✓	28 d Hyallicella P/F 32 d FHM P/F C-10 Conducted by Calgary 32 d FHM P/F C-20 Conducted in Calgary								Temp (°C)	
CM_MC2_Q3_WS_20180828_N	CM_MC2	WS	n	8/28/2018	9:46	G	2 x 20L	X	✓										11.0
CM_MC2								✓											
CM_MC3_Q3_WS_20180828_NP	CM_MC3	WS	n	8/28/2018	10:14	G	1 x 20L	X											9.8
								181278											
								181279											
								181280											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Tyrone Hamilton TH	Aug. 29/18 @ 9:40
			Nautilus - Burnaby	refresh sample Q3 - week 4

NB OF BOTTLES RETURNED/DESCRIPTION	Regular (default) X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name	SH/DS/SB	Mobile #	250 425 7518
					Samplers Signature		Date/Time	8/28/2018 14:00:00

2018 Q3 - week 4 (cont)

COC ID: 20180807-1420

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil_macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	teckcoal@equisonline.com			X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field, L: Lab, FL: Field & Lab, N: None					
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30d early life stage fathead minnow P/F (10 ug/l)	30d early life stage fathead minnow P/F (20 ug/l)									
FR_FRCPI_MON_2018-08-06_N 1718-1557	FR_FRCPI	WS		2018/08/07	10:12	G	6	X	X									YSC
FR_UFRI_MON_2018-08-06_N 1718-1558	FR_UFRI	WS		2018/08/07	11:48	G	3	X										YSC
				2018/08/08	11:30													
				Bear pond														
				Jelca														
				9x 20L carboys														
				NOS/NOI														
				Good condition														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	07-Aug-18		

SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	<i>Jan Smith</i>	Date/Time	August 7, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID:	20180904-1423	TURNAROUND TIME:		RUSH:							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number			

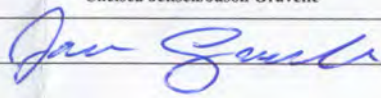
SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F; Field, I; Lab, FI; Field & Lab, N; None

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 d early life stage fathead minnow P/F (10ug/l CU)	30 d early life stage fathead minnow P/F (20ug/l CU)	PHL	PRESERV.	ANALYSIS
FR_FRCPI_MON_2018-09-03_N	1718-1557 FR_FRCPI	WS		2018/09/04	10:47	G	4	X	X			10.39c
FR_UFRI_MON_2018-09-03_N	1718-1558 FR_UFRI	WS		2018/09/04	13:13	G	2	X				10.40c
<p>2018/09/05 10:40 Bearpaw SC 6x 20L carboys Nos/NoI Good condition</p>												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	04-Sep-18		

SERVICE REQUEST (rush - subject to availability)	Regular (default) <input checked="" type="checkbox"/>	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name	Chelsea Jensen/Jason Gravelle		Mobile #	250 425 4729
Sampler's Signature			Date/Time	September 4, 2018

COC ID: 20180814-1258

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report/Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2	chelsea.jensen@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3	chelsea.jensen@teck.com	X	X	X
City	Edmonton	Province	BC	City	Calgary	Province	AB	Email 4	jason.gravelle@teck.com	X	X	X
Postal Code	V6B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5	tecklab@epimailus.com			X
Phone Number	1-250-863-5704			Phone Number	403-253-7171			PO number				

SAMPLE DETAILS							ANALYSIS REQUESTED				
Sample ID	Sample Location (City, Loc, & Site)	Field Matrix	Successive Material (Yes/No)	Date	Time (24hr)	G-Grab C-Comp	# Of Cont	ALS (Yes/No)	Analysis Requested	Price	Notes
FR_FBCPI_WS_20180814_N	1718-1557	FR_FBCPI	WS	2018/08/14	10:49	G	4		30 d early life stage batchhead minnow P/F (10 -4%)	2	15.48
FR_UFRI_WS_20180814_N	1718-1558	FR_UFRI	WS	2018/08/14	09:20	G	2		30 d early life stage batchhead minnow P/F (20 -4%)	2	14.98
<p>2018/08/15 11:00 DU 9x20L DROP OFF NOS/I good</p>											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jason Gravelle	14-Aug-18		
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	August 14, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Teck

Q3 Aug 07

COC ID: ~~Q2~~ Chronic TOX May 22 Hyd

TURNAROUND TIME: regular

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:				
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com		EQUIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution				
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel	
City	Edmonton	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com				
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com				
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED																
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A					
GH_FR1_WS_2018-08-07_N	1718-1559 GH_FR1	WS	N	7-Aug-18	13:26	G	6	x	x															
GH_ER2_WS_2018-08-07_N	1718-1560 GH_ER2	WS	N	7-Aug-18	10:40	G	3	x																

15°C
15°C

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: **Q3 Chronic TOX Aug14_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:				
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com		EQuIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution				
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel	
City	Elkford			Province	BC			City	Calgary		Province	AB
Postal Code	V0B 1H0			Country	Canada			City	T2H 2K1		Country	Can
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number				
Email 1:				leigh.stickney@teck.com				Email 2:				jennifer.kropp@teck.com
Email 3:				jeremy.enns@teck.com								

SAMPLE DETAILS								ANALYSIS REQUESTED																
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A				
GH_FR1_WS_2018-08-21_N <i>1718-1559</i>	GH_FR1	WS	N	<i>2</i> Aug-18	<i>11:52</i>	G	4	x	x															
GH_ER2_WS_2018-08-21_N <i>1718-1560</i>	GH_ER2	WS	N	<i>2</i> Aug-18	<i>10:30</i>	G	2	x																
								<i>2018/08/22</i> <i>11:20</i> <i>Rear park</i> <i>SC</i> <i>6 x 20 L carboys</i> <i>No 6/No 7</i> <i>Good condition</i>																

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default) <input checked="" type="checkbox"/>	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name		Mobile #	
Sampler's Signature		Date/Time	

COC ID: **WEEKLY_CHRONIC_08212018_2** TURNAROUND TIME: **Regular** RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories				Report Format / Distribution				
Project Manager Jay Jones				Lab Contact Claudio Quinteros				Email 1:	Scott.Holmgren@teck.com	X	X	X
Email Jay.Jones@teck.com				Jessica Wang				Email 2:	teckcoal@equisonline.com			X
				Email claudio@nautilusenvironmental.ca				Email 3:	Karen.Hannan@teck.com	X	X	X
				Email jessica@nautilusenvironmental.ca				Email 4:	Don.Sacino@teck.com	X	X	X
Address PO Box 3000				Address #4, 6125-12th Street S.E.				Email 5:	Jay.jones@teck.com	X	X	X
City Sparwood		Province BC		City Calgary		Province AB	PO number	478075				
Postal Code V0B 2G0		Country Canada		Postal Code T2H 2K1		Country Canada						
Phone Number 1-250-425-7321				Phone Number 403-253-7121								

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)						
CM_MC1_Q3_WS_20180821_N <i>1718-1562</i>	CM_MC1	WS	n	8/21/2018	<i>10:30</i>	G	2	X							
CM_MC2_Q3_WS_20180821_N <i>1718-1561</i>	CM_MC2	WS	n	8/21/2018	<i>11:37</i>	G	4	X	X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	DS/SB	Mobile #	250 425 7518
Regular (default)	X	Sampler's Signature	<i>Sean Bucin</i>	Date/Time	8/21/2018 14:00:00
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

*2018/08/22
~~10:00~~ 11:20
 Bear paw
 JC
 6x 20 L carboys
 No S/No I
 Good condition*

COC ID: WEEKLY_CHRONIC_08282018_2 TURNAROUND TIME: Regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories		Report Format / Distribution				Excel	PDF	EDD
Project Manager Jay Jones				Lab Contact Claudio Quinteros		Email 1:	Scott.Holmgren@teck.com	X	X	X		
Email Jay.Jones@teck.com						Email 2:	teckcoal@equisonline.com				X	
				Email claudio@nautilusenvironmental.ca		Email 3:	Karen.Hannan@teck.com	X	X	X		
				Email jessica@nautilusenvironmental.ca		Email 4:	Don.Sacino@teck.com	X	X	X		
Address PO Box 3000				Address #4, 6125-12th Street S.E.		Email 5:	Jay.jones@teck.com	X	X	X		
City Sparwood		Province BC	City Calgary	Province AB	PO number	478075						
Postal Code V0B 2G0		Country Canada	Postal Code T2H 2K1	Country Canada								
Phone Number 1-250-425-7321		Phone Number 403-253-7121										

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PRESERV.	FILE						
CM_MC1_Q3_WS_20180828_N 1718-1562	CM_MC1	WS	n	8/28/2018	9:06	G	2	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)								
CM_MC2_Q3_WS_20180828_N 1718-1561	CM_MC2	WS	n	8/28/2018	9:46	G	4	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)								

2018/08/29
11:30
Bear paw
SC
6x 20L carboys
No 5/No 1
Good condition

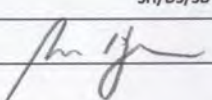
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	SH/DS/SB	Mobile #	250 425 7518		
Regular (default) X							
Priority (2-3 business days) - 50% surcharge							
Emergency (1 Business Day) - 100% surcharge							
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Sampler's Signature		Date/Time	8/28/2018 14:00:00		



COC ID: **WEEKLY_CHRONIC_09042018_2** TURNAROUND TIME: **Regular** RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories				Report Format / Distribution			
Project Manager Jay Jones				Lab Contact Claudio Quinteros				Email 1: Scott.Holmgren@teck.com X X X			
Email Jay.Jones@teck.com				Email claudio@nautilusenvironmental.ca				Email 2: teckcoal@equisonline.com X X X			
				Email jessica@nautilusenvironmental.ca				Email 3: Karen.Hannan@teck.com X X X			
				Email jessica@nautilusenvironmental.ca				Email 4: Don.Sacino@teck.com X X X			
Address PO Box 3000				Address #4, 6125-12th Street S.E.				Email 5: Jay.jones@teck.com X X X			
City Sparwood		Province BC		City Calgary		Province AB		PO number 478075			
Postal Code V0B 2G0		Country Canada		Postal Code T2H 2K1		Country Canada					
Phone Number 1-250-425-7321				Phone Number 403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PHI	PRECIP.	ANALYSIS					
CM_MC1_Q3_WS_20180904_N 1718-1562	CM_MC1	WS	n	9/4/2018	9:59	G	2			30 d early life stage fathead minnow P/F (10 ug/l CU Treated)					
											10.0°C				
CM_MC2_Q3_WS_20180904_N 1718-1561	CM_MC2	WS	n	9/4/2018	10:30	G	4			30 d early life stage fathead minnow P/F (20 ug/l CU Treated)					
											9.8°C	X			
Week 5															

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
NB OF BOTTLES RETURNED/DESCRIPTION			Sampler's Name			SH/DS/SB		Mobile #		250 425 7518	
Regular (default) X			Priority (2-3 business days) - 50% surcharge			Emergency (1 Business Day) - 100% surcharge		For Emergency <1 Day, ASAP or Weekend - Contact ALS		Sampler's Signature 	
								Date/Time		9/4/2018 14:00:00	

END OF REPORT

Appendix B-4
Fourth Quarter 2018 Results: Toxicity testing on
Elk Valley samples with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata, *Hyalella azteca*
Pimephales promelas and *Oncorhynchus mykiss*



**Toxicity testing on Elk Valley samples
with *Ceriodaphnia dubia*,
Pseudokirchneriella subcapitata,
Hyalella azteca, *Pimephales promelas*
and *Oncorhynchus mykiss***

Fourth Quarter 2018 Results

Final Report

April 29, 2019

Submitted to: **Teck Coal Ltd.**
Sparwood, BC

TABLE OF CONTENTS

	Page
Signature Page.....	iv
Summary.....	v
1.0 Introduction.....	1
2.0 Methods.....	4
3.0 Results.....	10
3.1 <i>Ceriodaphnia dubia</i>	10
3.2 <i>Pseudokirchneriella subcapitata</i>	10
3.3 <i>Hyaella azteca</i>	10
3.4 <i>Pimephales promelas</i>	11
3.5 <i>Oncorhynchus mykiss</i>	11
4.0 QA/QC.....	18
5.0 References.....	20

List of Tables

Table 1.	Summary of toxicity testing program.....	2
Table 2.	Test conditions: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	5
Table 3.	Test conditions: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	6
Table 4.	Test conditions: <i>Hyaella azteca</i> survival and growth test.....	7
Table 5.	Test conditions: <i>Pimephales promelas</i> survival and growth test.....	8
Table 6.	Test conditions: <i>Oncorhynchus mykiss</i> embryo-alevin development test.....	9
Table 7.	Results: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	13
Table 8.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	14
Table 9.	Interim Results: <i>Hyaella azteca</i> survival and growth test.....	15
Table 10.	Results: <i>Pimephales promelas</i> survival and growth test.....	16
Table 11.	Results: <i>Oncorhynchus mykiss</i> embryo-alevin development test.....	17
Table 12.	Reference toxicant test results.....	19

List of Figures

Figure 1.	Chronic toxicity monitoring locations.	3
-----------	---	---

List of Appendices

APPENDIX A – <i>Ceriodaphnia dubia</i> Toxicity Test Data	
APPENDIX B – <i>Pseudokirchneriella subcapitata</i> Toxicity Test Data	
APPENDIX C – <i>Hyaella azteca</i> Toxicity Test Data	
APPENDIX D – <i>Pimephales promelas</i> Toxicity Test Data	
APPENDIX E – <i>Oncorhynchus mykiss</i> Toxicity Test Data	
APPENDIX F - Chain-of-Custody Forms	

SIGNATURE PAGE



Report By:
Emma Marus, B.Sc.
Laboratory Biologist



Reviewed By:
Bonnie Lo, M.E.T.
Environmental Toxicologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Summaries of sample information and test results from the toxicity tests conducted on samples collected from the Elk Valley to meet requirements of the quarterly toxicity testing program required under BC Ministry of Environment and Sustainability permit number 107517 in the fourth quarter of 2018 are provided in the tables below.

Sample and Test Type Information

Sample IDs	FR_UFR1 (site control), GH_ER2 (site control), CM_MC1 (site control), LC_SLC (site control) [†] , FR_FRCP1, FR_FRABCH, GH_FR1, GH_ERC [‡] , EV_HC1 [‡] , EV_MC2 [‡] , CM_MC2, CM_MC3 ^{*†} , LC_LCDSSLCC [†]
Sample collection dates	
<i>C. dubia</i> and <i>P. subcapitata</i>	October 30, 2018
<i>H. azetca</i>	January 8, 9, 15,16, 23 and 30, 2019 [#]
<i>P. promelas</i>	October 30, November 6, 13, 20, and 27, 2018
<i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
Sample receipt dates	One day after sample collection
Sample receipt temperatures	Ranged from 0.0 to 8.4°C
Test types	<i>Ceriodaphnia dubia</i> 7-d survival and reproduction <i>Pseudokirchneriella subcapitata</i> 72-h growth inhibition <i>Hyalella azteca</i> 28-d survival and growth <i>Pimephales promelas</i> 32-d survival and growth <i>Oncorhynchus mykiss</i> (rainbow trout) embryo-alevin development

[†] Not tested with *P. promelas*

^{*} Not tested with *P. subcapitata* and *O. mykiss*

[#] Test was re-initiated in January, 2019, due to control failure associated with the initial tests (see Section 4)

Summary of Results

Endpoint	Mean ± SD				
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	LC_SLC (Site Control)
<i>C. dubia</i>					
Survival (%)	90	90	100	100	100
Reproduction	18.9 ± 4.1	21.0 ± 7.1	21.4 ± 7.4	23.8 ± 5.4	19.7 ± 3.7
<i>P. subcapitata</i>					
Cell Yield (x 10 ⁴ cells/mL)	28.8 ± 2.1	109.1 ± 6.8	104.8 ± 6.0 [#]	111.2 ± 8.1	109.9 ± 8.2
<i>H. azteca</i>					
Survival (%)	94.0 ± 8.9	88.0 ± 21.7	92.0 ± 4.5	88.0 ± 11.0	92.0 ± 4.5
Dry weight (mg)	0.34 ± 0.20	0.19 ± 0.08	0.24 ± 0.11	0.46 ± 0.17	0.23 ± 0.12
<i>O. mykiss</i>					
Survival (%)	92.4 ± 8.1	86.7 ± 3.3	87.8 ± 9.7	80.0 ± 0.0	89.7 ± 6.0
Viability (%)	88.0 ± 10.5	83.3 ± 3.3	87.8 ± 9.7	80.0 ± 0.0	88.6 ± 8.0
Length (mm)	20.6 ± 0.3	21.0 ± 0.2	21.1 ± 0.0	21.4 ± 0.4	21.3 ± 0.2
Wet weight (mg)	102.2 ± 4.3	103.8 ± 2.6	104.7 ± 2.1	105.6 ± 2.4	104.7 ± 3.3

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^a Result was significantly lower than the site control FR_UFR1

^b Result was significantly lower than the site control GH_ER2

[#] Result was significantly lower than the site control CM_MC1

^o Result was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD			
	FR_FRCP1	FR_FRABCH	GH_FR1	GH_ERC
<i>C. dubia</i>				
Survival (%)	90	90	100	90
Reproduction	1.1 ± 1.9 * α β # δ	18.4 ± 6.3	17.3 ± 6.8	18.3 ± 5.4
<i>P. subcapitata</i>				
Cell Yield (x 10 ⁴ cells/mL)	7.0 ± 1.8 * α β # δ	92.0 ± 5.6 α β # δ	109.0 ± 8.6	118.8 ± 1.7
<i>H. azteca</i>				
Survival (%)	16.0 ± 23.0 * α β # δ	88.0 ± 13.0	86.0 ± 16.7	80.0 ± 24.5
Dry weight (mg)	0.06 ± 0.02 * α β # δ	0.17 ± 0.14 #	0.16 ± 0.06	0.16 ± 0.07
<i>O. mykiss</i>				
Survival (%)	21.1 ± 21.7 * α β # δ	70.4 ± 20.0 * β δ	61.1 ± 19.5 * α β δ	90.0 ± 0.0
Viability (%)	16.7 ± 15.3 * α β # δ	69.3 ± 21.2 * β δ	60.0 ± 17.6 * α β # δ	86.7 ± 3.3
Length (mm)	17.1 ± 0.1 * α β # δ	20.3 ± 0.8 # δ	19.8 ± 0.1 α β # δ	20.7 ± 0.4
Wet weight (mg)	88.8 ± 0.6 * α β # δ	100.9 ± 4.7	99.6 ± 3.8	98.6 ± 2.6

SD = Standard Deviation, NT=Not Tested

* Result was significantly lower than the laboratory control

α Result was significantly lower than the site control FR_UFR1

β Result was significantly lower than the site control GH_ER2

Result was significantly lower than the site control CM_MC1

δ Result was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD				
	EV_HC1	EV_MC2	CM_MC2	CM_MC3	LC_LCDSSLCC
<i>C. dubia</i>					
Survival (%)	100	100	80	100	90
Reproduction	22.8 ± 3.9	17.3 ± 5.9	0.0 ± 0.0 ^{*αβ#δ}	3.6 ± 2.1 ^{*αβ#δ}	11.9 ± 4.3 ^{*αβ#δ}
<i>P. subcapitata</i>					
Cell Yield (x 10 ⁴ cells/mL)	109.2 ± 2.6	90.5 ± 5.3 ^{αβ#δ}	94.8 ± 7.8 ^{α#δ}	NT	87.8 ± 8.2 ^{αβ#δ}
<i>H. azteca</i>					
Survival (%)	88.0 ± 4.5	92.0 ± 13.0	66.0 ± 16.7 ^{*α}	76.0 ± 23.0	70.0 ± 28.3 [*]
Dry weight (mg)	0.30 ± 0.12	0.17 ± 0.02	0.07 ± 0.02 ^{*αβ#δ}	0.22 ± 0.08	0.12 ± 0.07 ^{αβ#}
<i>O. mykiss</i>					
Survival (%)	77.5 ± 14.0	84.2 ± 14.1	77.8 ± 13.9	NT	92.0 ± 8.0
Viability (%)	77.5 ± 14.0	84.2 ± 14.1	76.7 ± 14.5	NT	90.9 ± 10.0
Length (mm)	21.2 ± 0.8	21.6 ± 0.1	21.3 ± 0.2	NT	21.7 ± 0.2
Wet weight (mg)	105.2 ± 6.2	107.9 ± 2.6	111.0 ± 3.8	NT	112.1 ± 4.2

SD = Standard Deviation, NT=Not Tested

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[#] Result was significantly lower than the site control CM_MC1

^δ Result was significantly lower than the site control LC_SLC

Summary of Results (continued)

Endpoint	Mean ± SD							
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1	CM_MC2	FR_FRABCH
<i>P. promelas</i>								
10 µg/L Cu								
Hatch (%)	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	98.3 ± 3.3	95.0 ± 6.4	100.0 ± 0.0	98.3 ± 3.3	98.3 ± 3.3
Survival (%)	90.0 ± 11.6	98.3 ± 3.3	93.3 ± 5.4	83.3 ± 13.9	1.7 ± 3.3* ^{αβ#}	80.0 ± 15.4 ^α	80.0 ± 16.3 ^α	51.7 ± 11.4* ^{αβ#}
Biomass (mg)	3.3 ± 0.1	3.2 ± 0.2	3.3 ± 0.3	2.6 ± 0.2*	0.02 ± 0.03* ^{αβ#}	2.6 ± 0.1* ^{αβ}	2.5 ± 0.3* ^{αβ}	1.9 ± 0.1* ^{αβ#}
Length (mm)	11.3 ± 0.6	11.7 ± 0.2	12.0 ± 0.1	11.2 ± 0.6	1.8 ± 3.5* ^{αβ#}	11.6 ± 0.5	11.3 ± 0.7 ^β	11.8 ± 0.9
Normal development (%)	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	NT	98.2 ± 0.04	100.0 ± 0.0	100.0 ± 0.0
20 µg/L Cu								
Hatch (%)	100.0 ± 0.0	NT	NT	NT	98.3 ± 3.3	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0
Survival (%)	96.7 ± 3.8	NT	NT	NT	1.7 ± 3.3 [§]	93.3 ± 7.7	88.3 ± 3.3	60.0 ± 23.7 [§]
Biomass (mg)	3.2 ± 0.1	NT	NT	NT	0.1 ± 0.3 [§]	2.6 ± 0.0 [§]	2.9 ± 0.2 [§]	1.9 ± 0.1 [§]
Length (mm)	11.2 ± 0.3	NT	NT	NT	3.5 ± 7.0 [§]	10.6 ± 0.1 [§]	10.8 ± 0.4	11.1 ± 1.2
Normal development (%)	100.0 ± 0.0	NT	NT	NT	NT	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0

SD = Standard Deviation, NT=Not Tested,

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

^β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

[#] Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

[§] Result was significantly lower than the 20 µg/L copper-treated laboratory control

1.0 INTRODUCTION

Nautilus Environmental conducted toxicity tests for Teck Coal Ltd. on samples collected from various locations in the Elk Valley as part of a quarterly toxicity testing program required under BC Ministry of Environment and Climate Change Strategy permit number 107517. Test species required to be tested quarterly include a cladoceran (*Ceriodaphnia dubia*), a unicellular green alga (*Pseudokirchneriella subcapitata*), an amphipod (*Hyaella azteca*), and the fathead minnow (*Pimephales promelas*). Tests are also required on a semi-annual basis (in alignment with second and fourth quarter testing) using rainbow trout (*Oncorhynchus mykiss*).

Water samples used for testing were transported in 20-L plastic containers in coolers containing ice packs, or in 200-L plastic drums. Samples were received at temperatures ranging from 0.0 to 8.4°C and were stored in the dark at $4 \pm 2^\circ\text{C}$ prior to testing. Table 1 summarizes the toxicity tests that were conducted on each sample as well as sample collection dates. Samples were collected weekly on the dates shown in Table 1 for the duration of the *H. azteca*, *P. promelas* and *O. mykiss* tests. The *P. promelas* test was conducted at the Nautilus Environmental laboratory in Calgary, AB; the other toxicity tests were conducted at the Burnaby, BC location.

This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through E. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management System database. These samples were collected by Teck personnel at the same time the samples were collected for toxicity testing. The chain-of-custody forms are provided in Appendix F.

Table 1. Summary of toxicity testing program.

Sample ID	EMS Location ID	Species Tested	Sample Collection Dates
FR_UFR1 *	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20, and 27, 2018
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20, and 27, 2018
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20, and 27, 2018
LC_SLC *	E282149	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
FR_FRABCH	-	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
GH_ERC	E300090	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
EV_HC1	E102682	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†αθ} and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
EV_MC2	E300091	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#θ} and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} , <i>P. promelas</i> and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018
CM_MC3	-	<i>C. dubia</i> and <i>H. azteca</i> ^{†#β}	October 30, November 6, 13, 20 and 27, 2018
LC_LCDSSLCC	E297110	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> ^{†#β} and <i>O. mykiss</i>	October 30, November 6, 13, 20 and 27, 2018

* Site water controls

† Re-tested due to control failure; sample collection dates for re-test were January 8, 9, 15, 16, 23 and 30, 2019.

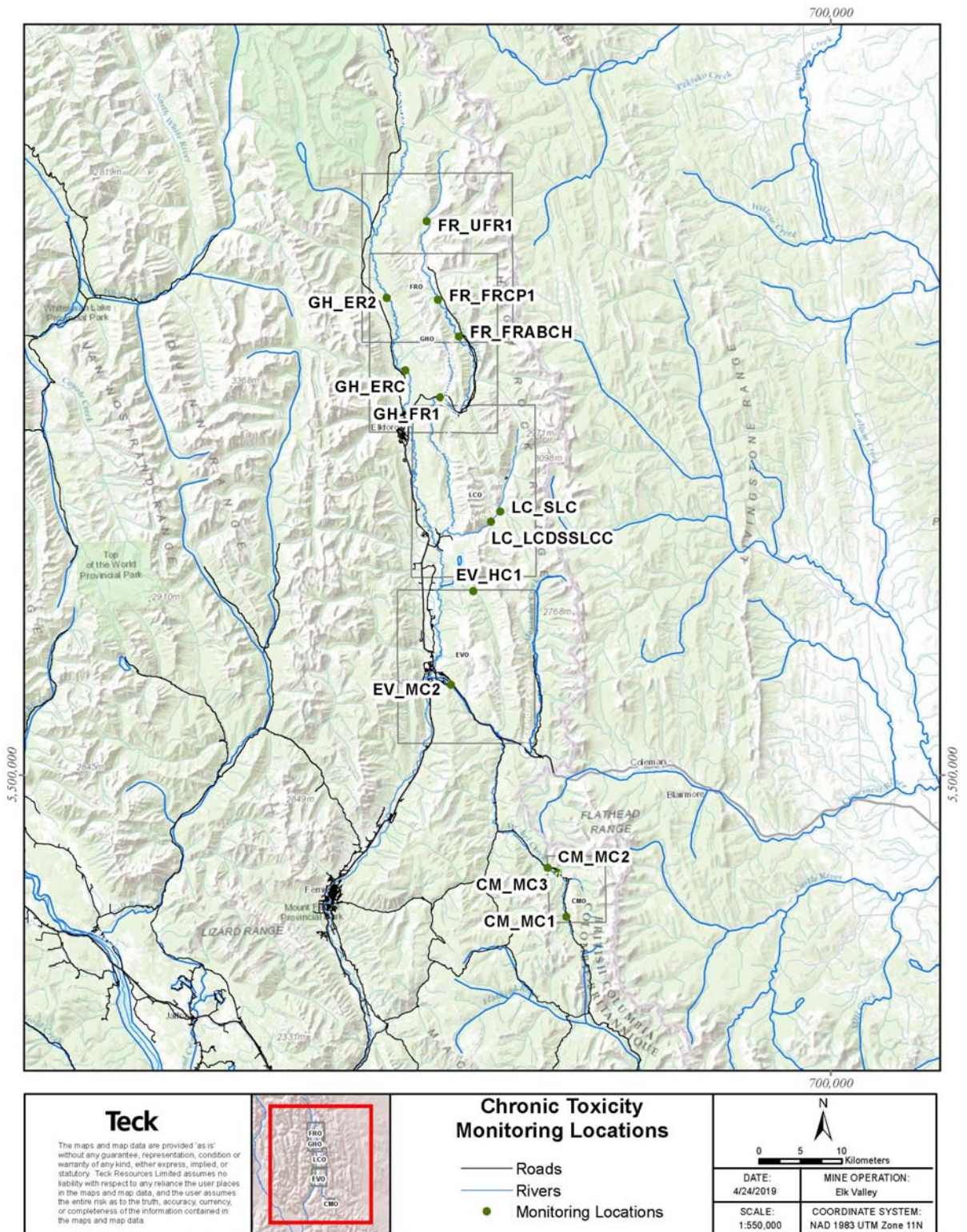
^αCollected January 8, 2019

[#]Collected January 9, 2019

^θ Collected January 15, 2019

^βCollected January 16, 2019

Figure 1. Chronic toxicity monitoring locations.



2.0 METHODS

Methods for the toxicity tests using *C. dubia*, *P. subcapitata*, *H. azteca*, *P. promelas* and *O. mykiss* are summarized in Tables 2 through 6. Laboratory control water was 20% Perrier water prepared with deionized water for *C. dubia*; dechlorinated City of Calgary municipal tap water with the addition of 4 mg/L potassium chloride (KCl) for *P. promelas*; reconstituted water prepared by addition of reagent grade salts to dechlorinated Metro Vancouver municipal tap water for *H. azteca* according to a recipe provided in Environment Canada (2013); dechlorinated Metro Vancouver municipal tap water for *O. mykiss*; and deionized water with supplemented nutrients for *P. subcapitata*.

For the *H. azteca* tests, all of the site waters were supplemented with 25 mg/L chloride and 0.02 mg/L bromide using NaCl and NaBr, respectively, according to recommendations of the *Hyaella* Advisory Group (chaired by Chris Ingersoll, USGS) (Norberg-King et al., 2014), since low concentrations of these halides are known to impair growth of this species. The laboratory control water contained approximately 75 mg/L chloride and 0.8 mg/L bromide, respectively.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Kszos et al., 1997; Downey et al. 2000). Results of toxicity tests and Toxicity Identification Evaluation efforts conducted in 2015 indicated that artefactual toxicity (i.e., adverse effects that were not associated with toxicants in the sample) had occurred in fathead minnow tests using ambient water samples from the Elk Valley and amendment of the samples with a low dose of copper appeared to counteract the adverse effect. Consequently, the *P. promelas* tests were tested on the samples with addition of 10 µg/L copper, in order to reduce the potential adverse effects caused by fungi and microbes in the samples. Four of the site waters (FR_FRCP1, GH_FR1, CM_MC2 and FR_FRABCH) were also tested using 20 µg/L copper to evaluate whether higher concentration of copper was necessary to control microbial growth in these samples, which contained a higher hardness than the other samples. Copper-amended control water treatments using the same concentrations were also evaluated to test whether copper itself caused any adverse response.

Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013), and involved comparison of results to both the laboratory and site water controls.

Table 2. Test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	<i>Ceriodaphnia dubia</i>
Organism source	In-house culture
Organism age	<24 hour old neonates, produced within a 12 hour window
Test type	Static-renewal
Test duration	7 ± 1 day
Test vessel	20-mL glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Control water	20% Perrier water and 80% deionized water + 5 µg/L Se and 2 µg/L vitamin B12
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with <i>Pseudokirchneriella subcapitata</i> and YCT (3:1 ratio)
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival and reproduction checked daily
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and reproduction ≥80% survival; ≥15 young per surviving control producing three broods; ≥60% of controls producing three or more broods; no ephippia present
Test acceptability criteria for controls	
Reference toxicant	Sodium chloride (NaCl)

Table 3. Test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	<i>Pseudokirchneriella subcapitata</i> , strain CPCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Full strength sample diluted to 95.2% (v/v) by addition of nutrients, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control and site control
Number of organisms	10,000 cells/mL
Control water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007b), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoints	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as ZnSO ₄)

Table 4. Test conditions: *Hyalella azteca* survival and growth test.

Test species	<i>Hyalella azteca</i>
Organism source	Aquatic Research Organisms, NH
Organism age	7- to 8-days old
Test type	Static-renewal
Test duration	28 days
Test vessel	375-mL glass container
Test volume	300 mL
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	5 per treatment
Number of organisms	10 per replicate
Control water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples were supplemented with 25 mg/L Cl and 0.02 mg/L Br.
Test solution renewal	Twice daily (~80% renewal)
Test temperature	23 ± 1°C
Feeding	1 mL of YCT daily to each container. Tetramin daily, with amounts increasing weekly: Week 1: 0.25 mg, Week 2: 0.5 mg, Week 3: 1 mg, Week 4: 1.5 mg in each test container.
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; hardness and alkalinity measured at test termination; total ammonia measured at test initiation and termination
Test protocol	Modified from US EPA (2000), as described in Norberg-King et al. (2014)
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	Mean control survival of ≥80% survival
Reference toxicant	Sodium chloride (NaCl)

Table 5. Test conditions: *Pimephales promelas* survival and growth test.

Test species	<i>Pimephales promelas</i>
Organism source	Aquatic Biosystems, CO
Organism age	<24 hours
Test type	Static-renewal
Test duration	From egg stage until 28 days post hatch
Test vessel	1-L glass jar
Test volume	1 L
Test concentrations	100% (undiluted) sample amended with 10 or 20 µg/L Cu, plus laboratory control and control amended with 10 or 20 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control water	Dechlorinated City of Calgary municipal tapwater
Test solution renewal	Daily (80% renewal)
Test temperature	25 ± 1°C
Feeding	Twice a day, after hatch, with newly hatched brine shrimp (<i>Artemia nauplii</i>)
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None unless dissolved oxygen fell to less than 60% saturation
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity measured upon arrival; survival checked daily
Test protocol	US EPA (1996) and ASTM (2013)
Statistical software	CETIS Version 1.9.4
Test endpoints	Hatch, survival, length, biomass, normal development (which assesses incidence of deformities)
Test acceptability criteria for controls	>66% hatch, ≥70% post-hatch survival
Reference toxicant	Sodium chloride (NaCl)

Table 6. Test conditions: *Oncorhynchus mykiss* embryo-alevin development test.

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Lyndon Fish Hatcheries, ON
Gamete quality	Small amount of water added to milt on a dry glass slide; verification of vigorous sperm motility using a compound microscope (100 X magnification)
Organism age	<30 minutes post fertilization, <24 hour old gametes
Test type	Static-renewal
Test duration	Test terminated 7 days after ≥50% of controls hatch
Test vessel	4-L plastic containers
Test volume	2 L
Test solution depth	17 cm
Test concentrations	100% (undiluted sample), plus laboratory control
Test replicates	3 per treatment
Number of organisms	30 per replicate
Control water	Dechlorinated Metro Vancouver municipal tap water
Test solution renewal	Daily (80% renewal)
Test temperature	14 ± 1°C
Feeding	None
Light intensity	Dark
Photoperiod	24 hours dark; low intensity light used during solution renewals
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured upon arrival; survival checked daily
Test protocol	Environment Canada (1998), EPS 1/RM/28
Statistical software	CETIS Version 1.9.4
Test endpoint	Survival, viability (which assesses incidence of deformities), length, wet weight
Test acceptability criteria for controls	≥65% normally developed hatched fish
Reference toxicant	Sodium dodecyl sulphate (SDS)

2.0 RESULTS

2.1 *Ceriodaphnia dubia*

Results of the toxicity tests using *C. dubia* are provided in Table 7. The Fording River (FR_UFR1), Elk River (GH_ER2), Michel Creek (CM_MC1) and South Line Creek (LC_SLC) site water controls performed similarly to the laboratory control for this species, indicating that there were no adverse effects associated with the upstream Fording River, Elk River, Michel Creek and South Line Creek stations.

There were no adverse effects on survival in any of the samples tested; survival ranged between 80 and 100%. Reproduction was significantly reduced in four samples (FR_FRCP1, CM_MC2, CM_MC3 and LC_LCDSSLCC) relative to the laboratory control and all four site water controls. The most apparent reduction was observed in FR_FRCP1, CM_MC2 and CM_MC3 in which reproduction was reduced by 80 to 100% relative to the laboratory control.

2.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 8. The site water controls FR_UFR1, GH_ER2, CM_MC1 and LC_SLC produced 3.6 to 3.9-fold greater growth than the laboratory control. This finding is not unusual, since the higher ionic strength associated with the site water controls would be expected to stimulate cell growth of this species relative to the very low ionic strength associated with the laboratory control water.

With the exception of sample FR_FRCP1, there were no adverse effects on cell yield in any of the samples tested relative to the laboratory control; stimulation ranged between 205.2 and 313.0%. Cell yield was significantly reduced in sample FR_FRCP1; growth was reduced by approximately 76% relative to the laboratory control for this sample. Compared to the upstream site water controls, there was a small, but statistically significant decrease in growth in samples FR_FRABCH, GH_ER2, EV_MC2, CM_MC2 and LC_LCDSSLCC.

2.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 9. The site water controls FR_UFR1, GH_ER2, CM_MC1 and LC_SLC performed similarly to the laboratory control, indicating that there were no adverse effects associated with any of the upstream site waters.

Survival was reduced significantly in two samples (FR_FRCP1 and CM_MC2) relative to two or more of the site water controls; there was 16% survival in FR_FRCP1 and 66% survival in CM_MC2. Sample LC_LCDSSLCC also produced a small, but statistically significant reduction in survival compared to the laboratory control (but not site controls); survival at this location was 70%. There were no adverse effects on survival in any of the other samples tested; survival ranged between 76 and 92%. There was an adverse effect on growth in samples FR_FRCP1, CM_MC2, LC_LCDSSLCC and FR_FRABCH.

2.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 10. There were no adverse effects associated with site water controls FR_UFR1, GH_ER2 and CM_MC1; results for survival, hatch, length and normal development (i.e., incidence of deformities) were similar between site water controls and the laboratory control. The biomass endpoint in site water control CM_MC1 was marginally, but statistically significantly lower than the laboratory control.

There were no adverse effects observed on hatch for samples FR_FRCP1, GH_FR1, CM_MC2 and FR_FRABCH when compared to the site water controls or laboratory control. Adverse effects were observed on survival and biomass in samples FR_FRCP1 and FR_FRABCH compared to laboratory and site water controls; survival in FR_FRCP1 and FR_FRABCH was 1.7 and 51.7% and biomass was 0.02 and 1.90 mg, respectively. Samples GH_FR1 and CM_MC2 produced a small, but statistically significant reduction in survival and biomass relative to site control FR_UFR1.

Microbial growth was not observed in any of the samples supplemented with 10 µg/L and 20 µg/L copper, or in the un-amended laboratory control. The samples that were supplemented with 20 µg/L copper produced results that were similar, and in some cases, slightly better than the 10 µg/L copper-treated samples. It is inconclusive whether or not addition of copper curtailed microbial growth in these tests, however, results indicate addition of copper of up to 20 µg/L did not exacerbate toxicity in any of the samples tested. Other toxicants may have contributed to adverse effects observed in the samples, particularly in site water from FR_FRCP1, where toxicity was not reduced with the addition of 10 or 20 µg/L copper.

2.5 *Oncorhynchus mykiss*

Results of the toxicity tests using *O. mykiss* are provided in Table 11. The site water controls FR_UFR1, CM_MC1, GH_ER2 and LC_SLC performed similarly to the laboratory control for this species, indicating that there were no adverse effects associated with the upstream site waters.

There were adverse effects associated with samples FR_FRCP1, FR_FRABCH and GH_FR1 while all other samples tested did not exhibit results that were significantly different than the laboratory control or site water controls. The greatest reduction was observed in sample FR_FRCP1.

There were no observations of unusual behaviour of *O. mykiss* in any of the test solutions. A hatch rate was not calculated in these tests; however, the survival endpoint provides an appropriate measure of successful hatch, since the test is terminated shortly following hatch.

Table 7. Results: *Ceriodaphnia dubia* survival and reproduction test.

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	90	18.9 ± 4.1
FR_UFR1 (Site Control)	90	21.0 ± 7.1
GH_ER2 (Site Control)	100	21.4 ± 7.4
CM_MC1 (Site Control)	100	23.8 ± 5.4
LC_SLC (Site Control)	100	19.7 ± 3.7
FR_FRCP1	90	1.1 ± 1.9 * ^α β# ^δ
FR_FRABCH	90	18.4 ± 6.3
GH_FR1	100	17.3 ± 6.8
GH_ERC	90	18.3 ± 5.4
EV_HC1	100	22.8 ± 3.9
EV_MC2	100	17.3 ± 5.9
CM_MC2	80	0.0 ± 0.0 * ^α β# ^δ
CM_MC3	100	3.6 ± 2.1 * ^α β# ^δ
LC_LCDSSLCC	90	11.9 ± 4.3 * ^α β# ^δ

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[#] Result was significantly lower than the site control CM_MC1

^δ Result was significantly lower than the site control LC_SLC

Table 8. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Sample ID	Cell Yield (x 10 ⁴ cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
Laboratory Control	28.8 ± 2.1	-
FR_UFR1 (Site Control)	109.1 ± 6.8	279.6
GH_ER2 (Site Control)	104.8 ± 6.0 [#]	264.4
CM_MC1 (Site Control)	111.2 ± 8.1	287.0
LC_SLC (Site Control)	109.9 ± 8.2	282.2
FR_FRCP1	7.0 ± 1.8 ^{* α β # ∂}	-
FR_FRABCH	92.0 ± 5.6 ^{α β # ∂}	220.0
GH_FR1	109.0 ± 8.6	279.1
GH_ERC	118.8 ± 1.7	313.0
EV_HC1	109.2 ± 2.6	280.0
EV_MC2	90.5 ± 5.3 ^{α β # ∂}	214.8
CM_MC2	94.8 ± 7.8 ^{α # ∂}	229.6
LC_LCDSSLCC	87.8 ± 8.2 ^{α β # ∂}	205.2

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

[#] Result was significantly lower than the site control CM_MC1

[∂] Result was significantly lower than the site control LC_SLC

Table 9. Interim Results: *Hyaella azteca* survival and growth test.

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	94.0 ± 8.9	0.34 ± 0.20
FR_UFR1 (Site Control)	88.0 ± 21.7	0.19 ± 0.08
GH_ER2 (Site Control)	92.0 ± 4.5	0.24 ± 0.11
CM_MC1 (Site Control)	88.0 ± 11.0	0.46 ± 0.17
LC_SLC (Site Control)	92.0 ± 4.5	0.23 ± 0.12
FR_FRCP1	16.0 ± 23.0 * ^α β# ^δ	0.06 ± 0.02 * ^α β# ^δ
FR_FRABCH	88.0 ± 13.0	0.17 ± 0.14 #
GH_FR1	86.0 ± 16.7	0.16 ± 0.06
GH_ERC	80.0 ± 24.5	0.16 ± 0.07
EV_HC1	88.0 ± 4.5	0.30 ± 0.12
EV_MC2	92.0 ± 13.0	0.17 ± 0.02
CM_MC2	66.0 ± 16.7 * ^α β	0.07 ± 0.02 * ^α β# ^δ
CM_MC3	76.0 ± 23.0	0.22 ± 0.08
LC_LCDSSLCC	70.0 ± 28.3 *	0.12 ± 0.07 ^α β#

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

Result was significantly lower than the site control CM_MC1

^δ Result was significantly lower than the site control LC_SLC

Table 10. Results: *Pimephales promelas* survival and growth test.

Sample ID	(Mean ± SD)				
	Hatch (%)	Survival (%)	Biomass (mg)	Length (mm)	Normal development (%)
Laboratory Control	100.0 ± 0.0	85.0 ± 13.7	3.2 ± 0.2	11.4 ± 0.4	100.0 ± 0.0
10 µg/L Cu Amendments					
Laboratory Control [+Cu]	100.0 ± 0.0	90.0 ± 11.6	3.3 ± 0.1	11.3 ± 0.6	100.0 ± 0.0
FR_UFR1 (Site Control) [+Cu]	100.0 ± 0.0	98.3 ± 3.3	3.2 ± 0.2	11.7 ± 0.2	100.0 ± 0.0
GH_ER2 (Site Control) [+Cu]	100.0 ± 0.0	93.3 ± 5.4	3.3 ± 0.3	12.0 ± 0.1	100.0 ± 0.0
CM_MC1 (Site Control) [+Cu]	98.3 ± 3.3	83.3 ± 13.9	2.6 ± 0.2 *	11.2 ± 0.6	100.0 ± 0.0
FR_FRCP1 [+Cu]	95.0 ± 6.4	1.7 ± 3.3 ^{*αβ#}	0.02 ± 0.03 ^{*αβ#}	1.8 ± 3.5 ^{*αβ#}	NT
GH_FR1 [+Cu]	100.0 ± 0.0	80.0 ± 15.4 ^α	2.6 ± 0.1 ^{*αβ}	11.6 ± 0.5	98.2 ± 0.04
CM_MC2 [+Cu]	98.3 ± 3.3	80.0 ± 16.3 ^α	2.5 ± 0.3 ^{*αβ}	11.3 ± 0.7 ^β	100.0 ± 0.0
FR_FRABCH [+Cu]	98.3 ± 3.3	51.7 ± 11.4 ^{*αβ#}	1.9 ± 0.1 ^{*αβ#}	11.8 ± 0.9	100.0 ± 0.0
20 µg/L Cu Amendments					
Laboratory Control [+Cu]	100.0 ± 0.0	96.7 ± 3.8	3.2 ± 0.1	11.2 ± 0.3	100.0 ± 0.0
FR_FRCP1 [+Cu]	98.3 ± 3.3	1.7 ± 3.3 [§]	0.1 ± 0.3 [§]	3.5 ± 7.0 [§]	NT
GH_FR1 [+Cu]	100.0 ± 0.0	93.3 ± 7.7	2.6 ± 0.0 [§]	10.6 ± 0.1 [§]	100.0 ± 0.0
CM_MC2 [+Cu]	100.0 ± 0.0	88.3 ± 3.3	2.9 ± 0.2 [§]	10.8 ± 0.4	100.0 ± 0.0
FR_FRABCH [+Cu]	100.0 ± 0.0	60.0 ± 23.7 [§]	1.9 ± 0.1 [§]	11.1 ± 1.2	100.0 ± 0.0

SD = Standard Deviation

* Result was significantly lower than the 10 µg/L copper-treated laboratory control

^α Result was significantly lower than the 10 µg/L copper-treated site control FR_UFR1

^β Result was significantly lower than the 10 µg/L copper-treated site control GH_ER2

[#] Result was significantly lower than the 10 µg/L copper-treated site control CM_MC1

[§] Result was significantly lower than the 20 µg/L copper-treated laboratory control

Table 11. Results: *Oncorhynchus mykiss* embryo-alevin development test.

Sample ID	(Mean ± SD)			
	Survival (%)	Viability (%)	Length (mm)	Wet weight (mg)
Laboratory Control	92.4 ± 8.1	88.0 ± 10.5	20.6 ± 0.3	102.2 ± 4.3
FR_UFR1 (Site Control)	86.7 ± 3.3	83.3 ± 3.3	21.0 ± 0.2	103.8 ± 2.6
GH_ER2 (Site Control)	87.8 ± 9.7	87.8 ± 9.7	21.1 ± 0.0	104.7 ± 2.1
CM_MC1 (Site Control)	80.0 ± 0.0	80.0 ± 0.0	21.4 ± 0.4	105.6 ± 2.4
LC_SLC (Site Control)	89.7 ± 6.0	88.6 ± 8.0	21.3 ± 0.2	104.7 ± 3.3
FR_FRCP1	21.1 ± 21.7 * ^α β# ^δ	16.7 ± 15.3 * ^α β# ^δ	17.1 ± 0.1 * ^α β# ^δ	88.8 ± 0.6 * ^α β# ^δ
FR_FRABCH	70.4 ± 20.0 * ^β ^δ	69.3 ± 21.2 * ^β ^δ	20.3 ± 0.8 # ^δ	100.9 ± 4.7
GH_FR1	61.1 ± 19.5 * ^α β ^δ	60.0 ± 17.6 * ^α β# ^δ	19.8 ± 0.1 ^α β# ^δ	99.6 ± 3.8
GH_ERC	90.0 ± 0.0	86.7 ± 3.3	20.7 ± 0.4	98.6 ± 2.6
EV_HC1	77.5 ± 14.0	77.5 ± 14.0	21.2 ± 0.8	105.2 ± 6.2
EV_MC2	84.2 ± 14.1	84.2 ± 14.1	21.6 ± 0.1	107.9 ± 2.6
CM_MC2	77.8 ± 13.9	76.7 ± 14.5	21.3 ± 0.2	111.0 ± 3.8
LC_LCDSSLCC	92.0 ± 8.0	90.9 ± 10.0	21.7 ± 0.2	112.1 ± 4.2

SD = Standard Deviation

* Result was significantly lower than the laboratory control

^α Result was significantly lower than the site control FR_UFR1

^β Result was significantly lower than the site control GH_ER2

Result was significantly lower than the site control CM_MC1

^δ Result was significantly lower than the site control LC_SLC

3.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the test protocols. The initial *H. azteca* tests conducted on samples collected between October 30 and November 20, 2018, did not meet control acceptability criteria for test performance and, consequently, the results of those tests are not reported, and the tests were repeated with samples collected between January 8 and 30, 2019. All tests reported here met control acceptability criteria and water quality parameters remained within the ranges specified in the protocols throughout the tests. Uncertainty associated with these tests is best described by the standard deviations around the means.

There were no deviations from test methodologies, other than the planned modification to the *H. azteca* method and addition of copper in the *P. promelas* tests, as described in Section 2.0, with the exception that the eggs in the rainbow trout embryo-alevin test were exposed using a blocked design (i.e., eggs from one fish was used for replicate A of each test concentration, eggs from the second fish for replicate B, and so on); this approach deviates from the Environment Canada test method, which indicates that the eggs should be pooled prior to testing. However, this modification is considered appropriate because it reduces the risk of non-viable eggs affecting the test results, since in the event that one of the batches of eggs had been non-viable, it would have been possible to exclude data for that replicate. In the *O. mykiss* test during this quarter, eggs in one of the four replicates were considered non-viable, producing particularly poor results; therefore, data from this replicate was excluded from statistical analysis.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 12. Results for these tests fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate. The reference toxicant tests were performed under the same conditions as those used for the samples.

Table 12. Reference toxicant test results.

Test species	Endpoint	Historical mean (2 SD Range)	CV (%)	Test date
<i>C. dubia</i>	Survival (LC50): 2.0 g/L NaCl	2.0 (1.8 – 2.2)	5	October 24, 2018
	Reproduction (IC50): 1.8 g/L NaCl	1.3 (0.8 – 1.9)	21	
<i>P. subcapitata</i>	Growth (IC50): 34.8 µg/L Zn	30.9 (25.8 – 37.0)	9	October 22, 2018
<i>H. azteca</i>	Survival (LC50): 6.0 g/L NaCl	6.1 (5.2 – 7.2)	8	January 11, 2019
<i>P. promelas</i>	Survival (LC50): 4.7 g/L NaCl	6.3 (3.2 – 12.3)	22	November 13, 2018
	Biomass (IC25): 3.5 g/L NaCl	3.0 (1.3 – 6.3)	26	
<i>O. mykiss</i>	Viability (EC50): 3.0 mg/L SDS	4.1 (2.1 – 7.9)	34	October 31, 2018

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration

4.0 REFERENCES

- ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 p.
- ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates and amphibians. E729-80, 25p
- Downey PJ, Flemmin K, Guinn R, Chapman N, Varner P, Cooney JD. 2000. Sporadic mortality in chronic toxicity tests using *Pimephales promelas* (Rafinesque): Cases of characterization and control. *Environ Toxicol Chem* 19:248-255.
- Environment Canada. 1998. Biological test method: toxicity tests using early life stages of salmonid fish (rainbow trout). Environmental Protection Series EPS 1/RM/28. Second Edition, July 1998. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 102 pp.
- Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.
- Environment Canada. 2007b. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.
- Environment Canada. 2013. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyaella azteca*. EPS 1/RM/33, Second Edition, January 2013.
- Grothe DR, Johnson DE. 1996. Bacterial interference in whole-effluent toxicity tests. *Environ Toxicol Chem* 15:761-764.
- Kszos LA, Stewart AJ, Sumner JR. 1997. Evidence that variability in ambient fathead minnow short-term chronic tests is due to pathogenic infection. *Environ Toxicol Chem* 6:351-356
- Norberg-King TJ, Hockett R, Mount DR, Ivey C, Ingersoll C, Kemble N, Brumbaugh B, Hammer E, Soucek D, Taylor L. 2014. Inter-lab testing of *Hyaella azteca* water and sediment methods:

3. Results from 10- to 42-d tests conducted with the new water-only method. Proceedings of SETAC, Vancouver, BC, Canada, November 09 - 13, 2014.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.8.7.16 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

USEPA. 1996. Ecological Effects Test Guidelines. OPPTS 850.1400 Fish Early-Life Stage Toxicity Test. EPA-712-C-96-121, Public Draft.

USEPA. 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. EPA 600/R-99/064. March 2000.

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client: Teck
Work Order No.: ~~181877~~ 181871

Start Date/Time: Oct 31/18 e 18
Set up by: KL

Sample Information:

Sample ID: various (see below)
Sample Date: Oct 30/18
Date Received: Oct 31/18
Sample Volume: 2-9 x 20L + 3 barrels
barrels

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: BB102218
Age of young (Day 0): <24-h (within 12-h)
Avg No. young in first 3 broods of previous 7 d: 20
Mortality (%) in previous 7 d: 0
Individual female # used ≥ 8 young on test day: 2,3,6,8-20

NaCl Reference Toxicant Results:

Reference Toxicant ID: Ca199
Stock Solution ID: 18 NaCl (100 g/L NaCl)
Date Initiated: Oct 24/18

7-d LC50 (95% CL): 2.0 (1.7 - 2.3) g/L NaCl
7-d IC50 (95% CL): 1.8 (1.4 - 2.0) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.2) g/L NaCl CV (%): 5
7-d IC50 Reference Toxicant Mean and Historical Range: 1.3 (0.8 - 1.9) g/L NaCl CV (%): 21

Test Results:

	Survival (%)	Reproduction (Mean \pm SD)
Negative Control	90	18.9 \pm 4.1
FRUFY1-WS-2018-10-30-N	90	21.0 \pm 7.1
GHLEP2-WS-2018-10-30-N	100	21.4 \pm 7.4
CM.MC1-04-WS-20181030-N	100	23.8 \pm 5.4
LC-SLL-WS-2018-10-30-N	<u>~ 90</u> 100	19.7 \pm 3.7
PE-PPCF1-WS-2018-10-30-N	90	1.1 ^{a,b,c,d} \pm 1.9
PE-PPACCH-WS-2018-10-30-NP	<u>~ 100</u> 90	18.4 \pm 6.3
GHLEP1-WS-2018-10-30-N	<u>~ 90</u> 100	17.3 \pm 6.8
GHLEP2-WS-2018-10-30-N	90	18.3 \pm 5.4

site controls

* indicates that reproduction is significantly lower than control (insects)

a. indicates that reproduction is significantly lower than site control FRUFY1

b. indicates that reproduction is significantly lower than site control GHLEP2

c. indicates that reproduction is significantly lower than site control CM.MC1

d. indicates that reproduction is significantly lower than site control LC-SLL

Reviewed by: JM

Date reviewed: Dec 6/18

Ceriodaphnia dubia Summary Sheet

Client: Teck
 Work Order No.: ~~18187~~ 181871

Start Date/Time: Oct 31/18 c 18
 Set up by: KL

Sample Information:

Sample ID: various (see below)
 Sample Date: Oct 30/18
 Date Received: Oct 31/18
 Sample Volume: 29 x20L + 3 barrels

Test Validity Criteria:

- 1) Mean survival of first generation controls is $\geq 80\%$
- 2) At least 60% of controls have produced three broods within 8 days
- 3) An average of ≥ 15 live young produced per surviving female in the control solutions during the first three broods.
- 4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T ($^{\circ}$ C) = 25 ± 1 ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: BB102218
 Age of young (Day 0): <24-h (within 12-h)
 Avg No. young in first 3 broods of previous 7 d: 20
 Mortality (%) in previous 7 d: 0
 Individual female # used ≥ 8 young on test day: 2, 3, 6, 8-20

NaCl Reference Toxicant Results:

Reference Toxicant ID: 02199
 Stock Solution ID: 18 NaCl (100 g/L NaCl)
 Date Initiated: Oct 24/18

7-d LC50 (95% CL): 2.0 (1.7 - 2.3) g/L NaCl
 7-d IC50 (95% CL): 1.8 (1.4 - 2.0) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.2) g/L NaCl CV (%): 5
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.3 (0.8 - 1.9) g/L NaCl CV (%): 21

Test Results:

	Survival (%)	Reproduction (Mean \pm SD)	
EV_HL3_WS_2018-10-30_N <u>Negative Control</u>	100	22.8 \pm 3.9	*indicates that reproduction is significantly lower than laboratory control a- indicates that reproduction is significantly lower than the site control (FR_UFES) b- indicates that reproduction is significantly lower than site control (all) c- indicates that reproduction is significantly lower than site control (all) d- indicates that reproduction is significantly lower than site control (all)
EV_MCR_WS_2018-10-30_N	100	17.3 \pm 5.9	
CM_MCR_04_WS_20181030_N	80	0.0 *abcd \pm 0.0	
CM_MCS_04_WS_20181030_NP	100	3.6 *abcd \pm 2.1	
LC_HOSLCC_WS_2018-10-30_N	90	11.9 *abcd \pm 4.3	
LC_PDS_WS_2018-10-30_N	90	13.4 ^e \pm 7.7	
LC_WS_WS_2018-10-30_N	80	10.0 *abcd \pm 5.5	
LC_WS_WS_2018-10-30_N	80	21.9 \pm 12.1	

Reviewed by: JCM

Date reviewed: Dec. 6/18

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Tell
 Sample ID: (see below) various
 Work Order #: 81871

Start Date & Time: Oct 31/18 @ 1800h
 Stop Date & Time: Nov 7/18 @ 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration (units)	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	25.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	25.0	25.0	25.0	25.0	
DO (mg/L)	8.79	8.1	7.9	7.4	8.1	7.4	8.1	7.4	8.0	7.4	8.1	8.1	8.1	7.1	
pH	8.3	8.2	8.3	7.4	8.3	7.9	8.2	7.9	8.2	7.9	8.2	7.8	8.2	7.7	
Cond. (µS/cm)	2189	220	220	221	221	221	221	221	221	221	221	222	220	220	
Initials	u	JB	u	u	u	u	u	u	u	u	u	JB	JB	JB	

069

Concentration (units)	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	
DO (mg/L)	8.2	8.2	8.1	7.4	8.2	7.2	8.1	5.5	8.0	7.5	8.1	8.1	8.0	7.1	
pH	8.3	8.3	8.2	7.8	8.2	8.1	8.1	8.0	8.2	7.6	8.1	7.9	8.1	8.0	
Cond. (µS/cm)	879	875	875	875	875	871	871	872	872	888	888	882	882	856	
Initials	u	JB	u	u	u	u	u	u	u	u	u	JB	JB	JB	

06-1

Concentration (units)	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	25.0	25.0	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	
DO (mg/L)	8.2	8.2	8.1	7.4	8.2	7.5	8.1	6.1	8.1	7.5	8.1	8.1	8.0	7.1	
pH	8.3	8.3	8.2	8.3	8.3	8.3	8.2	8.1	8.2	7.9	8.1	8.0	8.2	8.0	
Cond. (µS/cm)	310	308	312	314	314	311	311	311	311	311	311	309	307	307	
Initials	u	JB	u	u	u	u	u	u	u	u	u	JB	JB	JB	

024.0

6-3

Concentration (units)	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.0	25.0	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	
DO (mg/L)	8.2	8.2	8.1	7.4	8.2	7.3	8.2	6.7	8.0	7.4	8.0	8.0	8.0	7.1	
pH	8.1	8.2	8.1	8.2	8.1	8.2	8.2	8.1	8.1	7.9	8.0	7.9	8.0	7.9	
Cond. (µS/cm)	275	274	274	267	270	270	270	270	270	277	277	273	271	271	
Initials	u	JB	u	u	u	u	u	u	u	u	u	JB	JB	JB	

Thermometer: 4 DO meter/probe: 1, 1 pH meter/probe: 1/3, 1/3 Conductivity meter/probe: 1, 1

	Control	FR UFF1	GH EP2	CM MCI
Hardness*	100	564	240	256
Alkalinity*	96	684	132	126

Analysts: KL, JB, MD
 Reviewed by: JB
 Date reviewed: Nov. 30/18

* mg/L as CaCO3

Sample Description: ① clear, colourless, odourless, no particulates; ② & ③ clear, colourless, odourless, some particulates.

Comments: Broodboard Used: BB02218 (# 2, 3, 6, 8, 8-11, 13-20, 12)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECH
 Sample ID: Various (see below)
 Work Order #: 01871

Start Date & Time: 06/31/18 @ 1800h
 Stop Date & Time: Nov 7/18 @ 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration ④ PR-FRCP1	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.3	7.4	8.1	7.3	8.1	6.2	8.0	7.4	8.4	8.5	8.1	5.9
pH	7.7	7.7	7.5	7.6	7.7	7.7	7.8	7.6	7.7	7.5	7.5	7.5	7.5	7.4
Cond. (µS/cm)	3410	3400		3390		2440		3410		3440		3460		3260
Initials	K	JB		K		A		A		JB		JB		JB

Concentration ⑤ PR-FRABCH	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.4	7.4	8.1	7.6	8.2	6.6	8.1	7.4	8.0	8.5	8.1	5.4
pH	8.1	8.1	8.0	8.0	8.1	8.1	8.1	7.9	8.2	7.8	7.9	7.8	8.0	7.8
Cond. (µS/cm)	1088	1093		1088		1095		1095		1100		1096		1038
Initials	K	JB		K		A		A		JB		JB		JB

Concentration ⑥ GH-FR1	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.1	7.4	8.1	7.5	8.2	8.0	8.1	7.4	8.1	6.5	8.0	7.0
pH	8.3	8.3	8.2	8.4	8.2	8.3	8.2	8.2	8.1	8.1	8.0	8.1	8.1	8.1
Cond. (µS/cm)	882	882		877		880		877		891		885		859
Initials	K	JB		K		A		A		JB		JB		JB

Concentration ③ GH-ERC	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.1	7.4	8.1	7.3	8.1	6.3	8.0	7.4	8.1	8.5	8.0	7.4
pH	8.1	8.2	8.0	8.2	8.1	8.1	8.2	8.2	8.1	8.2	8.0	7.9	8.0	8.0
Cond. (µS/cm)	335	333		340		332		335		338		334		328
Initials	K	JB		K		A		A		JB		JB		JB

Thermometer: 4 DO meter/probe: 1, 1 pH meter/probe: 1/3, 1/3 Conductivity meter/probe: 1, 1

	Control	PR-FRABCH	GH-FR1	GH-ERC
Hardness*	2640	1100	640	238
Alkalinity*	150	196	188	140

* mg/L as CaCO₃
 Sample Description: ④ turbid, colourless, hydrocarbon odour, no particulates
 ⑤ clear, colourless, odourless, some particulates ⑥ ③ clear, colourless, odourless, some particulates

Comments: Broodboard Used: 05102218 (#2, 3, 6, 8 - 20)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: (see below) various
 Work Order #: 18171

Start Date & Time: Oct 31/88 1:00pm
 Stop Date & Time: Nov 7/88 1:00pm
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration (8) EV.MCL	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.1	8.1	8.1	8.1	7.5	8.1	8.0	8.0	7.0	8.2	7.0	8.2	7.0
pH	8.2	8.2	8.1	8.0	8.2	8.1	8.2	8.2	8.2	7.7	7.8	8.0	8.1	8.0
Cond. (µS/cm)	731	740		729		722		725		740		734		710
Initials	W	JB		W		A		AW		JB		JB		JB

Concentration (9) EV.MCL	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.1	8.1	8.2	7.4	8.0	8.3	7.9	7.1	8.2	7.1	8.2	7.0
pH	8.0	8.2	7.9	8.3	8.0	8.2	8.1	8.2	8.1	8.1	7.8	8.0	7.9	8.0
Cond. (µS/cm)	687	698		691		689		691		696		698		676
Initials	W	JB		W		A		AW		JB		JB		JB

Concentration (10) CM.MCL	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	7.9	7.9	8.2	7.4	8.0	8.0	8.0	7.2	8.3	7.7	8.2	7.9
pH	8.2	8.3	8.1	8.2	8.2	8.1	8.3	8.0	8.2	7.9	8.0	7.9	8.1	8.0
Cond. (µS/cm)	1000	992		997		999		997		996		1002		953
Initials	W	JB		W		A		AW		JB		JB		JB

Concentration (11) CM.MCL	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.2	7.9	8.2	7.5	8.0	8.4	8.0	7.2	8.4	7.2	8.1	7.7
pH	8.2	8.3	8.1	8.2	8.2	8.1	8.2	8.1	8.1	8.0	8.0	8.0	8.1	8.0
Cond. (µS/cm)	582	585		577		584		583		580		588		571
Initials	W	JB		W		A		AW		JB		JB		JB

Thermometer: 4 DO meter/probe: 1 / 1 pH meter/probe: 1/3 / 1/3 Conductivity meter/probe: 1 / 1

	Control	EV.MCL	CM.MCL	CM.MCL
Hardness*	450	410	780	334
Alkalinity*	186	174	128	150

Analysts: W, JB, AW
 Reviewed by: JBL
 Date reviewed: Nov-30/88

* mg/L as CaCO3

Sample Description: (8)(9)(10)(11) Clear, colourless, odourless, some particulates.

Comments: Broodboard Used: Feb 10/22/88 (#2, 3, 6, 8-20)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: various (see below)
 Work Order #: 181871

Start Date & Time: 06/31/08 1800h
 Stop Date & Time: 00/7/08 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

Concentration ⑫ LL-9C	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.3	8.0	8.2	7.3	8.0	8.7	8.0	7.2	8.2	7.3	8.2	7.0
pH	8.2	8.3	8.1	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.0	7.9	8.1	8.0
Cond. (µS/cm)	365	376		376		371		368		378		372		368
Initials	W	JB		W		A		AWP		JB		JB		JB

① 8.2

Concentration ⑬ LL-100SS/LL	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.4	7.9	8.2	7.4	8.1	6.6	8.0	7.2	8.2	7.8	8.2	7.2
pH	8.2	8.3	8.1	8.3	8.3	8.2	8.3	8.1	8.3	8.0	8.0	8.1	8.1	8.0
Cond. (µS/cm)	824	831		828		831		835		834		834		804
Initials	W	JB		W		AWP		AWP		JB		JB		JB

② 8.2

Concentration ⑭ LL-100X	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.4	7.9	8.2	7.4	8.0	6.6	8.1	7.0	8.2	7.4	8.2	7.5
pH	8.5	8.3	8.4	8.3	8.4	8.3	8.3	8.2	8.4	8.0	8.2	8.0	8.4	8.0
Cond. (µS/cm)	596	606		600		601		603		606		608		608
Initials	W	JB		W		AWP		AWP		JB		JB		JB

③ 8.2

Concentration ⑮ LL-103	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.2	8.2	8.4	7.9	8.2	7.4	8.1	6.8	8.0	7.2	8.2	7.8	8.2	7.6
pH	8.1	8.3	8.0	8.3	8.1	8.1	8.2	8.3	8.1	8.2	8.0	8.1	7.9	8.1
Cond. (µS/cm)	1006	1015		1011		1001		1010		1017		1028		990
Initials	W	JB		W		AWP		AWP		JB		JB		JB

④ 8.2

Thermometer: 4 DO meter/probe: 1 / 1 pH meter/probe: 1/3 / 1/3 Conductivity meter/probe: 1 / 1

⑫ LL-9C

	Control	⑫ LL-9C	⑬ LL-100SS/LL	⑭ LL-100X	⑮ LL-103
Hardness*	240	620	330	830	
Alkalinity*	134	154	140	202	

* mg/L as CaCO3

Analysts: W, JB, AWP

Reviewed by: JGH

Date reviewed: Nov. 30 / 08

Sample Description: (12), (13), (14) & (15) clear, odorless, colorless, some particulates.

Comments: Broodboard Used: 601022 (A3, 3, 6, 8-20)

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK
 Sample ID: Various (see below)
 Work Order #: 151871

Start Date & Time: Oct 31 / 18 1300h
 Stop Date & Time: Nov 7 / 18 1500h
 CER #: 4
 Test Species: Ceriodaphnia dubia

⑩ % (v/v) 100 Concentration LLCS	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	24.0	25.0	25.8	25.0	26.0	25.0	24.0	25.0	24.0	25.0	24.8	25.0	24.0	25.0	
DO (mg/L)	8.2	8.0	7.9	7.7	7.7	7.5	8.1	6.1	8.0	7.0	8.0	7.3	8.2	7.0	
pH	8.3	8.3	8.3	7.9	8.4	8.1	8.3	8.1	8.4	8.2	8.2	8.0	8.2	8.1	
Cond. (µS/cm)	743	742	742	742	740	742	753	750	721						
Initials	K	JB	K		A	AD						JB	JB		

EDTA Concentration Control TESTA	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)															
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials															

Concentration	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)															
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials															

Concentration	Days														
	0		1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)															
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials															

Thermometer: 4 DO meter/probe: 1 / 1 pH meter/probe: 1/3 / 1/3 Conductivity meter/probe: (/)

	Control	LLCS	
Hardness*		840	
Alkalinity*		174	

Analysts: EL, JB, AD
 Reviewed by: JB
 Date reviewed: Nov. 30 / 18

* mg/L as CaCO3

Sample Description: ⑩ clear, colourless, odourless, some particulates.

Comments: Broodboard Used: B0102218 (#3,3,6,8-20)

**Chronic Freshwater Toxicity Test
C. dubia Reproduction Data**

R02/2

Client: TEC
 Sample ID: VARIOUS (See below)
 Work Order: 181871

Start Date & Time: OCT 31 / 18 @ 1800h
 Stop Date & Time: NOV 7 / 18 @ 1500h
 Set up by: KL

Days	Concentration: (100) EV. MCL												Concentration: (100) EV. CM MCL												Concentration: (100) CM MCL											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
2	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
3	/	2	3	5	2	3	2	/	3	3	A	/	/	/	/	/	/	/	/	/	/	A	/	2	2	2	/	/	2	3	/	2	A			
4	/	/	/	/	/	/	/	/	/	/	CW	OX	/	/	/	/	/	/	/	/	/	CW	/	/	/	/	4	4	/	/	2	2	CW			
5	4	5	8	8	15	3	7	6	3	2	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	5	3	/	/	/	/	/	/	JB			
6	10	11	16	12	15	7	12	10	/	9	8	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB		
7	12	13	11	15	/	/	/	5	/	10	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
8																																				
Total	26	17	15	17	12	21	16	8	14	27	W	0	0	0	0	0	0	0	0	0	0	OX	W	0	2	7	5	4	4	2	5	2	5	W		

Days	Concentration: (100) LC SLCC												Concentration: (100) LC SLCC												Concentration: LC DCDS (100)											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
2	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
3	2	2	/	/	2	3	2	2	2	2	A	/	2	2	/	/	/	/	/	/	2	A	/	3	2	/	/	2	2	2	2	2	A			
4	/	/	/	/	/	/	/	/	/	/	CW	/	/	/	/	5	5	/	/	/	/	CW	/	/	/	/	/	/	/	/	/	/	CW			
5	4	6	4	4	3	7	5	7	5	6	JB	/	4	5	6	6	7	5	7	5	6	JB	/	/	/	/	/	8	4	2	/	4	JB			
6	11	9	10	7	10	13	9	12	11	11	JB	4	6	6	/	4	4	4	X	4	4	JB	4	8	6	7	11	13	10	9	4	4	JB			
7	11	/	13	12	/	/	/	/	/	/	JB	13	/	/	/	5	/	/	/	/	/	JB	/	14	/	X	/	12	/	/	10	/	JB			
8																																				
Total	18	17	27	23	15	23	16	21	18	19	W	19	12	13	6	10	17	14	11	5	12	W	4	25	8	7	11	28	16	13	12	10	W			

Days	Concentration: (100) LC LC3												Concentration: (100) LC LC5												Concentration:											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init			
1	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB	/	/	/	/	/	/	/	/	/	/	JB			
2	X	/	/	2	2	/	2	2	X	2	JB	/	/	/	X	/	/	/	/	/	/	JB														
3	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A														
4	/	/	/	/	/	3	/	/	/	/	CW	/	/	/	/	5	5	2	2	2	2	CW														
5	/	4	7	2	2	/	2	4	/	4	JB	7	/	6	/	5	8	2	8	9	5	JB														
6	/	8	8	8	7	9	11	4	/	7	JB	14	/	9	/	8	9	10	/	10	11	JB														
7	/	/	/	/	/	/	/	/	/	/	JB	10	/	18	/	9	10	10	15	10	14	JB														
8																																				
Total	OX	12	15	12	11	12	15	10	OX	13	W	31	OX	33	OX	22	27	22	25	29	30	W														

Notes: X = mortality.

Comments: 1. Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

2. Ehippia present in Controls (Y), (N)?

Reviewed by: JGU

Date reviewed: Nov. 30/18

Client: Tecy

W.O.#: 181871

Hardness and Alkalinity Datasheet

Sample ID	Subsample Date	Date Measured	Alkalinity				Hardness			Technician
			Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
20% primer	Oct 31/18	Oct 31/18	50 ¹⁰⁰	9.8	10.0	96	50	5.0 28.7	100	K
PR_UFP1			50	9.4	9.6	184	100 50	28.2	564	
GH_ER2			50	6.8	7.0	132	50 50	12.0	240	
CM_MCS			50	6.5	6.7	126	50	12.8	256	
FR_FRCP1			100	1.8	2.1	150	100	12.2 26.4	2640	
FR_FRACH			50	9.9	10.0	196	100	11.2	1100	
GH_ER1			50	9.6	9.8 9.8	188	100	6.9	690	
GH_ERC			50	7.2	7.4	140	50	11.9	238	
EV_KCS			50	9.5	9.7	186	50	22.5	450	
EV_MCL			50	8.9	9.1	174	50	20.5	410	
CM_MCL			50	6.5	6.6	128	100	7.8	780	
CM_MCS			50	7.7	7.9	150	50	16.7	334	
LC_LOSS										
LC_SLC	Oct 31/18	Oct 31/18	50	6.9	7.1	134	50	12.0	240	K
LC_LOSSLC			50	7.9	8.1	154	100	6.2	620	
LC_DCOS			50	7.2	7.4	140	50	16.5	330	
LC_LCS			50	10.2	10.4	202	100	8.3	830	
LC_LCS			50	8.9	9.1	174	100	8.4	840	

Notes: ① Sample diluted w/ DI water up to 100mL.

Reviewed by:

JGK

Date Reviewed:

Nov-30/18

CETIS Summary Report

Report Date: 20 Nov-18 14:46 (p 51 of 53)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

7d Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	LC	10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
FR_UFR1		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
GH_ER2		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
CM_MC1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
FR_FRCP1		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
FR_FRABCH		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
GH_FR1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
GH_ERC		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
EV_HC1		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
EV_MC2		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
CM_MC2		10	0.8000	0.4984	1.0000	0.0000	1.0000	0.1333	0.4216	52.70%	11.11%
CM_MC3		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
LC_SLC		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
LC_LCDSSLCC		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
LC_DCDS		10	0.9000	0.6738	1.0000	0.0000	1.0000	0.1000	0.3162	35.14%	0.00%
LC_LC3		10	0.8000	0.4984	1.0000	0.0000	1.0000	0.1333	0.4216	52.70%	11.11%
LC_LC5		10	0.8000	0.4984	1.0000	0.0000	1.0000	0.1333	0.4216	52.70%	11.11%

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	LC	10	18.9	15.93	21.87	11	24	1.312	4.149	21.95%	0.00%
FR_UFR1		10	21	15.95	26.05	10	30	2.231	7.055	33.60%	-11.11%
GH_ER2		10	21.4	16.13	26.67	4	31	2.33	7.367	34.42%	-13.23%
CM_MC1		10	23.8	19.94	27.66	16	31	1.705	5.391	22.65%	-25.93%
FR_FRCP1		10	1.1	-0.2677	2.468	0	5	0.6046	1.912	173.81%	94.18%
FR_FRABCH		10	18.4	13.91	22.89	7	29	1.984	6.275	34.10%	2.65%
GH_FR1		10	17.3	12.46	22.14	0	26	2.14	6.767	39.11%	8.47%
GH_ERC		10	18.3	14.47	22.13	7	27	1.693	5.355	29.26%	3.17%
EV_HC1		10	22.8	20	25.6	17	31	1.236	3.91	17.15%	-20.63%
EV_MC2		10	17.3	13.06	21.54	8	27	1.874	5.926	34.26%	8.47%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	0	7	0.6532	2.066	57.38%	80.95%
LC_SLC		10	19.7	17.02	22.38	15	27	1.184	3.743	19.00%	-4.23%
LC_LCDSSLCC		10	11.9	8.801	15	5	19	1.37	4.332	36.40%	37.04%
LC_DCDS		10	13.4	7.898	18.9	4	28	2.432	7.691	57.40%	29.10%
LC_LC3		10	10	6.067	13.93	0	15	1.738	5.497	54.97%	47.09%
LC_LC5		10	21.9	13.25	30.55	0	33	3.825	12.1	55.23%	-15.87%

CETIS Summary Report

Report Date: 20 Nov-18 14:46 (p 52 of 53)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	LC	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_DCDS		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LC3		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_LC5		1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	LC	20	15	11	24	20	22	24	17	16	20
FR_UFR1		27	30	29	11	22	10	15	24	21	21
GH_ER2		31	15	24	25	4	26	23	20	22	24
CM_MC1		25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC		18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

CETIS Summary Report

Report Date: 20 Nov-18 14:46 (p 53 of 53)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	LC	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRABCH		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_DCDS		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LC3		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_LC5		1/1	0/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date: 20 Nov-18 14:44 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-9971-7741	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 20 Nov-18 14:43	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Control	07-2637-5525	31 Oct-18	31 Oct-18	18h	Teck Coal	
④ FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)		
② GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
③ CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
② LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

① lab control = 20% perrier
 ② FR_UFR1, GH_ER2, CM_MC1 & LC_SLC are QR controls

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control		FR_UFR1	0.7632	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.7632	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.7632	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.7632	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.5000	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 20 Nov-18 14:44 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

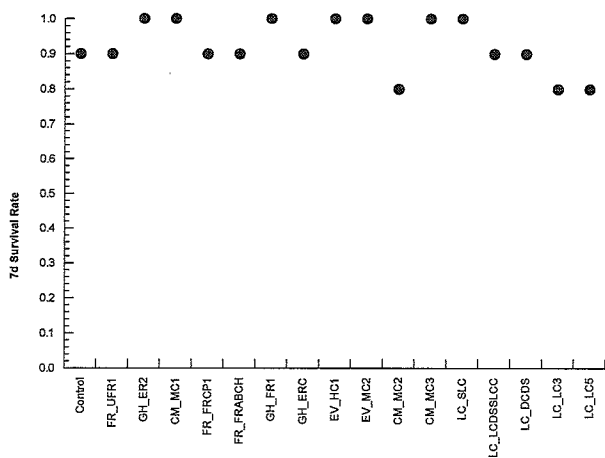
Analysis ID: 08-9971-7741 Endpoint: 7d Survival Rate
 Analyzed: 20 Nov-18 14:43 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	LC	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_UFR1		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRABCH		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_DCDS		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LC3		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_LC5		1/1	0/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Report Date: 20 Nov-18 14:44 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 16-9495-3608	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 20 Nov-18 14:42	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		① FR_UFR1, GH_ER2, CM_MC1 A LC_SLC are site controls
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		upstream control (u) = FR_UFR1
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.7632	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.7632	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.7632	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.7632	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 20 Nov-18 14:44 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 16-9495-3608 Endpoint: 7d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 20 Nov-18 14:42 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_DCDS	0.7632	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.5000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	U	9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1		10	0	10	1	0	0.0%
FR_FRCP1		9	1	10	0.9	0.1	10.0%
FR_FRABCH		9	1	10	0.9	0.1	10.0%
GH_FR1		10	0	10	1	0	0.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		8	2	10	0.8	0.2	20.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%
LC_LCDSSLCC		9	1	10	0.9	0.1	10.0%
LC_DCDS		9	1	10	0.9	0.1	10.0%
LC_LC3		8	2	10	0.8	0.2	20.0%
LC_LC5		8	2	10	0.8	0.2	20.0%

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	U	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_DCDS		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LC3		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_LC5		1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 16-9495-3608
 Analyzed: 20 Nov-18 14:42

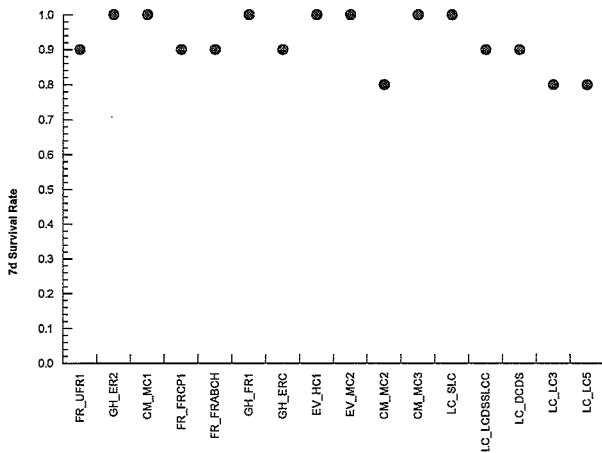
Endpoint: 7d Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRABCH		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSLLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_DCDS		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LC3		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_LC5		1/1	0/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Report Date: 20 Nov-18 14:41 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 05-6046-3756	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 20 Nov-18 14:41	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture	Age: <24		

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		① FR_UFR1, GH_ER2, CM_MC1 & LC_SLC are site controls
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		receiving water (R) = GH_ER2
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.2368	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.5000	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 20 Nov-18 14:41 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 05-6046-3756 Endpoint: 7d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 20 Nov-18 14:41 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_DCDS	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.2368	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.2368	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2	R	10	0	10	1	0	0.0%
CM_MC1		10	0	10	1	0	0.0%
FR_FRCP1		9	1	10	0.9	0.1	10.0%
FR_FRABCH		9	1	10	0.9	0.1	10.0%
GH_FR1		10	0	10	1	0	0.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		8	2	10	0.8	0.2	20.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%
LC_LCDSSLCC		9	1	10	0.9	0.1	10.0%
LC_DCDS		9	1	10	0.9	0.1	10.0%
LC_LC3		8	2	10	0.8	0.2	20.0%
LC_LC5		8	2	10	0.8	0.2	20.0%

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2	R	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_DCDS		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LC3		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_LC5		1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 20 Nov-18 14:41 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 05-6046-3756
 Analyzed: 20 Nov-18 14:41

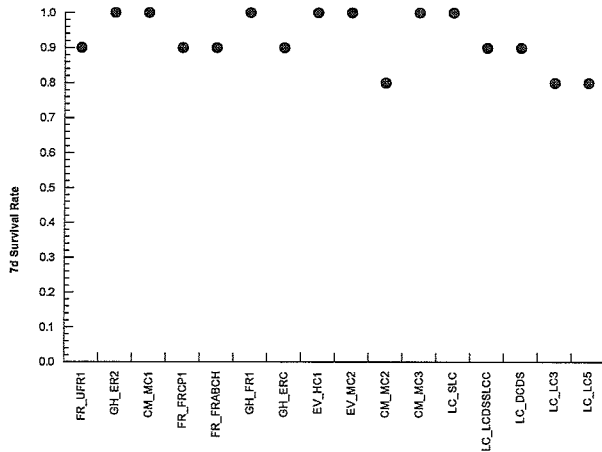
Endpoint: 7d Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
GH_ER2	R	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRABCH		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_DCDS		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LC3		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_LC5		1/1	0/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Report Date: 20 Nov-18 14:39 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 03-9422-6281	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 20 Nov-18 14:39	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

① FR_UFR1, GH_ER2, CM_MC1
 & LC_SLC are site controls
 site control (XC) = CM_MC1

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.2368	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_SLC	1.0000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.5000	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 20 Nov-18 14:39 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 03-9422-6281 Endpoint: 7d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 20 Nov-18 14:39 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_DCDS	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.2368	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.2368	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1	XC	10	0	10	1	0	0.0%
FR_FRCP1		9	1	10	0.9	0.1	10.0%
FR_FRABCH		9	1	10	0.9	0.1	10.0%
GH_FR1		10	0	10	1	0	0.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		8	2	10	0.8	0.2	20.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC		10	0	10	1	0	0.0%
LC_LCDSSLCC		9	1	10	0.9	0.1	10.0%
LC_DCDS		9	1	10	0.9	0.1	10.0%
LC_LC3		8	2	10	0.8	0.2	20.0%
LC_LC5		8	2	10	0.8	0.2	20.0%

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_DCDS		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LC3		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_LC5		1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 20 Nov-18 14:39 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

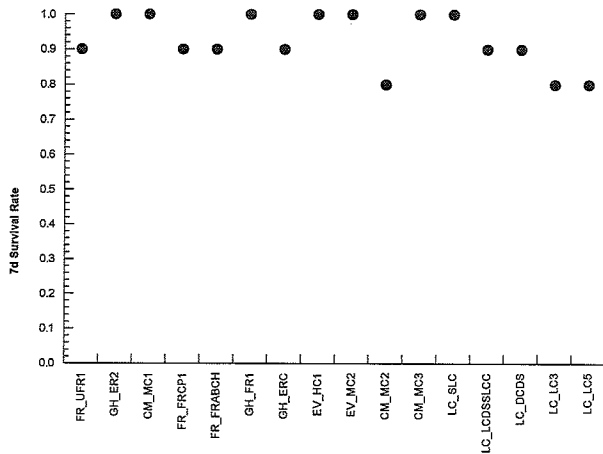
Analysis ID: 03-9422-6281 Endpoint: 7d Survival Rate
 Analyzed: 20 Nov-18 14:39 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

7d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
GH_ER2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC1	XC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRCP1		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
FR_FRABCH		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
GH_FR1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
GH_ERC		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
EV_HC1		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
EV_MC2		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
CM_MC3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_SLC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LCDSSLCC		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_DCDS		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
LC_LC3		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
LC_LC5		1/1	0/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Report Date: 20 Nov-18 14:36 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 01-3715-7687	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 20 Nov-18 14:36	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe			
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		① FR_UFR1, GH_ER2, CM_MC1 & LC_SLC are the controls
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		Unamended sample (US) = LC_SLC
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Unamended Sample		FR_UFR1	0.5000	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.5000	Exact	1.0000	Non-Significant Effect
		EV_HC1	1.0000	Exact	1.0000	Non-Significant Effect
		EV_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.2368	Exact	1.0000	Non-Significant Effect
		CM_MC3	1.0000	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.5000	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 20 Nov-18 14:36 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-3715-7687 Endpoint: 7d Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 20 Nov-18 14:36 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_DCDS	0.5000	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.2368	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.2368	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		9	1	10	0.9	0.1	10.0%
GH_ER2		10	0	10	1	0	0.0%
CM_MC1		10	0	10	1	0	0.0%
FR_FRCP1		9	1	10	0.9	0.1	10.0%
FR_FRABCH		9	1	10	0.9	0.1	10.0%
GH_FR1		10	0	10	1	0	0.0%
GH_ERC		9	1	10	0.9	0.1	10.0%
EV_HC1		10	0	10	1	0	0.0%
EV_MC2		10	0	10	1	0	0.0%
CM_MC2		8	2	10	0.8	0.2	20.0%
CM_MC3		10	0	10	1	0	0.0%
LC_SLC	US	10	0	10	1	0	0.0%
LC_LCDSSLCC		9	1	10	0.9	0.1	10.0%
LC_DCDS		9	1	10	0.9	0.1	10.0%
LC_LC3		8	2	10	0.8	0.2	20.0%
LC_LC5		8	2	10	0.8	0.2	20.0%

7d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_FR1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
GH_ERC		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_HC1		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
EV_MC2		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CM_MC2		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CM_MC3		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_SLC	US	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LCDSSLCC		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_DCDS		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
LC_LC3		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
LC_LC5		1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

CETIS Analytical Report

Report Date: 16 Nov-18 16:44 (p 1 of 4)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-7108-3651	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 16 Nov-18 16:27	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① Control	07-2637-5525	31 Oct-18	31 Oct-18	18h	Teck Coal	
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)		
② GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
② CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
② LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

(LC)
 ① Lab control = 20% perrier
 ② FR_UFR1, GH_ER2, CM_MC1
 A LC_SLC are still controls

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	

CETIS Analytical Report

Report Date: 16 Nov-18 16:44 (p 3 of 4)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-7108-3651 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:27 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	LC	10	18.9	15.93	21.87	20	11	24	1.312	21.95%	0.00%
FR_UFR1		10	21	15.95	26.05	21.5	10	30	2.231	33.60%	-11.11%
GH_ER2		10	21.4	16.13	26.67	23.5	4	31	2.33	34.42%	-13.23%
CM_MC1		10	23.8	19.94	27.66	24	16	31	1.705	22.65%	-25.93%
FR_FRCP1		10	1.1	-0.2677	2.468	0	0	5	0.6046	173.81%	94.18%
FR_FRABCH		10	18.4	13.91	22.89	18.5	7	29	1.984	34.10%	2.65%
GH_FR1		10	17.3	12.46	22.14	19	0	26	2.14	39.11%	8.47%
GH_ERC		10	18.3	14.47	22.13	18	7	27	1.693	29.26%	3.17%
EV_HC1		10	22.8	20	25.6	22	17	31	1.236	17.15%	-20.63%
EV_MC2		10	17.3	13.06	21.54	16.5	8	27	1.874	34.26%	8.47%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	4	0	7	0.6532	57.38%	80.95%
LC_SLC		10	19.7	17.02	22.38	18.5	15	27	1.184	19.00%	-4.23%
LC_LCDSSLCC		10	11.9	8.801	15	12	5	19	1.37	36.40%	37.04%
LC_DCDS		10	13.4	7.898	18.9	11.5	4	28	2.432	57.40%	29.10%
LC_LC3		10	10	6.067	13.93	12	0	15	1.738	54.97%	47.09%
LC_LC5		10	21.9	13.25	30.55	26	0	33	3.825	55.23%	-15.87%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	LC	20	15	11	24	20	22	24	17	16	20
FR_UFR1		27	30	29	11	22	10	15	24	21	21
GH_ER2		31	15	24	25	4	26	23	20	22	24
CM_MC1		25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC		18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

CETIS Analytical Report

Report Date: 16 Nov-18 16:45 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-4975-0524	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 16 Nov-18 16:28	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

① FR_UFR1, GH_ER2, CM_MC1
 & LC_SLC are site controls
 upstream control (U) = FR_UFR1

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	

CETIS Analytical Report

Report Date: 16 Nov-18 16:45 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-4975-0524 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:28 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_ER2 passed reproduction	33.07%
		CM_MC1 passed reproduction	33.07%
		FR_FRCP1 failed reproduction	33.07%
		FR_FRABCH passed reproduction	33.07%
		GH_FR1 passed reproduction	33.07%
		GH_ERC passed reproduction	33.07%
		EV_HC1 passed reproduction	33.07%
		EV_MC2 passed reproduction	33.07%
		CM_MC2 failed reproduction	33.07%
		CM_MC3 failed reproduction	33.07%
		LC_SLC passed reproduction	33.07%
		LC_LCDSSLCC failed reproduction	33.07%
		LC_DCDS passed reproduction	33.07%
		LC_LC3 failed reproduction	33.07%
		LC_LC5 passed reproduction	33.07%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control		GH_ER2	109	71	3	18	CDF	0.9725	Non-Significant Effect
		CM_MC1	116.5	71	3	18	CDF	0.9959	Non-Significant Effect
		FR_FRCP1*	55	71	0	18	CDF	0.0011	Significant Effect
		FR_FRABCH	94	71	3	18	CDF	0.6863	Non-Significant Effect
		GH_FR1	86.5	71	2	18	CDF	0.4127	Non-Significant Effect
		GH_ERC	91	71	3	18	CDF	0.5801	Non-Significant Effect
		EV_HC1	109	71	3	18	CDF	0.9725	Non-Significant Effect
		EV_MC2	89	71	3	18	CDF	0.5055	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	0.0011	Significant Effect
		CM_MC3*	55	71	0	18	CDF	0.0011	Significant Effect
		LC_SLC	96	71	3	18	CDF	0.7502	Non-Significant Effect
		LC_LCDSSLCC*	71	71	2	18	CDF	0.0494	Significant Effect
		LC_DCDS	79	71	2	18	CDF	0.1793	Non-Significant Effect
		LC_LC3*	70	71	3	18	CDF	0.0408	Significant Effect
	LC_LC5	118.5	71	4	18	CDF	0.9977	Non-Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9030.84	602.056	15	16.79	<1.0E-37	Significant Effect
Error	5163.9	35.8604	144			
Total	14194.7		159			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.773	2.165	8.6E-04	Unequal Variances
Variances	Mod Levene Equality of Variance Test	1.901	2.165	0.0275	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9372	0.9774	1.7E-06	Non-Normal Distribution

CETIS Analytical Report

Report Date: 16 Nov-18 16:45 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-4975-0524 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:28 Analysis: Nonparametric-Control vs Treatments Status Level: 1

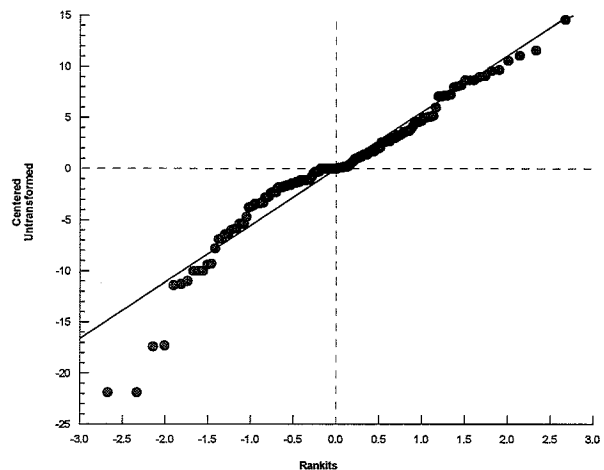
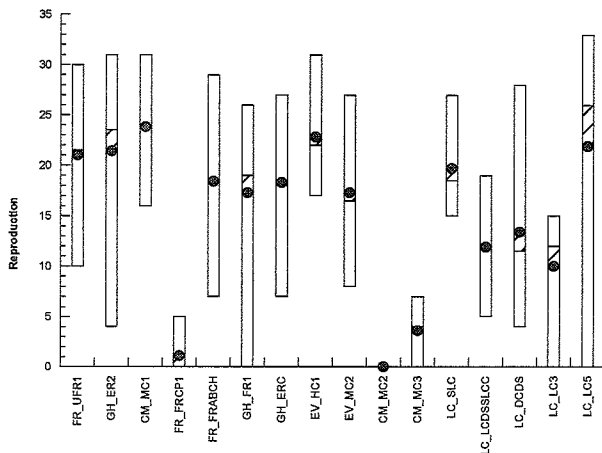
Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	10	21	15.95	26.05	21.5	10	30	2.231	33.60%	0.00%
GH_ER2		10	21.4	16.13	26.67	23.5	4	31	2.33	34.42%	-1.90%
CM_MC1		10	23.8	19.94	27.66	24	16	31	1.705	22.65%	-13.33%
FR_FRCP1		10	1.1	-0.2677	2.468	0	0	5	0.6046	173.81%	94.76%
FR_FRABCH		10	18.4	13.91	22.89	18.5	7	29	1.984	34.10%	12.38%
GH_FR1		10	17.3	12.46	22.14	19	0	26	2.14	39.11%	17.62%
GH_ERC		10	18.3	14.47	22.13	18	7	27	1.693	29.26%	12.86%
EV_HC1		10	22.8	20	25.6	22	17	31	1.236	17.15%	-8.57%
EV_MC2		10	17.3	13.06	21.54	16.5	8	27	1.874	34.26%	17.62%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	4	0	7	0.6532	57.38%	82.86%
LC_SLC		10	19.7	17.02	22.38	18.5	15	27	1.184	19.00%	6.19%
LC_LCDSSLCC		10	11.9	8.801	15	12	5	19	1.37	36.40%	43.33%
LC_DCDS		10	13.4	7.898	18.9	11.5	4	28	2.432	57.40%	36.19%
LC_LC3		10	10	6.067	13.93	12	0	15	1.738	54.97%	52.38%
LC_LC5		10	21.9	13.25	30.55	26	0	33	3.825	55.23%	-4.29%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	U	27	30	29	11	22	10	15	24	21	21
GH_ER2		31	15	24	25	4	26	23	20	22	24
CM_MC1		25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC		18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

Graphics



CETIS Analytical Report

Report Date: 16 Nov-18 16:46 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-1917-6757	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 16 Nov-18 16:30	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

① FR_UFR1, GH_ER2, CM_MC1
 & LC_SLC are site controls
 receiving water (R) = GH_ER2

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	

CETIS Analytical Report

Report Date: 16 Nov-18 16:46 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-1917-6757 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:30 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	32.45%
		CM_MC1 passed reproduction	32.45%
		FR_FRCP1 failed reproduction	32.45%
		FR_FRABCH passed reproduction	32.45%
		GH_FR1 passed reproduction	32.45%
		GH_ERC passed reproduction	32.45%
		EV_HC1 passed reproduction	32.45%
		EV_MC2 passed reproduction	32.45%
		CM_MC2 failed reproduction	32.45%
		CM_MC3 failed reproduction	32.45%
		LC_SLC passed reproduction	32.45%
		LC_LCDSSLCC failed reproduction	32.45%
		LC_DCDS passed reproduction	32.45%
		LC_LC3 failed reproduction	32.45%
		LC_LC5 passed reproduction	32.45%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water		FR_UFR1	101	71	3	18	CDF	0.8752	Non-Significant Effect
		CM_MC1	112	71	4	18	CDF	0.9864	Non-Significant Effect
		FR_FRCP1*	56.5	71	1	18	CDF	0.0016	Significant Effect
		FR_FRABCH	86	71	4	18	CDF	0.3946	Non-Significant Effect
		GH_FR1	80.5	71	3	18	CDF	0.2179	Non-Significant Effect
		GH_ERC	85	71	2	18	CDF	0.3591	Non-Significant Effect
		EV_HC1	102	71	4	18	CDF	0.8938	Non-Significant Effect
		EV_MC2	86	71	2	18	CDF	0.3946	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	0.0011	Significant Effect
		CM_MC3*	60	71	1	18	CDF	0.0042	Significant Effect
		LC_SLC	87.5	71	2	18	CDF	0.4495	Non-Significant Effect
		LC_LCDSSLCC*	67	71	0	18	CDF	0.0221	Significant Effect
		LC_DCDS	80	71	2	18	CDF	0.2045	Non-Significant Effect
		LC_LC3*	64	71	1	18	CDF	0.0113	Significant Effect
		LC_LC5	116	71	3	18	CDF	0.9953	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9030.84	602.056	15	16.79	<1.0E-37	Significant Effect
Error	5163.9	35.8604	144			
Total	14194.7		159			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.773	2.165	8.6E-04	Unequal Variances
Variances	Mod Levene Equality of Variance Test	1.901	2.165	0.0275	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9372	0.9774	1.7E-06	Non-Normal Distribution

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-1917-6757 Endpoint: Reproduction
 Analyzed: 16 Nov-18 16:30 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

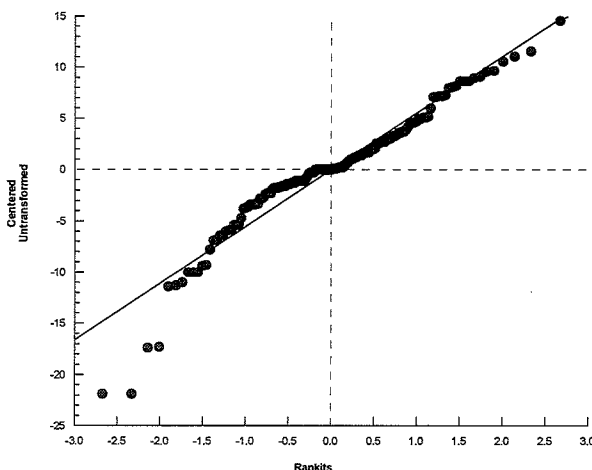
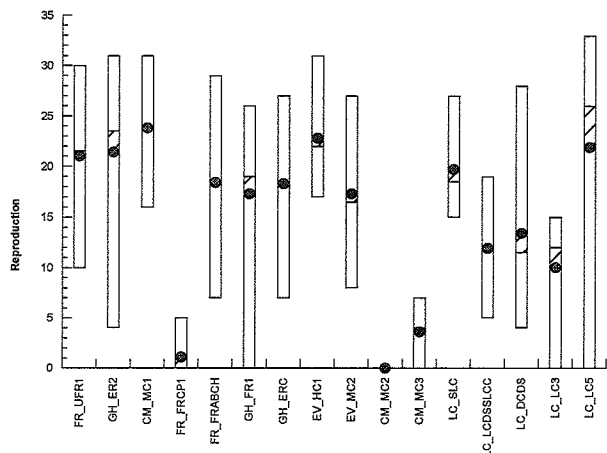
Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	21	15.95	26.05	21.5	10	30	2.231	33.60%	0.00%
GH_ER2	R	10	21.4	16.13	26.67	23.5	4	31	2.33	34.42%	-1.90%
CM_MC1		10	23.8	19.94	27.66	24	16	31	1.705	22.65%	-13.33%
FR_FRCP1		10	1.1	-0.2677	2.468	0	0	5	0.6046	173.81%	94.76%
FR_FRABCH		10	18.4	13.91	22.89	18.5	7	29	1.984	34.10%	12.38%
GH_FR1		10	17.3	12.46	22.14	19	0	26	2.14	39.11%	17.62%
GH_ERC		10	18.3	14.47	22.13	18	7	27	1.693	29.26%	12.86%
EV_HC1		10	22.8	20	25.6	22	17	31	1.236	17.15%	-8.57%
EV_MC2		10	17.3	13.06	21.54	16.5	8	27	1.874	34.26%	17.62%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	4	0	7	0.6532	57.38%	82.86%
LC_SLC		10	19.7	17.02	22.38	18.5	15	27	1.184	19.00%	6.19%
LC_LCDSSLCC		10	11.9	8.801	15	12	5	19	1.37	36.40%	43.33%
LC_DCDS		10	13.4	7.898	18.9	11.5	4	28	2.432	57.40%	36.19%
LC_LC3		10	10	6.067	13.93	12	0	15	1.738	54.97%	52.38%
LC_LC5		10	21.9	13.25	30.55	26	0	33	3.825	55.23%	-4.29%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		27	30	29	11	22	10	15	24	21	21
GH_ER2	R	31	15	24	25	4	26	23	20	22	24
CM_MC1		25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC		18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

Graphics



CETIS Analytical Report

Report Date: 16 Nov-18 16:46 (p 1 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-7390-3390	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 16 Nov-18 16:31	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Batch ID: 11-9001-6548	Test Type: Reproduction-Survival (7d)	Analyst: Kania Lywe
Start Date: 31 Oct-18 18:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 07 Nov-18 15:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 21h	Taxon: Branchiopoda	Source: In-House Culture Age: <24

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	32h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	31h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	32h (0 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	31h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	32h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	27h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	28h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	34h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	31h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	32h (0 °C)		
CM_MC3	18-7105-6870	30 Oct-18 10:55	31 Oct-18 11:50	31h (1 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	32h (0.5 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	30h (1.4 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	30h (0.5 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	28h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	27h (2 °C)		

FR_UFR1, GH_ER2, CM_MC1
 & LC_SLC are site controls
 Site control (XC) = CM_MC1

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	

CETIS Analytical Report

Report Date: 16 Nov-18 16:46 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-7390-3390 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:31 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	29.18%
		GH_ER2 passed reproduction	29.18%
		FR_FRCP1 failed reproduction	29.18%
		FR_FRABCH passed reproduction	29.18%
		GH_FR1 passed reproduction	29.18%
		GH_ERC passed reproduction	29.18%
		EV_HC1 passed reproduction	29.18%
		EV_MC2 passed reproduction	29.18%
		CM_MC2 failed reproduction	29.18%
		CM_MC3 failed reproduction	29.18%
		LC_SLC passed reproduction	29.18%
		LC_LCDSSLCC failed reproduction	29.18%
		LC_DCDS failed reproduction	29.18%
		LC_LC3 failed reproduction	29.18%
		LC_LC5 passed reproduction	29.18%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	93.5	71	3	18	CDF	0.6694	Non-Significant Effect
		GH_ER2	98	71	5	18	CDF	0.8065	Non-Significant Effect
		FR_FRCP1*	55	71	0	18	CDF	0.0011	Significant Effect
		FR_FRABCH	78.5	71	3	18	CDF	0.1675	Non-Significant Effect
		GH_FR1	76.5	71	3	18	CDF	0.1254	Non-Significant Effect
		GH_ERC	79	71	3	18	CDF	0.1793	Non-Significant Effect
		EV_HC1	98.5	71	6	18	CDF	0.8193	Non-Significant Effect
		EV_MC2	76	71	3	18	CDF	0.1162	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	0.0011	Significant Effect
		CM_MC3*	55	71	0	18	CDF	0.0011	Significant Effect
		LC_SLC	81.5	71	3	18	CDF	0.2462	Non-Significant Effect
		LC_LCDSSLCC*	58.5	71	1	18	CDF	0.0028	Significant Effect
		LC_DCDS*	69	71	2	18	CDF	0.0335	Significant Effect
		LC_LC3*	55	71	0	18	CDF	0.0011	Significant Effect
		LC_LC5	111	71	4	18	CDF	0.9826	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9030.84	602.056	15	16.79	<1.0E-37	Significant Effect
Error	5163.9	35.8604	144			
Total	14194.7		159			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.773	2.165	8.6E-04	Unequal Variances
Variances	Mod Levene Equality of Variance Test	1.901	2.165	0.0275	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9372	0.9774	1.7E-06	Non-Normal Distribution

CETIS Analytical Report

Report Date: 16 Nov-18 16:46 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-7390-3390 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:31 Analysis: Nonparametric-Control vs Treatments Status Level: 1

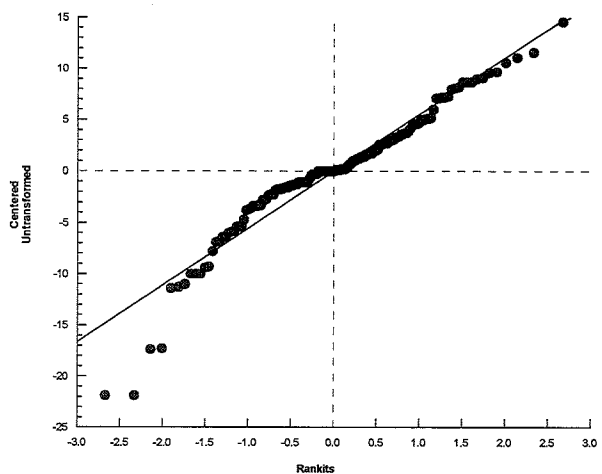
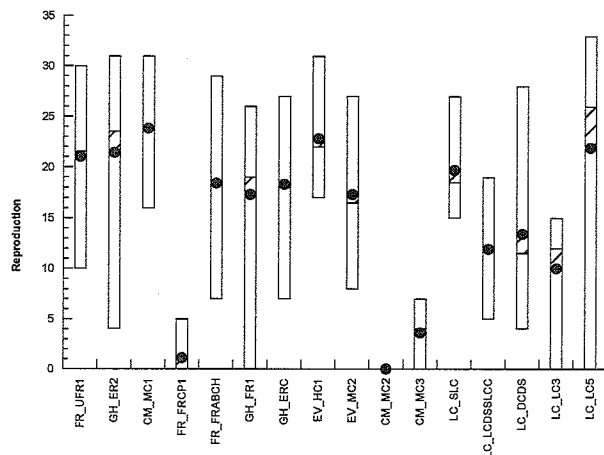
Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	21	15.95	26.05	21.5	10	30	2.231	33.60%	0.00%
GH_ER2		10	21.4	16.13	26.67	23.5	4	31	2.33	34.42%	-1.90%
CM_MC1	XC	10	23.8	19.94	27.66	24	16	31	1.705	22.65%	-13.33%
FR_FRCP1		10	1.1	-0.2677	2.468	0	0	5	0.6046	173.81%	94.76%
FR_FRABCH		10	18.4	13.91	22.89	18.5	7	29	1.984	34.10%	12.38%
GH_FR1		10	17.3	12.46	22.14	19	0	26	2.14	39.11%	17.62%
GH_ERC		10	18.3	14.47	22.13	18	7	27	1.693	29.26%	12.86%
EV_HC1		10	22.8	20	25.6	22	17	31	1.236	17.15%	-8.57%
EV_MC2		10	17.3	13.06	21.54	16.5	8	27	1.874	34.26%	17.62%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	4	0	7	0.6532	57.38%	82.86%
LC_SLC		10	19.7	17.02	22.38	18.5	15	27	1.184	19.00%	6.19%
LC_LCDSSLCC		10	11.9	8.801	15	12	5	19	1.37	36.40%	43.33%
LC_DCDS		10	13.4	7.898	18.9	11.5	4	28	2.432	57.40%	36.19%
LC_LC3		10	10	6.067	13.93	12	0	15	1.738	54.97%	52.38%
LC_LC5		10	21.9	13.25	30.55	26	0	33	3.825	55.23%	-4.29%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		27	30	29	11	22	10	15	24	21	21
GH_ER2		31	15	24	25	4	26	23	20	22	24
CM_MC1	XC	25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC		18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

Graphics



CETIS Analytical Report

Report Date: 16 Nov-18 16:48 (p 2 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-6957-1060 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:32 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed reproduction	35.25%
		GH_ER2 passed reproduction	35.25%
		CM_MC1 passed reproduction	35.25%
		FR_FRCP1 failed reproduction	35.25%
		FR_FRABCH passed reproduction	35.25%
		GH_FR1 passed reproduction	35.25%
		GH_ERC passed reproduction	35.25%
		EV_HC1 passed reproduction	35.25%
		EV_MC2 passed reproduction	35.25%
		CM_MC2 failed reproduction	35.25%
		CM_MC3 failed reproduction	35.25%
		LC_LCDSSLCC failed reproduction	35.25%
		LC_DCDS passed reproduction	35.25%
		LC_LC3 failed reproduction	35.25%
		LC_LC5 passed reproduction	35.25%

Steel Many-One Rank Sum Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Unamended Sampl		FR_UFR1	114	71	3	18	CDF	0.9918	Non-Significant Effect
		GH_ER2	122.5	71	2	18	CDF	0.9994	Non-Significant Effect
		CM_MC1	128.5	71	3	18	CDF	0.9999	Non-Significant Effect
		FR_FRCP1*	55	71	0	18	CDF	0.0011	Significant Effect
		FR_FRABCH	97.5	71	3	18	CDF	0.7932	Non-Significant Effect
		GH_FR1	99	71	5	18	CDF	0.8316	Non-Significant Effect
		GH_ERC	98	71	7	18	CDF	0.8065	Non-Significant Effect
		EV_HC1	127.5	71	4	18	CDF	0.9999	Non-Significant Effect
		EV_MC2	87	71	5	18	CDF	0.4310	Non-Significant Effect
		CM_MC2*	55	71	0	18	CDF	0.0011	Significant Effect
		CM_MC3*	55	71	0	18	CDF	0.0011	Significant Effect
		LC_LCDSSLCC*	63	71	2	18	CDF	0.0089	Significant Effect
		LC_DCDS	75.5	71	1	18	CDF	0.1075	Non-Significant Effect
		LC_LC3*	56	71	1	18	CDF	0.0014	Significant Effect
		LC_LC5	127.5	71	1	18	CDF	0.9999	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9030.84	602.056	15	16.79	<1.0E-37	Significant Effect
Error	5163.9	35.8604	144			
Total	14194.7		159			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.773	2.165	8.6E-04	Unequal Variances
Variances	Mod Levene Equality of Variance Test	1.901	2.165	0.0275	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9372	0.9774	1.7E-06	Non-Normal Distribution

CETIS Analytical Report

Report Date: 16 Nov-18 16:48 (p 3 of 3)
 Test Code/ID: 181871a / 21-4712-0778

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-6957-1060 Endpoint: Reproduction CETIS Version: CETISv1.9.4
 Analyzed: 16 Nov-18 16:32 Analysis: Nonparametric-Control vs Treatments Status Level: 1

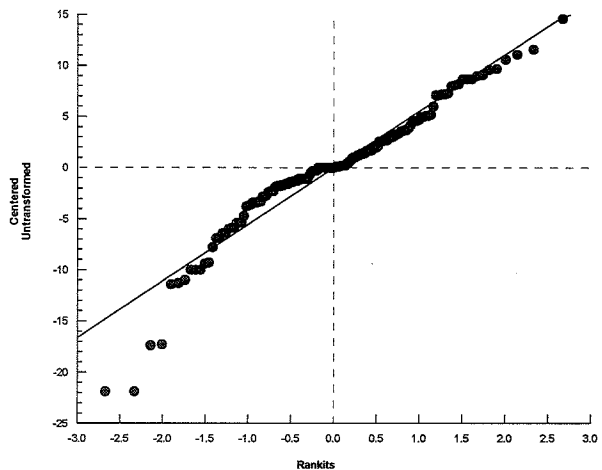
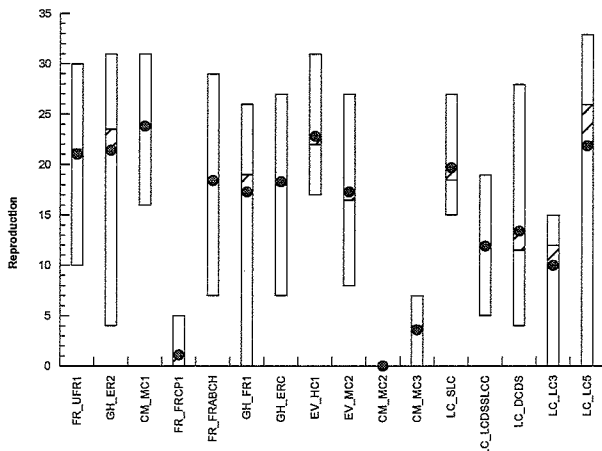
Reproduction Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		10	21	15.95	26.05	21.5	10	30	2.231	33.60%	0.00%
GH_ER2		10	21.4	16.13	26.67	23.5	4	31	2.33	34.42%	-1.90%
CM_MC1		10	23.8	19.94	27.66	24	16	31	1.705	22.65%	-13.33%
FR_FRCP1		10	1.1	-0.2677	2.468	0	0	5	0.6046	173.81%	94.76%
FR_FRABCH		10	18.4	13.91	22.89	18.5	7	29	1.984	34.10%	12.38%
GH_FR1		10	17.3	12.46	22.14	19	0	26	2.14	39.11%	17.62%
GH_ERC		10	18.3	14.47	22.13	18	7	27	1.693	29.26%	12.86%
EV_HC1		10	22.8	20	25.6	22	17	31	1.236	17.15%	-8.57%
EV_MC2		10	17.3	13.06	21.54	16.5	8	27	1.874	34.26%	17.62%
CM_MC2		10	0	0	0	0	0	0	0		100.00%
CM_MC3		10	3.6	2.122	5.078	4	0	7	0.6532	57.38%	82.86%
LC_SLC	US	10	19.7	17.02	22.38	18.5	15	27	1.184	19.00%	6.19%
LC_LCDSSLCC		10	11.9	8.801	15	12	5	19	1.37	36.40%	43.33%
LC_DCDS		10	13.4	7.898	18.9	11.5	4	28	2.432	57.40%	36.19%
LC_LC3		10	10	6.067	13.93	12	0	15	1.738	54.97%	52.38%
LC_LC5		10	21.9	13.25	30.55	26	0	33	3.825	55.23%	-4.29%

Reproduction Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1		27	30	29	11	22	10	15	24	21	21
GH_ER2		31	15	24	25	4	26	23	20	22	24
CM_MC1		25	17	21	20	24	31	29	16	24	31
FR_FRCP1		0	5	4	0	0	0	2	0	0	0
FR_FRABCH		29	13	17	15	7	22	23	15	20	23
GH_FR1		26	16	21	19	19	20	0	18	15	19
GH_ERC		18	21	21	16	7	23	27	18	15	17
EV_HC1		20	17	31	21	23	23	27	24	21	21
EV_MC2		26	17	15	17	12	21	16	8	14	27
CM_MC2		0	0	0	0	0	0	0	0	0	0
CM_MC3		0	2	7	5	4	4	2	5	2	5
LC_SLC	US	18	17	27	23	15	23	16	21	18	19
LC_LCDSSLCC		19	12	13	6	10	17	14	11	5	12
LC_DCDS		4	25	8	7	11	28	16	13	12	10
LC_LC3		0	12	15	12	11	12	15	10	0	13
LC_LC5		31	0	33	0	22	27	22	25	29	30

Graphics



APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 181870

Start Date: Nov 2/18
 Set up by: ML

Sample Information:

Sample ID: various: see results table for IDs
 Sample Date: Oct 30/18
 Date Received: Oct 31/18
 Sample Volume: various

Test Organism Information:

Culture Date: Oct 26/18
 Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC175
 Stock Solution ID: 18Zn05
 Date Initiated: Oct 22/18

72-h IC50 (95% CL): 34.8 (31.9-37.6) mg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.9 (25.8-37.0) mg/L Zn CV (%): 9

Test Results:

Ⓛ site controls

	Cell Yield (Mean ± SD)
Negative Control	28.8 ± 2.1
FR-UPRI-WS-2018-10-30-N Ⓛ	109.1 ± 6.8 *
GH-ER2-WS-2018-10-30-N Ⓛ	104.8 ± 6.0 *f
CM-MCI-04-WS-2018-10-30-N Ⓛ	111.2 ± 8.1 *
LC-SLC-WS-2018-10-30-N Ⓛ	109.9 ± 8.2 *
FR-FRPI-WS-2018-10-30-N	7.0 ± 1.8 abdef
FR-FRABCH-WS-2018-10-30-N	92.0 ± 5.6 * abdf
GH-FRI-WS-2018-10-30-N	109.0 ± 8.6 *
GH-ERC-WS-2018-10-30-N	118.8 ± 1.7 *c

d. indicates cell yield that were significantly lower than LC-SLC

* indicates that cell yield that were significantly greater than the lab control

a. indicates cell yield that were significantly lower than site controls
 FR-UPRI

b. indicates cell yield that were significantly lower than GH-ER2.

c. indicates cell yield that were significantly greater than site controls
 FR-UPRI, GH-ER2, CM-MCI and LC-SLC.

Reviewed by: [Signature]

Date reviewed: Feb 14, 2019

e. indicates cell yield that were significantly lower than the lab control

f. indicates cell yield that were significantly lower than site controls CM-MCI

Pseudokirchneriella subcapitata Summary Sheet

Client: Teck Coal
 Work Order No.: 181870

Start Date: Nov 2/18
 Set up by: MLT

Sample Information:

Sample ID: VARIOUS: see results table for IDs
 Sample Date: Oct 30/18
 Date Received: Oct 31/18
 Sample Volume: VARIOUS

Test Organism Information:

Culture Date: Oct 26/18
 Age of culture (Day 0): 7 d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC175
 Stock Solution ID: 187705
 Date Initiated: Oct 22/18

72-h IC50 (95% CL): 34.8 (31.9-37.6) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.9 (25.8-37.0) µg/L Zn CV (%): 9

Test Results:

	Cell Yield (Mean ± SD)
Negative Control	28.8 ± 2.1
EV-HCL-WS-2018-10-30-N	109.2 ± 2.6 *
EV-MC2-WS-2018-10-30-N	90.5 ± 5.3 * abdf
CM-MC2-QT-WS-20181030-N	94.8 ± 7.8 * adf
LL-LCD33LCC-WS-2018-10-30-N	87.8 ± 8.2 * abdf
LL-LC3-WS-2018-10-30-N	100.8 ± 5.9 * adf
LL-LC5-WS-2018-10-30-N	97.8 ± 9.1 * adf
LL-DCDS-WS-2018-10-30-N	98.5 ± 5.8 * d, adf
	±

* indicates cell yield that were significantly greater than the lab control
 a. indicates cell yield that were significantly lower than site control CM-MC1
 b. indicates cell yield that were significantly lower than GH-ER2

d. indicates cell yield that were significantly lower than ~~CM-MC1~~ LC-SLC

c. indicates cell yield that were significantly greater than GH-ER2

Reviewed by: [Signature] Date reviewed: Feb 14, 2019

f. indicates cell yield that were significantly lower than site control CM-MC1

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLG
 Sample ID: various Test Date/Time: Nov 2/18 @ 0800h
 Work Order No.: 181870 CER #: 4
 Test Species: Pseudokirchneriella subcapitata
 Culture Date: Oct 26/18 Age of Culture: 7d Culture Health: Good
 Culture Count: 1 400 2 375 Average: 387.5 Culture Cell Density (c1): 387.5 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 387.5 \times 10^4 \text{ cells/mL}} = 5.68 \text{ mL}$$

Time Zero Counts: 1 21 2 20 Average: 20.5

No. of Cells/mL: 20.5 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 0.318 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	(°C)				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.0	23.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓
② FR-UPRI	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① GH-ER2	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① CM-MCI	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① LC-SLC	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
③ FR-FRCP1	7.5	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① FR-FRABCH	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① GH-FRI	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① GH-ERC	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① EV-HCl	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.1 Well 2: 7.1

Light intensity (lux): 3980 Date measured: Nov 2/18

Thermometer: 4 Light meter: 1 pH meter/probe: 1, 1

Sample Description: ① clear, odourless, odourless, some particulates.

Comments: ② clear, colourless, odourless, no particulates

③ turbid, colourless, hydrocarbon odour, no particulates.

Reviewed: MLG Date reviewed: Feb 7, 2019

72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLG
 Sample ID: various Test Date/Time: Nov 2/18 @ 0800h
 Work Order No.: 181870 CER #: 4
 Test Species: Pseudokirchneriella subcapitata
 Culture Date: Oct 26/18 Age of Culture: 7d Culture Health: Good
 Culture Count: 1 460 2 375 Average: 387.5 Culture Cell Density (c1): 387.5 x 10⁴ cells/mL

$$v1 = \frac{220,000 \text{ cells/ml} \times 100 \text{ ml}}{(c1) \quad 387.5 \times 10^4 \quad \text{cells/ml}} = 5.68 \text{ mL}$$

Time Zero Counts: 1 21 2 20 Average: 20.5

No. of Cells/mL: 20.5 x 10⁴ Initial Density: # cells/mL + 220 μL x 10 μL = 9318 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?				
	pH	Temp (°C)	(°C)				0 h	24 h	48 h	72 h	
			0 h	24 h	48 h	72 h					
Control											
① EV-ML2	8.0	23.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓	
① CM-ML2	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓	
① LC-LC0SSLEC	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓	
① LC-LC3	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓	
① LC-LC5	8.4	23.0	↓	↓	↓	↓	✓	✓	✓	✓	
① LC-DEDS	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓	
Initials	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG	MLG

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 7.1 Well 2: 7.1

Light intensity (lux): 3980 Date measured: Nov 2/18

Thermometer: 4 Light meter: 1 pH meter/probe: 11

Sample Description: ① clear, colourless, odourless, some particulates

Comments: _____

Reviewed: [Signature] Date reviewed: Feb 7, 2019

1/3

Pseudokirchneriella subcapitata Toxicity Test Data Sheet 72-h Algal Cell Counts

Client: Teek Coal Start Date/Time: Nov 2/18 @ 0800h

Work Order #: 181870 Termination Date: Nov 5/18 @ 0800h

Sample ID: various Test set up by: MLG

95.2 % (v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	20					MLG
	B	29					
	C	31					
	D	28					
	E	27					
	F	30					
	G	29					
	H	34					
FRNPR1	A	99					
	B	103					
	C	116					
	D	108					
MS9	EA	114					
	FB	108					
	GC	119					
	HD	114					
GH_E22	A	96					
	B	105					
	C	115					
	D	106					
ML9	EA	99					
	FB	110					
	GC	108					
	HD	107					
CMML1	A	122					
	B	121					
	C	116					
	D	108					
	EA	109					
	FB	103					
	GC	101					
	HD	118					
	A						✓
	B						
	C						
	D						

Comments: _____

Reviewed by: [Signature] Date Reviewed: Feb. 7, 2019

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: Teck Coal Start Date/Time: Nov 2/18 @ 0800h
 Work Order #: 181870 Termination Date: Nov 5/18 @ 0800h
 Sample ID: various Test set up by: MLG
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control <i>MLG</i>	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
LC-SLC	A	118					<i>MLG</i>
	B	105					
	C	110					
	D	107					
<i>EA</i>	<i>EA</i>	120					
	<i>FB</i>	121					
	<i>GC</i>	102					
	<i>HD</i>	111					
FR-FREP1	A	88	10				
	B	96	9				
	C	89	6				
	D	100	7				
FR-FRABCH	A	88					
	B	95					
	C	89					
	D	100					
GH-FR1	A	120					
	B	110					
	C	99					
	D	111					
GH-ERC	A	122					
	B	118					
	C	120					
	D	119					
EV-HC1	A	110					
	B	114					
	C	108					
	D	109					

Comments: _____
 Reviewed by: *MLG* Date Reviewed: Feb. 7, 2019

3/3

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: Teek Coal Start Date/Time: Nov 2/18 @ 0800h
 Work Order #: 181870 Termination Date: Nov 5/18 @ 0800h
 Sample ID: VARIOUS. Test set up by: MLG
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control <i>MLG</i>	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
EV-MC2	A	91					MLG
	B	89					
	C	99					
	D	87					
CM-MC2	A	107					
	B	91					
	C	95					
	D	90					
LC-LC881CE	A	81					
	B	100					
	C	85					
	D	89					
LC-LC3	A	101					
	B	110					
	C	100					
	D	96					
LC-LC5	A	102					
	B	90					
	C	110					
	D	93					
LC-DeDS	A	92					
	B	103					
	C	98					
	D	105					
	A						
	B						
	C						
	D						

Comments: _____
 Reviewed by: *MLG* Date Reviewed: Feb. 7, 2019

CETIS Summary Report

Report Date: 11 Feb-19 16:24 (p 1 of 45)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Batch ID: 18-4595-5384 Test Type: Cell Growth Analyst: Mimi Tran
 Start Date: 02 Nov-18 08:00 Protocol: EC/EPS 1/RM/25 Diluent: Deionized Water + nutrients
 Ending Date: 05 Nov-18 08:00 Species: Pseudokirchneriella subcapitata Brine:
 Test Length: 72h Taxon: Chlorophyta Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-9148-4958	02 Nov-18	02 Nov-18	8h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	LC_SLC passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	EV_MC2 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	LC_DCDS passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	FR_FRABCH passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	LC_LC3 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	CM_MC2 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	Lab Control passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	EV_HC1 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	LC_LCDSSLCC passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	GH_FR1 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	CM_MC1 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	LC_LC5 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	GH_ER2 passed cell yield	1
01-3717-0323	Cell Yield	Equal Variance t Two-Sample Test	0.9025	GH_ERC passed cell yield	1

CETIS Summary Report

Report Date: 11 Feb-19 16:24 (p 44 of 45)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	EV_HC1 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	FR_FRCP1 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	GH_ERC failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	FR_FRABCH failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	FR_UFR1 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	GH_FR1 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	CM_MC2 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	LC_LC3 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	LC_SLC failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	CM_MC1 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	LC_LC5 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	GH_ER2 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	LC_DCDS failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	LC_LCDSSLCC failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	EV_MC2 failed cell yield	1
13-6176-9619	Cell Yield	Equal Variance t Two-Sample Test	<1.0E-37	Lab Control failed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	LC_DCDS passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	GH_ERC passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	FR_UFR1 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	GH_ER2 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	CM_MC1 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	LC_SLC passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	FR_FRCP1 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	GH_FR1 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	FR_FRABCH passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	EV_HC1 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	EV_MC2 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	CM_MC2 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	LC_LCDSSLCC passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	LC_LC3 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	LC_LC5 passed cell yield	1
17-7614-1979	Cell Yield	Equal Variance t Two-Sample Test	0.9418	Lab Control passed cell yield	1

Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	N	8	28.75	26.98	30.52	26	33	0.75	2.121	7.38%	0.00%
FR_UFR1		8	109.1	103.4	114.8	98	118	2.416	6.833	6.26%	-279.57%
GH_ER2		8	104.8	99.74	109.8	95	114	2.119	5.994	5.72%	-264.35%
CM_MC1		8	111.2	104.5	118	100	121	2.864	8.102	7.28%	-286.96%
LC_SLC	XC	8	109.9	103	116.7	99	120	2.894	8.184	7.45%	-282.17%
FR_FRCP1		4	7	4.095	9.905	5	9	0.9129	1.826	26.08%	75.65%
FR_FRABCH		4	92	83.09	100.9	87	99	2.799	5.598	6.08%	-220.00%
GH_FR1		4	109	95.31	122.7	98	119	4.301	8.602	7.89%	-279.13%
GH_ERC		4	118.8	116	121.5	117	121	0.8539	1.708	1.44%	-313.04%
EV_HC1		4	109.2	105.1	113.4	107	113	1.315	2.63	2.41%	-280.00%
EV_MC2		4	90.5	82.13	98.87	86	98	2.63	5.26	5.81%	-214.78%
CM_MC2		4	94.75	82.33	107.2	89	106	3.902	7.805	8.24%	-229.57%
LC_LCDSSLCC		4	87.75	74.73	100.8	80	99	4.09	8.18	9.32%	-205.22%
LC_LC3		4	100.8	91.35	110.2	95	109	2.955	5.909	5.87%	-250.43%
LC_LC5		4	97.75	83.32	112.2	89	109	4.535	9.069	9.28%	-240.00%
LC_DCDS		4	98.5	89.27	107.7	91	104	2.901	5.802	5.89%	-242.61%

CETIS Summary Report

Report Date: 11 Feb-19 16:24 (p 45 of 45)
Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	29	28	30	27	26	29	28	33
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC	XC	117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-1876-9162 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample Status Level: 1

Batch ID: 18-4595-5384 Test Type: Cell Growth Analyst: Mimi Tran
 Start Date: 02 Nov-18 08:00 Protocol: EC/EPS 1/RM/25 Diluent: Deionized Water + nutrients
 Ending Date: 05 Nov-18 08:00 Species: Pseudokirchneriella subcapitata Brine:
 Test Length: 72h Taxon: Chlorophyta Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-9148-4958	02 Nov-18	02 Nov-18	8h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-1876-9162 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	14.05%
		GH_ER2 passed cell yield	14.05%
		CM_MC1 passed cell yield	14.05%
		LC_SLC passed cell yield	14.05%
		FR_FRCP1 failed cell yield	14.05%
		FR_FRABCH passed cell yield	14.05%
		GH_FR1 passed cell yield	14.05%
		GH_ERC passed cell yield	14.05%
		EV_HC1 passed cell yield	14.05%
		EV_MC2 passed cell yield	14.05%
		CM_MC2 passed cell yield	14.05%
		LC_LCDSSLCC passed cell yield	14.05%
		LC_LC3 passed cell yield	14.05%
		LC_LC5 passed cell yield	14.05%
		LC_DCDS passed cell yield	14.05%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	-31.77	1.761	4.456	14	CDF	1.0000	Non-Significant Effect
		GH_ER2	-33.81	1.761	3.959	14	CDF	1.0000	Non-Significant Effect
		CM_MC1	-27.86	1.761	5.215	14	CDF	1.0000	Non-Significant Effect
		LC_SLC	-27.14	1.761	5.265	14	CDF	1.0000	Non-Significant Effect
		FR_FRCP1*	17.43	1.812	2.261	10	CDF	<1.0E-37	Significant Effect
		FR_FRABCH	-29.16	1.812	3.932	10	CDF	1.0000	Non-Significant Effect
		GH_FR1	-26.03	1.812	5.588	10	CDF	1.0000	Non-Significant Effect
		GH_ERC	-73.26	1.812	2.227	10	CDF	1.0000	Non-Significant Effect
		EV_HC1	-57.51	1.812	2.537	10	CDF	1.0000	Non-Significant Effect
		EV_MC2	-29.8	1.812	3.756	10	CDF	1.0000	Non-Significant Effect
		CM_MC2	-23.28	1.812	5.137	10	CDF	1.0000	Non-Significant Effect
		LC_LCDSSLCC	-19.99	1.812	5.349	10	CDF	1.0000	Non-Significant Effect
		LC_LC3	-31.85	1.812	4.097	10	CDF	1.0000	Non-Significant Effect
		LC_LC5	-21.36	1.812	5.855	10	CDF	1.0000	Non-Significant Effect
		LC_DCDS	-31.29	1.812	4.04	10	CDF	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	75998.8	5066.59	15	122.5	<1.0E-37	Significant Effect
Error	2812.75	41.364	68			
Total	78811.6		83			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	24.33	30.58	0.0597	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9746	0.9596	0.0945	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-1876-9162 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

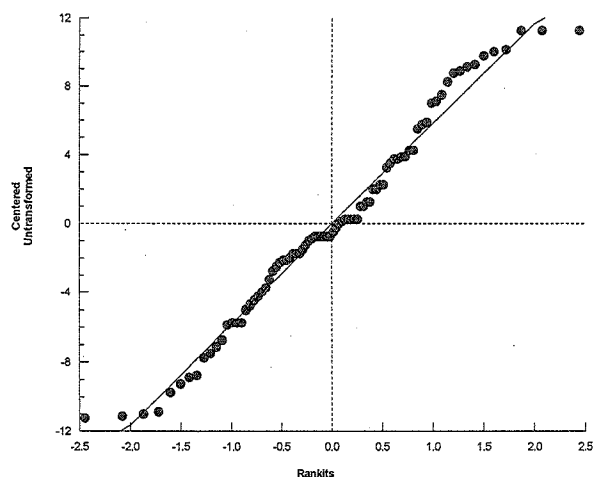
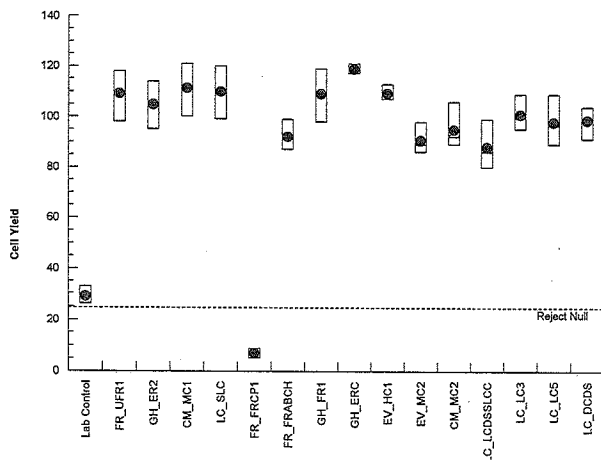
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	N	8	28.75	26.98	30.52	28.5	26	33	0.75	7.38%	0.00%
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	-279.57%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	-264.35%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-286.96%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-282.17%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	75.65%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	-220.00%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	-279.13%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-313.04%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-280.00%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	-214.78%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	-229.57%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	-205.22%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	-250.43%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	-240.00%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	-242.61%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	29	28	30	27	26	29	28	33
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 13-6176-9619	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-9148-4958	02 Nov-18	02 Nov-18	8h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 13-6176-9619 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 failed cell yield	14.05%
		GH_ER2 failed cell yield	14.05%
		CM_MC1 failed cell yield	14.05%
		LC_SLC failed cell yield	14.05%
		FR_FRCP1 passed cell yield	14.05%
		FR_FRABCH failed cell yield	14.05%
		GH_FR1 failed cell yield	14.05%
		GH_ERC failed cell yield	14.05%
		EV_HC1 failed cell yield	14.05%
		EV_MC2 failed cell yield	14.05%
		CM_MC2 failed cell yield	14.05%
		LC_LCDSSLCC failed cell yield	14.05%
		LC_LC3 failed cell yield	14.05%
		LC_LC5 failed cell yield	14.05%
		LC_DCDS failed cell yield	14.05%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1*	31.77	1.761	4.456	14	CDF	<1.0E-37	Significant Effect
		GH_ER2*	33.81	1.761	3.959	14	CDF	<1.0E-37	Significant Effect
		CM_MC1*	27.86	1.761	5.215	14	CDF	<1.0E-37	Significant Effect
		LC_SLC*	27.14	1.761	5.265	14	CDF	<1.0E-37	Significant Effect
		FR_FRCP1	-17.43	1.812	2.261	10	CDF	1.0000	Non-Significant Effect
		FR_FRABCH*	29.16	1.812	3.932	10	CDF	<1.0E-37	Significant Effect
		GH_FR1*	26.03	1.812	5.588	10	CDF	<1.0E-37	Significant Effect
		GH_ERC*	73.26	1.812	2.227	10	CDF	<1.0E-37	Significant Effect
		EV_HC1*	57.51	1.812	2.537	10	CDF	<1.0E-37	Significant Effect
		EV_MC2*	29.8	1.812	3.756	10	CDF	<1.0E-37	Significant Effect
		CM_MC2*	23.28	1.812	5.137	10	CDF	<1.0E-37	Significant Effect
		LC_LCDSSLCC*	19.99	1.812	5.349	10	CDF	<1.0E-37	Significant Effect
		LC_LC3*	31.85	1.812	4.097	10	CDF	<1.0E-37	Significant Effect
		LC_LC5*	21.36	1.812	5.855	10	CDF	<1.0E-37	Significant Effect
		LC_DCDS*	31.29	1.812	4.04	10	CDF	<1.0E-37	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	75998.8	5066.59	15	122.5	<1.0E-37	Significant Effect
Error	2812.75	41.364	68			
Total	78811.6		83			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	24.33	30.58	0.0597	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9746	0.9596	0.0945	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 13-6176-9619 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

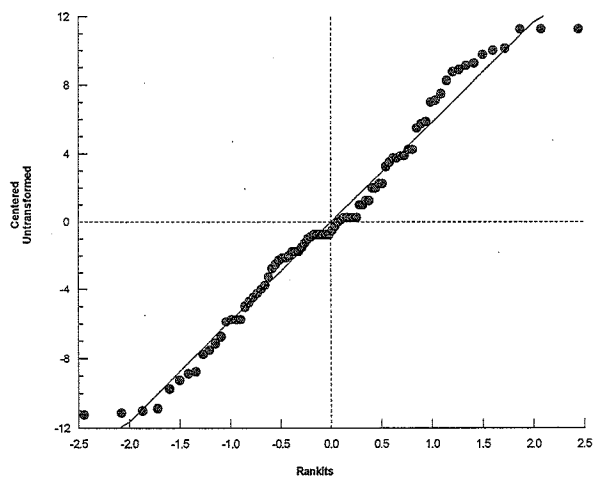
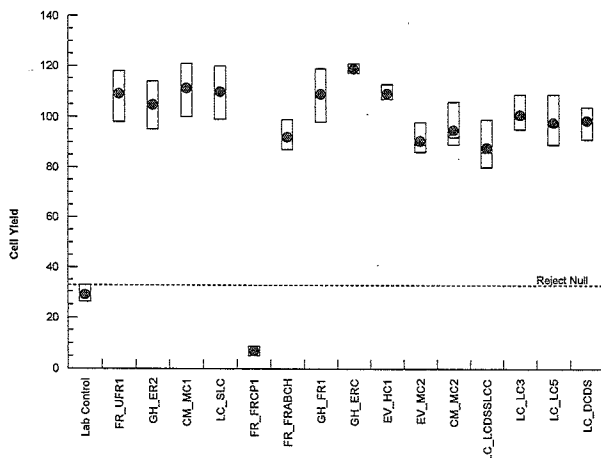
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	N	8	28.75	26.98	30.52	28.5	26	33	0.75	7.38%	0.00%
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	-279.57%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	-264.35%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-286.96%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-282.17%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	75.65%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	-220.00%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	-279.13%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-313.04%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-280.00%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	-214.78%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	-229.57%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	-205.22%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	-250.43%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	-240.00%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	-242.61%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	N	29	28	30	27	26	29	28	33
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4510-0632	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:17	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4510-0632 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:17 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_ER2 passed cell yield	6.65%
		CM_MC1 passed cell yield	6.65%
		LC_SLC passed cell yield	6.65%
		FR_FRCP1 failed cell yield	6.65%
		FR_FRABCH failed cell yield	6.65%
		GH_FR1 passed cell yield	6.65%
		GH_ERC passed cell yield	6.65%
		EV_HC1 passed cell yield	6.65%
		EV_MC2 failed cell yield	6.65%
		CM_MC2 failed cell yield	6.65%
		LC_LCDSSLCC failed cell yield	6.65%
		LC_LC3 failed cell yield	6.65%
		LC_LC5 failed cell yield	6.65%
		LC_DCDS failed cell yield	6.65%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		GH_ER2	1.361	1.761	5.66	14	CDF	0.0975	Non-Significant Effect
<i>FR & FR1</i>		CM_MC1	-0.5671	1.761	6.6	14	CDF	0.7102	Non-Significant Effect
		LC_SLC	-0.199	1.761	6.639	14	CDF	0.5774	Non-Significant Effect
		FR_FRCP1*	28.73	1.812	6.442	10	CDF	<1.0E-37	Significant Effect
		FR_FRABCH*	4.311	1.812	7.2	10	CDF	7.7E-04	Significant Effect
		GH_FR1	0.02755	1.812	8.223	10	CDF	0.4893	Non-Significant Effect
		GH_ERC	-2.713	1.812	6.43	10	CDF	0.9891	Non-Significant Effect
		EV_HC1	-0.03462	1.812	6.544	10	CDF	0.5135	Non-Significant Effect
		EV_MC2*	4.751	1.812	7.106	10	CDF	3.9E-04	Significant Effect
		CM_MC2*	3.288	1.812	7.923	10	CDF	0.0041	Significant Effect
		LC_LCDSSLCC*	4.805	1.812	8.062	10	CDF	3.6E-04	Significant Effect
		LC_LC3*	2.082	1.812	7.292	10	CDF	0.0320	Significant Effect
		LC_LC5*	2.453	1.812	8.406	10	CDF	0.0171	Significant Effect
		LC_DCDS*	2.652	1.812	7.26	10	CDF	0.0121	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.1855	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-4510-0632 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:17 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

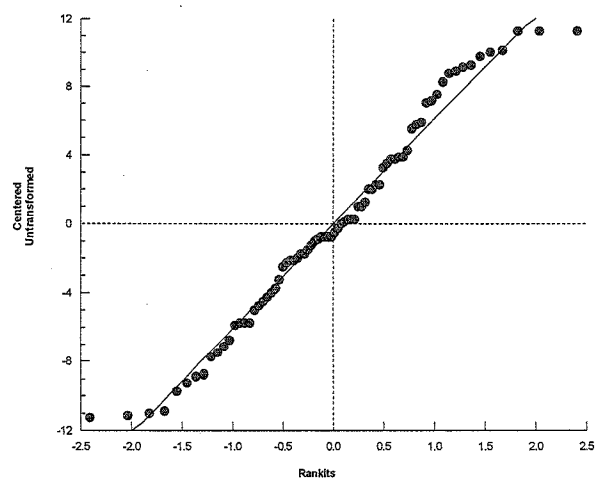
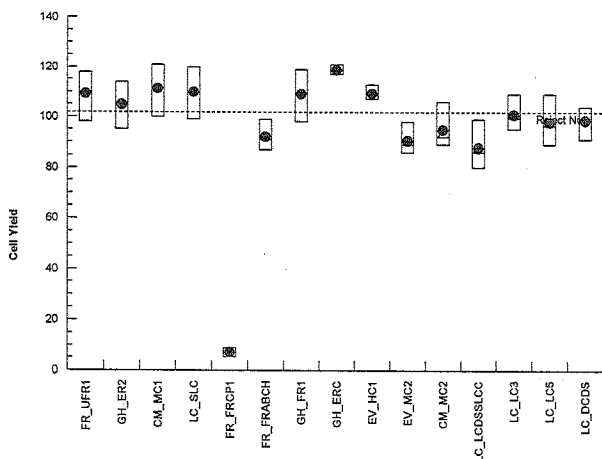
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	XC	8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	XC	98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



[Signature]
 FEB 14/19

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-5192-7237	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:17	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-5192-7237 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:17 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_ER2 passed cell yield	6.65%
		CM_MC1 passed cell yield	6.65%
		LC_SLC passed cell yield	6.65%
		FR_FRCP1 passed cell yield	6.65%
		FR_FRABCH passed cell yield	6.65%
		GH_FR1 passed cell yield	6.65%
		GH_ERC failed cell yield	6.65%
		EV_HC1 passed cell yield	6.65%
		EV_MC2 passed cell yield	6.65%
		CM_MC2 passed cell yield	6.65%
		LC_LCDSSLCC passed cell yield	6.65%
		LC_LC3 passed cell yield	6.65%
		LC_LC5 passed cell yield	6.65%
		LC_DCDS passed cell yield	6.65%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		GH_ER2	-1.361	1.761	5.66	14	CDF	0.9025	Non-Significant Effect
FR_FRCP1		CM_MC1	0.5671	1.761	6.6	14	CDF	0.2898	Non-Significant Effect
		LC_SLC	0.199	1.761	6.639	14	CDF	0.4226	Non-Significant Effect
		FR_FRCP1	-28.73	1.812	6.442	10	CDF	1.0000	Non-Significant Effect
		FR_FRABCH	-4.311	1.812	7.2	10	CDF	0.9992	Non-Significant Effect
		GH_FR1	-0.02755	1.812	8.223	10	CDF	0.5107	Non-Significant Effect
		GH_ERC*	2.713	1.812	6.43	10	CDF	0.0109	Significant Effect
		EV_HC1	0.03462	1.812	6.544	10	CDF	0.4865	Non-Significant Effect
		EV_MC2	-4.751	1.812	7.106	10	CDF	0.9996	Non-Significant Effect
		CM_MC2	-3.288	1.812	7.923	10	CDF	0.9959	Non-Significant Effect
		LC_LCDSSLCC	-4.805	1.812	8.062	10	CDF	0.9996	Non-Significant Effect
		LC_LC3	-2.082	1.812	7.292	10	CDF	0.9680	Non-Significant Effect
		LC_LC5	-2.453	1.812	8.406	10	CDF	0.9829	Non-Significant Effect
		LC_DCDS	-2.652	1.812	7.26	10	CDF	0.9879	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.1855	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:24 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-5192-7237 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:17 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

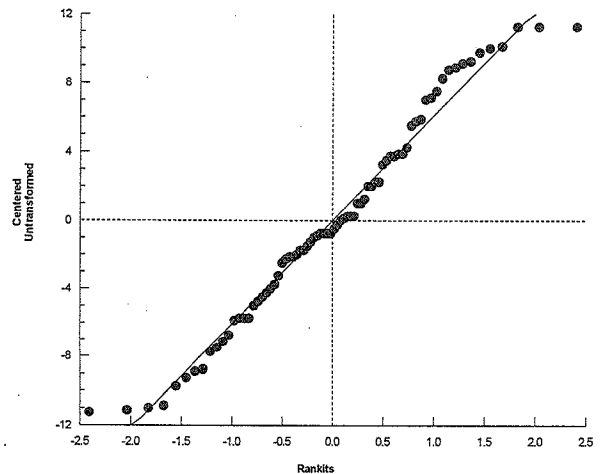
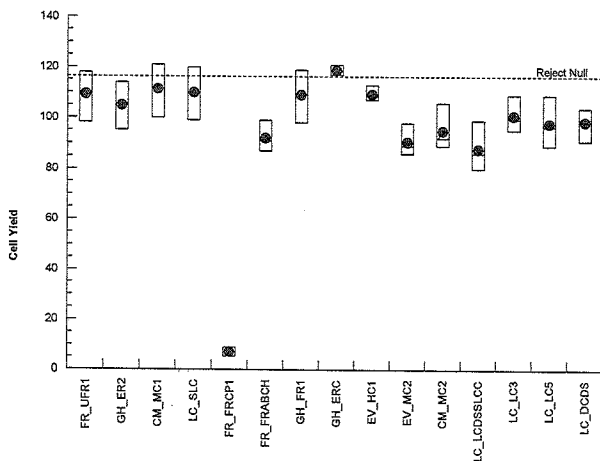
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	XC	8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	XC	98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



Feb. 14/19

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 01-3717-0323	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4			
Analyzed: 11 Feb-19 16:19	Analysis: Parametric-Two Sample	Status Level: 1			
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:			
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 01-3717-0323 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	6.29%
		CM_MC1 passed cell yield	6.29%
		LC_SLC passed cell yield	6.29%
		FR_FRCP1 failed cell yield	6.29%
		FR_FRABCH failed cell yield	6.29%
		GH_FR1 passed cell yield	6.29%
		GH_ERC passed cell yield	6.29%
		EV_HC1 passed cell yield	6.29%
		EV_MC2 failed cell yield	6.29%
		CM_MC2 failed cell yield	6.29%
		LC_LCDSSLCC failed cell yield	6.29%
		LC_LC3 passed cell yield	6.29%
		LC_LC5 passed cell yield	6.29%
		LC_DCDS passed cell yield	6.29%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	-1.361	1.761	5.66	14	CDF	0.9025	Non-Significant Effect
<i>GH_ERC2</i>		CM_MC1	-1.824	1.761	6.276	14	CDF	0.9552	Non-Significant Effect
		LC_SLC	-1.429	1.761	6.317	14	CDF	0.9125	Non-Significant Effect
		FR_FRCP1*	31.22	1.812	5.676	10	CDF	<1.0E-37	Significant Effect
		FR_FRABCH*	3.542	1.812	6.524	10	CDF	0.0027	Significant Effect
		GH_FR1	-1.009	1.812	7.637	10	CDF	0.8315	Non-Significant Effect
		GH_ERC	-4.481	1.812	5.662	10	CDF	0.9994	Non-Significant Effect
		EV_HC1	-1.408	1.812	5.791	10	CDF	0.9053	Non-Significant Effect
		EV_MC2*	4.023	1.812	6.419	10	CDF	0.0012	Significant Effect
		CM_MC2*	2.478	1.812	7.314	10	CDF	0.0163	Significant Effect
		LC_LCDSSLCC*	4.128	1.812	7.464	10	CDF	0.0010	Significant Effect
		LC_LC3	1.094	1.812	6.625	10	CDF	0.1497	Non-Significant Effect
		LC_LC5	1.619	1.812	7.834	10	CDF	0.0682	Non-Significant Effect
		LC_DCDS	1.719	1.812	6.59	10	CDF	0.0582	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.3987	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 01-3717-0323 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

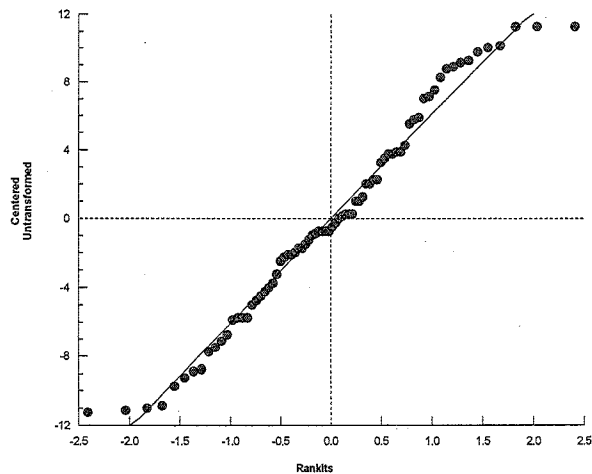
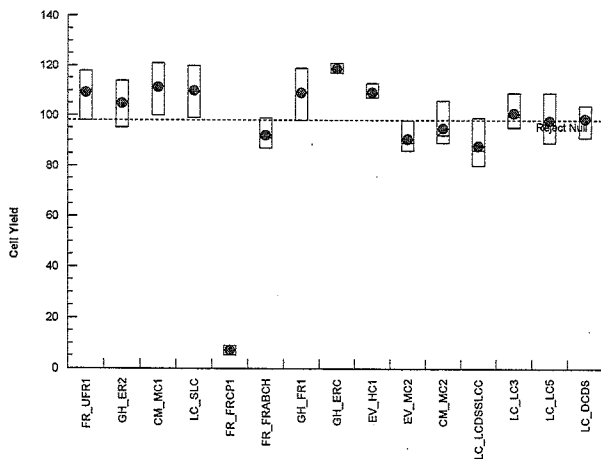
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2	XC	8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2	XC	95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-7614-1979	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 17-7614-1979 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	6.29%
		CM_MC1 failed cell yield	6.29%
		LC_SLC passed cell yield	6.29%
		FR_FRCP1 passed cell yield	6.29%
		FR_FRABCH passed cell yield	6.29%
		GH_FR1 passed cell yield	6.29%
		GH_ERC failed cell yield	6.29%
		EV_HC1 passed cell yield	6.29%
		EV_MC2 passed cell yield	6.29%
		CM_MC2 passed cell yield	6.29%
		LC_LCDSSLCC passed cell yield	6.29%
		LC_LC3 passed cell yield	6.29%
		LC_LC5 passed cell yield	6.29%
		LC_DCDS passed cell yield	6.29%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	1.361	1.761	5.66	14	CDF	0.0975	Non-Significant Effect
<i>GH_EK2</i>		CM_MC1*	1.824	1.761	6.276	14	CDF	0.0448	Significant Effect
		LC_SLC	1.429	1.761	6.317	14	CDF	0.0875	Non-Significant Effect
		FR_FRCP1	-31.22	1.812	5.676	10	CDF	1.0000	Non-Significant Effect
		FR_FRABCH	-3.542	1.812	6.524	10	CDF	0.9973	Non-Significant Effect
		GH_FR1	1.009	1.812	7.637	10	CDF	0.1685	Non-Significant Effect
		GH_ERC*	4.481	1.812	5.662	10	CDF	5.9E-04	Significant Effect
		EV_HC1	1.408	1.812	5.791	10	CDF	0.0947	Non-Significant Effect
		EV_MC2	-4.023	1.812	6.419	10	CDF	0.9988	Non-Significant Effect
		CM_MC2	-2.478	1.812	7.314	10	CDF	0.9837	Non-Significant Effect
		LC_LCDSSLCC	-4.128	1.812	7.464	10	CDF	0.9990	Non-Significant Effect
		LC_LC3	-1.094	1.812	6.625	10	CDF	0.8503	Non-Significant Effect
		LC_LC5	-1.619	1.812	7.834	10	CDF	0.9318	Non-Significant Effect
		LC_DCDS	-1.719	1.812	6.59	10	CDF	0.9418	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.3987	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-7614-1979 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

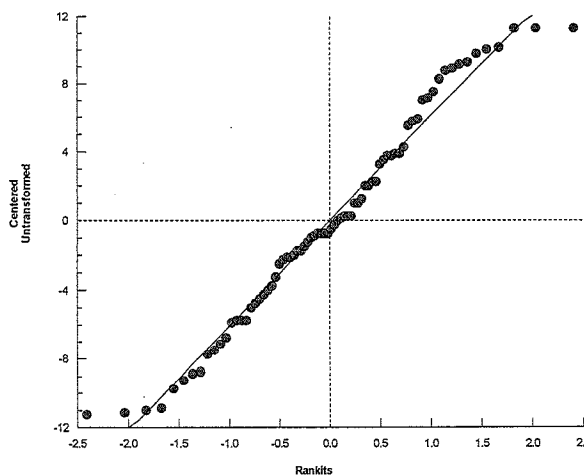
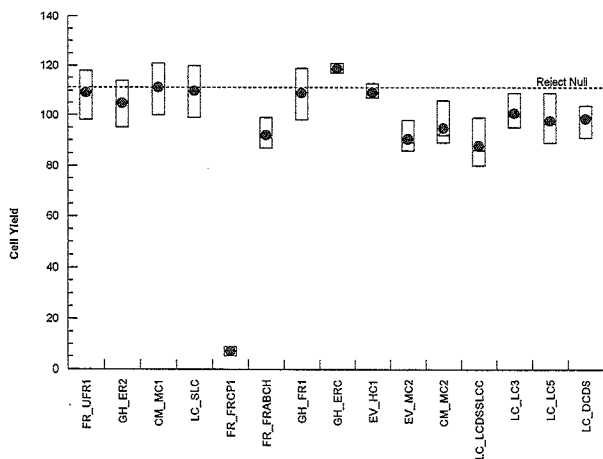
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2	XC	8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2	XC	95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test			Nautilus Environmental		
Analysis ID: 04-4573-2723	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4			
Analyzed: 11 Feb-19 16:20	Analysis: Parametric-Two Sample	Status Level: 1			
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:			
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 04-4573-2723 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:20 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	7.47%
		GH_ER2 passed cell yield	7.47%
		LC_SLC passed cell yield	7.47%
		FR_FRCP1 passed cell yield	7.47%
		FR_FRABCH passed cell yield	7.47%
		GH_FR1 passed cell yield	7.47%
		GH_ERC passed cell yield	7.47%
		EV_HC1 passed cell yield	7.47%
		EV_MC2 passed cell yield	7.47%
		CM_MC2 passed cell yield	7.47%
		LC_LCDSSLCC passed cell yield	7.47%
		LC_LC3 passed cell yield	7.47%
		LC_LC5 passed cell yield	7.47%
		LC_DCDS passed cell yield	7.47%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	-0.5671	1.761	6.6	14	CDF	0.7102	Non-Significant Effect
<i>CM-MC1</i>		GH_ER2	-1.824	1.761	6.276	14	CDF	0.9552	Non-Significant Effect
		LC_SLC	-0.3377	1.761	7.171	14	CDF	0.6297	Non-Significant Effect
		FR_FRCP1	-24.85	1.812	7.605	10	CDF	1.0000	Non-Significant Effect
		FR_FRABCH	-4.225	1.812	8.257	10	CDF	0.9991	Non-Significant Effect
		GH_FR1	-0.4451	1.812	9.163	10	CDF	0.6671	Non-Significant Effect
		GH_ERC	1.79	1.812	7.595	10	CDF	0.0519	Non-Significant Effect
		EV_HC1	-0.4713	1.812	7.692	10	CDF	0.6762	Non-Significant Effect
		EV_MC2	-4.6	1.812	8.175	10	CDF	0.9995	Non-Significant Effect
		CM_MC2	-3.362	1.812	8.895	10	CDF	0.9964	Non-Significant Effect
		LC_LCDSSLCC	-4.723	1.812	9.019	10	CDF	0.9996	Non-Significant Effect
		LC_LC3	-2.283	1.812	8.337	10	CDF	0.9772	Non-Significant Effect
		LC_LC5	-2.623	1.812	9.327	10	CDF	0.9873	Non-Significant Effect
		LC_DCDS	-2.781	1.812	8.309	10	CDF	0.9903	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.0610	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 04-4573-2723 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:20 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

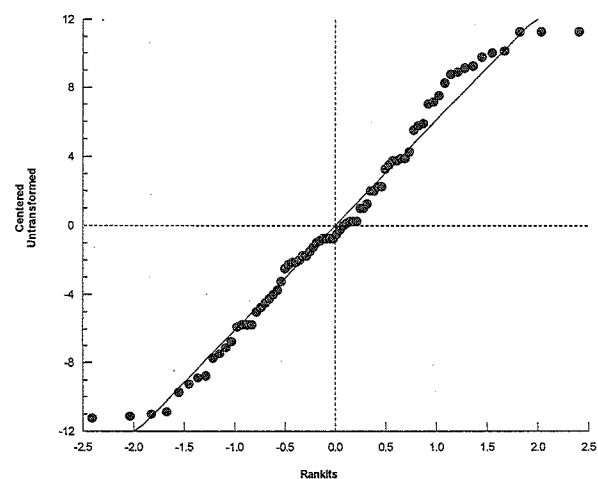
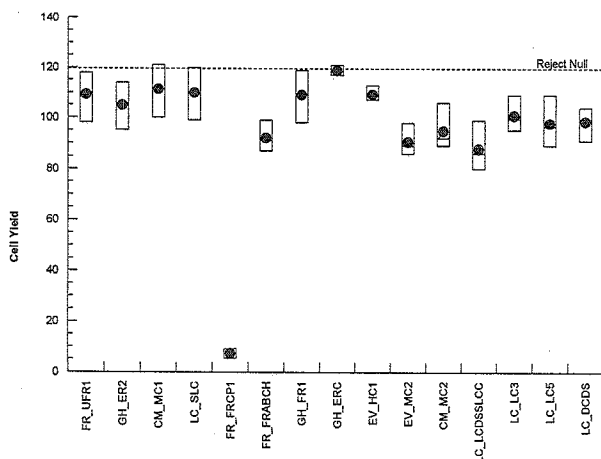
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1	XC	8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1	XC	121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-5388-8283	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:20	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test **Nautilus Environmental**

Analysis ID: 08-5388-8283 Endpoint: Cell Yield CETIS Version: CETISv1.9.4
 Analyzed: 11 Feb-19 16:20 Analysis: Parametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	7.47%
		GH_ER2 failed cell yield	7.47%
		LC_SLC passed cell yield	7.47%
		FR_FRCP1 failed cell yield	7.47%
		FR_FRABCH failed cell yield	7.47%
		GH_FR1 passed cell yield	7.47%
		GH_ERC passed cell yield	7.47%
		EV_HC1 passed cell yield	7.47%
		EV_MC2 failed cell yield	7.47%
		CM_MC2 failed cell yield	7.47%
		LC_LCDSSLCC failed cell yield	7.47%
		LC_LC3 failed cell yield	7.47%
		LC_LC5 failed cell yield	7.47%
		LC_DCDS failed cell yield	7.47%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.5671	1.761	6.6	14	CDF	0.2898	Non-Significant Effect
<i>CM_MCI</i>		GH_ER2*	1.824	1.761	6.276	14	CDF	0.0448	Significant Effect
		LC_SLC	0.3377	1.761	7.171	14	CDF	0.3703	Non-Significant Effect
		FR_FRCP1*	24.85	1.812	7.605	10	CDF	<1.0E-37	Significant Effect
		FR_FRABCH*	4.225	1.812	8.257	10	CDF	8.8E-04	Significant Effect
		GH_FR1	0.4451	1.812	9.163	10	CDF	0.3329	Non-Significant Effect
		GH_ERC	-1.79	1.812	7.595	10	CDF	0.9481	Non-Significant Effect
		EV_HC1	0.4713	1.812	7.692	10	CDF	0.3238	Non-Significant Effect
		EV_MC2*	4.6	1.812	8.175	10	CDF	4.9E-04	Significant Effect
		CM_MC2*	3.362	1.812	8.895	10	CDF	0.0036	Significant Effect
		LC_LCDSSLCC*	4.723	1.812	9.019	10	CDF	4.1E-04	Significant Effect
		LC_LC3*	2.283	1.812	8.337	10	CDF	0.0228	Significant Effect
		LC_LC5*	2.623	1.812	9.327	10	CDF	0.0127	Significant Effect
		LC_DCDS*	2.781	1.812	8.309	10	CDF	0.0097	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.0610	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-5388-8283 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:20 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

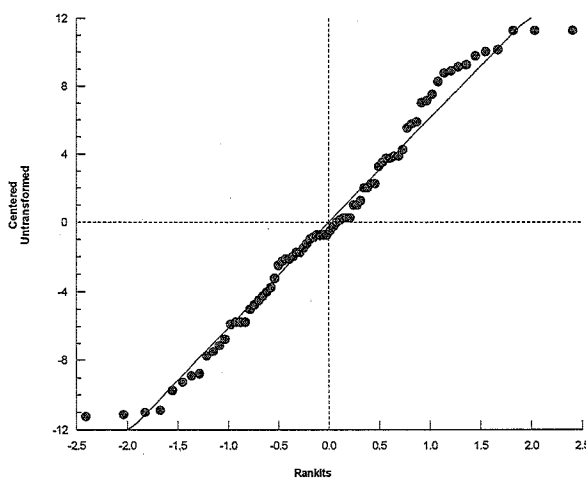
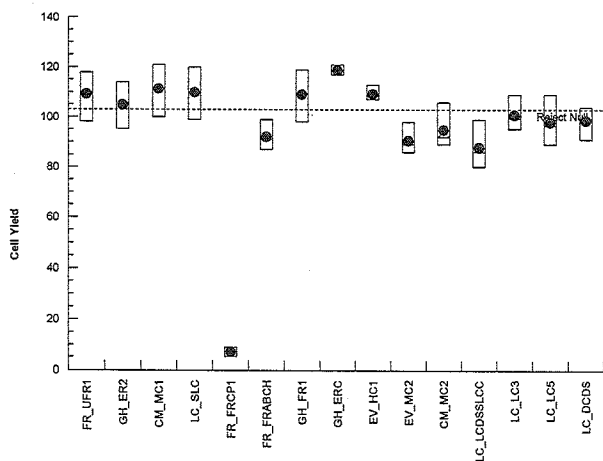
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1	XC	8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC		8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1	XC	121	120	115	107	108	102	100	117
LC_SLC		117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:22 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-6940-8286	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:21	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:22 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test		Nautilus Environmental	
Analysis ID: 07-6940-8286	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4	
Analyzed: 11 Feb-19 16:21	Analysis: Parametric-Two Sample	Status Level: 1	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed cell yield	7.63%
		GH_ER2 passed cell yield	7.63%
		CM_MC1 passed cell yield	7.63%
		FR_FRCP1 failed cell yield	7.63%
		FR_FRABCH failed cell yield	7.63%
		GH_FR1 passed cell yield	7.63%
		GH_ERC passed cell yield	7.63%
		EV_HC1 passed cell yield	7.63%
		EV_MC2 failed cell yield	7.63%
		CM_MC2 failed cell yield	7.63%
		LC_LCDSSLCC failed cell yield	7.63%
		LC_LC3 failed cell yield	7.63%
		LC_LC5 failed cell yield	7.63%
		LC_DCDS failed cell yield	7.63%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.199	1.761	6.639	14	CDF	0.4226	Non-Significant Effect
<i>LC_SLC</i>		GH_ER2	1.429	1.761	6.317	14	CDF	0.0875	Non-Significant Effect
		CM_MC1	-0.3377	1.761	7.171	14	CDF	0.6297	Non-Significant Effect
		FR_FRCP1*	24.28	1.812	7.681	10	CDF	<1.0E-37	Significant Effect
		FR_FRABCH*	3.891	1.812	8.327	10	CDF	0.0015	Significant Effect
		GH_FR1	0.1719	1.812	9.225	10	CDF	0.4335	Non-Significant Effect
		GH_ERC	-2.097	1.812	7.671	10	CDF	0.9688	Non-Significant Effect
		EV_HC1	0.1459	1.812	7.766	10	CDF	0.4435	Non-Significant Effect
		EV_MC2*	4.259	1.812	8.245	10	CDF	8.3E-04	Significant Effect
		CM_MC2*	3.06	1.812	8.959	10	CDF	0.0060	Significant Effect
		LC_LCDSSLCC*	4.415	1.812	9.082	10	CDF	6.5E-04	Significant Effect
		LC_LC3*	1.967	1.812	8.406	10	CDF	0.0387	Significant Effect
		LC_LC5*	2.341	1.812	9.389	10	CDF	0.0206	Significant Effect
		LC_DCDS*	2.461	1.812	8.379	10	CDF	0.0168	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

CETIS Analytical Report

Report Date: 11 Feb-19 16:22 (p 3 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-6940-8286 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:21 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

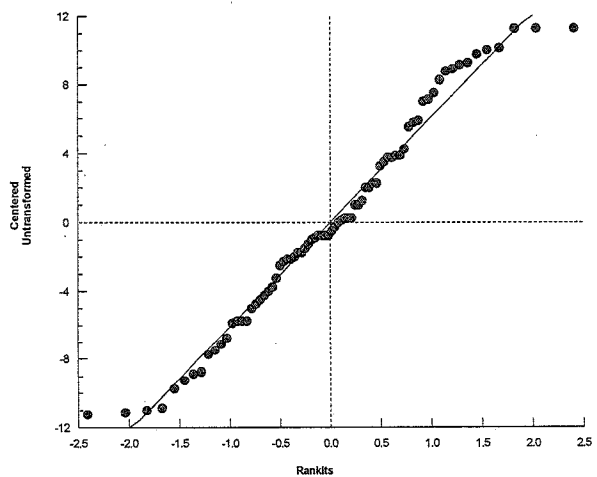
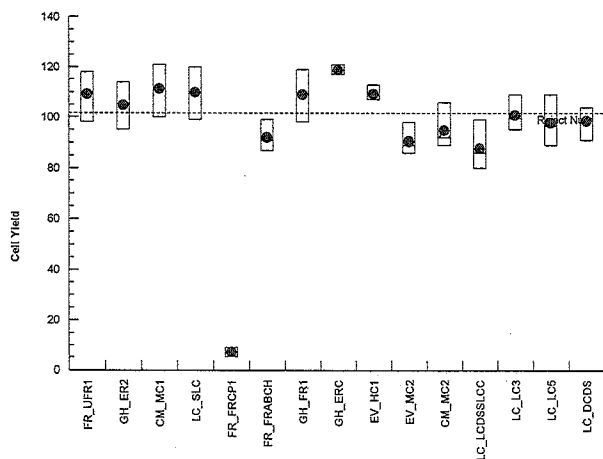
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC	XC	8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC	XC	117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 1 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 11-9061-5222	Endpoint: Cell Yield	CETIS Version: CETISv1.9.4
Analyzed: 11 Feb-19 16:21	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 18-4595-5384	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 02 Nov-18 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 05 Nov-18 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Test Length: 72h	Taxon: Chlorophyta	Source: In-House Culture Age: 7d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	70h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	69h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	70h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	70h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	69h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	70h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	65h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	67h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	72h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	69h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	70h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	68h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	66h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	65h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	68h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 16:23 (p 2 of 3)
 Test Code/ID: 181870 / 09-0600-0967

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 11-9061-5222 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:21 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_UFR1 passed cell yield	7.63%
		GH_ER2 passed cell yield	7.63%
		CM_MC1 passed cell yield	7.63%
		FR_FRCP1 passed cell yield	7.63%
		FR_FRABCH passed cell yield	7.63%
		GH_FR1 passed cell yield	7.63%
		GH_ERC failed cell yield	7.63%
		EV_HC1 passed cell yield	7.63%
		EV_MC2 passed cell yield	7.63%
		CM_MC2 passed cell yield	7.63%
		LC_LCDSSLCC passed cell yield	7.63%
		LC_LC3 passed cell yield	7.63%
		LC_LC5 passed cell yield	7.63%
		LC_DCDS passed cell yield	7.63%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	-0.199	1.761	6.639	14	CDF	0.5774	Non-Significant Effect
LC_SLC		GH_ER2	-1.429	1.761	6.317	14	CDF	0.9125	Non-Significant Effect
		CM_MC1	0.3377	1.761	7.171	14	CDF	0.3703	Non-Significant Effect
		FR_FRCP1	-24.28	1.812	7.681	10	CDF	1.0000	Non-Significant Effect
		FR_FRABCH	-3.891	1.812	8.327	10	CDF	0.9985	Non-Significant Effect
		GH_FR1	-0.1719	1.812	9.225	10	CDF	0.5665	Non-Significant Effect
		GH_ERC*	2.097	1.812	7.671	10	CDF	0.0312	Significant Effect
		EV_HC1	-0.1459	1.812	7.766	10	CDF	0.5565	Non-Significant Effect
		EV_MC2	-4.259	1.812	8.245	10	CDF	0.9992	Non-Significant Effect
		CM_MC2	-3.06	1.812	8.959	10	CDF	0.9940	Non-Significant Effect
		LC_LCDSSLCC	-4.415	1.812	9.082	10	CDF	0.9993	Non-Significant Effect
		LC_LC3	-1.967	1.812	8.406	10	CDF	0.9613	Non-Significant Effect
		LC_LC5	-2.341	1.812	9.389	10	CDF	0.9794	Non-Significant Effect
		LC_DCDS	-2.461	1.812	8.379	10	CDF	0.9832	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40545.5	2896.11	14	63.52	<1.0E-37	Significant Effect
Error	2781.25	45.5943	61			
Total	43326.7		75			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.54	29.14	0.3423	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9722	0.9559	0.0935	Normal Distribution

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 11-9061-5222 Endpoint: Cell Yield
 Analyzed: 11 Feb-19 16:21 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

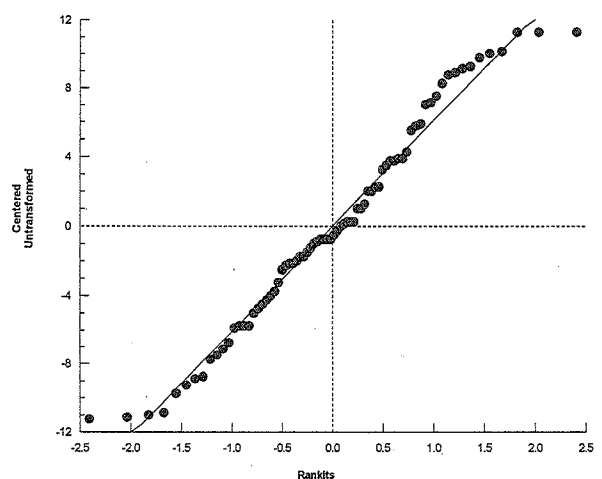
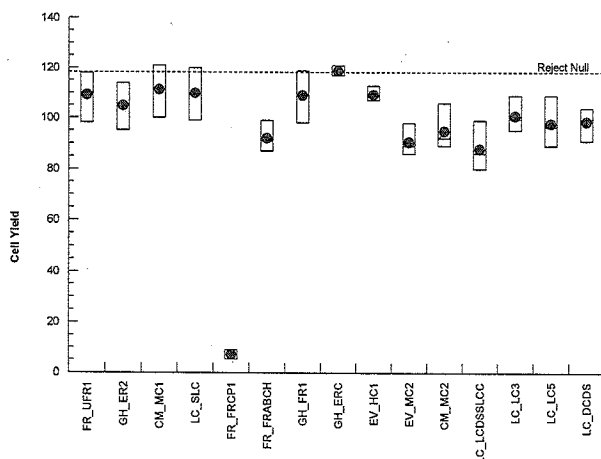
Cell Yield Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		8	109.1	103.4	114.8	110	98	118	2.416	6.26%	0.00%
GH_ER2		8	104.8	99.74	109.8	105.5	95	114	2.119	5.72%	4.01%
CM_MC1		8	111.2	104.5	118	111.5	100	121	2.864	7.28%	-1.95%
LC_SLC	XC	8	109.9	103	116.7	109.5	99	120	2.894	7.45%	-0.69%
FR_FRCP1		4	7	4.095	9.905	7	5	9	0.9129	26.08%	93.59%
FR_FRABCH		4	92	83.09	100.9	91	87	99	2.799	6.08%	15.69%
GH_FR1		4	109	95.31	122.7	109.5	98	119	4.301	7.89%	0.11%
GH_ERC		4	118.8	116	121.5	118.5	117	121	0.8539	1.44%	-8.82%
EV_HC1		4	109.2	105.1	113.4	108.5	107	113	1.315	2.41%	-0.11%
EV_MC2		4	90.5	82.13	98.87	89	86	98	2.63	5.81%	17.07%
CM_MC2		4	94.75	82.33	107.2	92	89	106	3.902	8.24%	13.17%
LC_LCDSSLCC		4	87.75	74.73	100.8	86	80	99	4.09	9.32%	19.59%
LC_LC3		4	100.8	91.35	110.2	99.5	95	109	2.955	5.87%	7.67%
LC_LC5		4	97.75	83.32	112.2	96.5	89	109	4.535	9.28%	10.42%
LC_DCDS		4	98.5	89.27	107.7	99.5	91	104	2.901	5.89%	9.74%

Cell Yield Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1		98	102	115	107	113	107	118	113
GH_ER2		95	104	114	105	98	109	107	106
CM_MC1		121	120	115	107	108	102	100	117
LC_SLC	XC	117	104	109	99	119	120	101	110
FR_FRCP1		9	8	5	6				
FR_FRABCH		87	94	88	99				
GH_FR1		119	109	98	110				
GH_ERC		121	117	119	118				
EV_HC1		109	113	107	108				
EV_MC2		90	88	98	86				
CM_MC2		106	90	94	89				
LC_LCDSSLCC		80	99	84	88				
LC_LC3		100	109	99	95				
LC_LC5		101	89	109	92				
LC_DCDS		91	102	97	104				

Graphics



APPENDIX C – *Hyaella azteca* Toxicity Test Data

Hyalella azteca Water-only Test Summary Sheet

Client: Teck
Work Order No.: 190063

Start Date: Jan 11, 2019
Set up by: SSM, KJL

Sample Information:

Sample ID: see test results below
Sample Date: Jan 8, 9, 15, 16, 22, 29, 2019
Date Received: Jan 10, 11, 17, 24, 31, 2019
Sample Volume: 20L per sample per week

Test Organism Information:

Species: Hyalella azteca
Supplier: Aquatox Biosystems Co
Date received: Jan 10, 2019
Age or size (Day 0): 7 to 8 days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA164
Stock Solution ID: n/a
Date Initiated: Jan 11, 2019

96-h LC50 (95% CL): 6.0 (4.8 - 7.5) mg/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 6.1 (5.2 - 7.2) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
control	94.0 ± 8.9	0.34 ± 0.20
FR-UF1 (site control)	88.0 ± 21.7	0.19 ± 0.08
GH-ER2 (site control)	92.0 ± 4.5	0.24 ± 0.11
CM-MCI (site control)	88.0 ± 11.0	0.46 ± 0.17
LC-SLC (site control)	92.0 ± 4.5	0.23 ± 0.12
FR-ER-CP1	16.0 ± 23.0 ^{*a,b,t,c}	0.06 ± 0.02 ^{*a,b,t}
FR-FR-ABCH	88.0 ± 13.0	0.17 ± 0.14 ⁺
GH-FR1	86.0 ± 16.7	0.16 ± 0.06

* significantly different compared to control
a significantly different compared to FR-UF1
b significantly different compared to GH-ER2

+ significantly different compared to CM-MCI
c significantly different compared to LC-SLC

Reviewed by: Joh

Date reviewed: Mar-1/19

Hyalella azteca Water-only Test Summary Sheet

Client: Teck
 Work Order No.: 190063

Start Date: Jan 11, 2019
 Set up by: SSM, KJL

Sample Information:

Sample ID: See test results below
 Sample Date: Jan 8, 9, 15, 16, 22, 29, 2019
 Date Received: Jan 10, 11, 17, 24, 31, 2019
 Sample Volume: 20L per sample per week

Test Organism Information:

Species: Hyalella azteca
 Supplier: Aquatox Biosystems Co
 Date received: Jan 10, 2019
 Age or size (Day 0): 7 to 8 days

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA151
 Stock Solution ID: n/a
 Date Initiated: Jan 11, 2019

96-h LC50 (95% CL): 6.0 (4.8 - 7.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 6.1 (5.2 - 7.2) g/L NaCl CV (%): 8

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
GH-F2C	80.0 ± 24.5	0.16 ± 0.07
EV-HCl	88.0 ± 4.5	0.30 ± 0.12
EV-MC2	92.0 ± 13.0	0.17 ± 0.02
CM-MC2	66.0 ± 16.7* ^{a, b}	0.07 ± 0.02* ^{a, b, t}
CM-MC3	76.0 ± 23.0	0.22 ± 0.08
LC-LC5SLCC	70.0 ± 28.3*	0.12 ± 0.07 ^{a, b, t}
LC-LC3	96.0 ± 5.5	0.27 ± 0.04
LC-LC5	84.0 ± 11.4	0.17 ± 0.12

* significantly different compared to control
 † significantly different compared to EV-HCl
 ‡ significantly different compared to GH-F2C

* significantly different compared to CM-MC1
 † significantly different compared to LC-SLCC

Reviewed by: Jou

Date reviewed: Mar. 1/19

1/2

Chronic *H. azteca* Sediment Toxicity Test Data Sheet Freshwater Sediment Water Quality

Client: Teck
WO #: 190063
Sample ID: See below

Start Date: Jan 11/19
Termination Date: Feb 8/19
CER #: 6
Test Organism: H. azteca

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Water	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRABCH	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-UFR1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-FR1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ERC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ER2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EV-HC1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EV-MC2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	J	W	A	F	F	F	F	F	F	F	F	F	F	F	F

Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control Water	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRABCH	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-UFR1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-FR1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ERC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
GH-ER2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EV-HC1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EV-MC2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	A	A	F	F	F	F	F	F	F	F	F	F	F	F

Thermometer: 6 Light meter: UT-1 Light intensity (Lux): 290-860

Comments: _____

Reviewed by: JCA Date Reviewed: Feb. 26/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet Freshwater Sediment Water Quality

Client: TECK
WO #: 190063
Sample ID: See below

Start Date: JAN 11/19
Termination Date: FEB 8/19
CER #: 6
Test Organism: H. azteca

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CM-MC3	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LCDSSLCC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-SLC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LC3	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LC5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-DCDS	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EDTA Control	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRABCH+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
CM-MC3	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LCDSSLCC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-SLC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LC3	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-LC5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LC-DCDS	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
EDTA Control	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRCPI+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
FR-FRABCH+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CM-MC2+EDTA	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Thermometer: 6 Light meter: L71 Light intensity (Lux): 290-860

Comments: _____

Reviewed by: [Signature] Date Reviewed: Feb. 26/19

1/2

Chronic *H. azteca* Sediment Toxicity Test Data Sheet Freshwater Sediment Water Quality

Client: Teck
WO #: 190063
Sample ID: see below

Start Date: Jan 11/19
Termination Date: Feb 8/19
CER #: 6
Test Organism: *H. azteca*

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Water	428	474	439	483	488	488	480	484	469	470	484	476	477	462	434
FR-FRCPI	3520	3420	3440	3430	3470	3370	3400	3420	3380	3410	3500	3500	3480	3440	3440
FR-FRABCH	1211	1217	1217	1206	1213	1180	1186	1191	1196	1214	1210	1197	1168	1188	1171
FR-WFRI	450	492	499	472	474	465	473	474	485	489	478	476	474	483	480
GH-FRI	1040	1055	999	1044	1065	1050	1066	1062	1066	1058	1002	1007	998	999	995
GH-ERC	435	468	450	445	453	448	451	449	456	455	445	446	443	449	454
GH-ER2	408	462	448	429	428	427	427	429	433	432	435	430	429	436	438
EV-HCI	859	877	856	862	879	873	872	874	879	875	861	870	874	890	886
EV-MC2	754	777	764	768	777	766	773	771	785	792	825	828	820	837	808
CM-MC1	386	416	405	406	408	406	408	407	417	413	409	408	407	413	419
CM-MC2	1047	1060	1062	1054	1060	1055	1052	1050	1050	1072	1077	1078	1070	1070	1057
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control Water	424	433	440	447	446	447	444	448	454	449	449	447	456	453
FR-FRCPI	3500	3480	3420	3390	3390	3410	3390	3350	3500	3410	3480	3460	3430	3450
FR-FRABCH	1195	1213	1192	1180	1172	1181	1195	1222	1218	1209	1209	1211	1205	1209
FR-WFRI	476	474	468	471	475	473	474	468	476	472	478	481	477	476
GH-FRI	1019	1022	1029	1023	1029	1025	1021	1044	1055	1049	1064	1065	1053	1045
GH-ERC	449	451	447	450	457	456	449	454	453	450	445	451	454	450
GH-ER2	405	420	424	426	428	425	424	423	426	427	423	428	419	426
EV-HCI	848	859	862	858	860	859	858	866	874	868	869	870	860	866
EV-MC2	798	778	742	737	738	740	743	829	826	824	846	848	870	871
CM-MC1	396	413	405	413	410	415	412	407	409	410	405	408	408	410
CM-MC2	1072	1087	1090	1087	1091	1083	1089	1090	1126	1135	1082	1086	1079	1081
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Conductivity meter/probe: 313

Comments: ① rechecked w/ another meter, confirmed.

Reviewed by: Joh

Date Reviewed: Feb-26/19

2/2

Chronic *H. azteca* Sediment Toxicity Test Data Sheet

Freshwater Sediment Water Quality

Client: Teck
 WO #: 190063
 Sample ID: See below

Start Date: Jan 11/19
 Termination Date: Feb 8/19
 CER #: 6
 Test Organism: H. azteca

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CM-MC3	502	543	508	520	536	529	529	531	530	521	526	519	515	524	527
LC-LCDSSLCC	1062	1063	1016	1050	1067	1054	1052	1056	1065	1064	1058	1059	1052	1055	1091
LC-SLC	503	527	499	532	535	526	526	528	532	544	531	532	535	533	524
LC-LC3	1379	1372	1364	1365	1373	1363	1360	1362	1358	1369	1367	1374	1364	1398	1378
LC-DCDS LC5	877	890	876	888	887	890	878	882	883	889	886	881	888	896	
LC-DCDS	704	727	735	715	718	715	721	720	713	710	709	708	707	746	707
EDTA Control	430	470	421	465	466	463	461	459	465	468	467	470	478	480	
FR-FRCPI + EDTA	3530	3430	3450	3450	3420	3380	3370	3390	3370	3470	3510	3480	3440	3470	3160
FR-FRABCH + EDTA	1207	1220	1231	1206	1206	1191	1190	1190	1199	1215	1228	1222	1212	1220	1198
CM-MC2 + EDTA	1046	1061	1054	1060	1067	1066	1056	1059	1059	1080	1087	1086	1083	1091	1071
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Conductivity (µS)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
CM-MC3	495	513	524	524	520	521	524	513	521	519	520	517	520	520	
LC-LCDSSLCC	1065	1064	1077	1072	1071	1075	1080	1066	1079	1074	1075	1069	1071	1073	
LC-SLC	516	522	525	529	521	528	531	534	530	532	527	531	530	529	
LC-LC3	1375	1316	1326	1322	1320	1331	1329	1362	1403	1411	1420	1418	1422	1420	
LC-LC5	873	885	871	873	879	880	875	891	891	889	885	881	874	882	
LC-DCDS	700	703	708	734	712	718	720	707	711	714	711	717	713	716	
EDTA Control	436	440	440	446	442	445	441	452	452	452	453	456	454	454	
FR-FRCPI + EDTA	3450	3470	3460	3490	3460	3450	3440	3470	3450	3510	3470	3460	3430	3440	
FR-FRABCH + EDTA	1209	1225	1204	1188	1186	1182	1183	1215	1244	1247	1216	1221	1211	1218	
CM-MC2 + EDTA	1082	1098	1094	1082	1085	1087	1080	1099	1102	1108	1098	1091	1084	1089	
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Conductivity meter/probe: 313

Comments: _____

Reviewed by: Jen

Date Reviewed: Feb 26/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

1/2

Client: Teck
WO #: 190063
Sample ID: see below

Start Date: Jan 11/19
Termination Date: Feb 8/19
CER #: 6
Test Organism: *H. azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Water	7.9	6.8	7.2	6.8	6.4	6.4	6.6	6.5	6.8	6.7	6.3	6.7	6.4	5.9	5.4
FR-FRCPI	7.6	6.7	7.3	6.9	6.0	6.0	6.6	6.5	6.9	6.8	5.9	6.5	5.8	5.3	5.7
FR-FRABCH	7.3	6.8	7.2	6.8	6.0	6.1	6.4	6.5	6.9	6.7	6.3	6.8	6.4	5.5	5.4
FR-WFRI	7.5	6.9	7.3	7.0	6.6	6.4	6.5	6.6	6.8	6.6	6.4	6.7	6.4	6.2	5.0
GH-FRI	8.3	6.9	7.3	7.0	6.0	6.0	6.2	6.3	7.0	6.8	6.1	6.7	6.2	6.3	5.4
GH-ERC	8.2	7.2	7.4	7.0	5.8	6.0	6.4	6.5	6.9	6.9	6.1	6.8	6.3	6.6	5.1
GH-ER2	8.4	7.0	7.3	6.9	6.7	6.3	6.5	6.5	6.8	6.7	6.2	6.7	6.2	6.5	5.9
EV-HCI	7.5	7.0	7.4	6.9	6.2	6.1	6.3	6.2	6.9	6.7	6.2	6.5	6.3	6.5	5.6
EV-MC2	7.1	6.9	7.3	7.0	6.2	6.1	6.2	6.1	6.8	6.6	6.1	6.5	6.2	6.2	5.7
CM-MC1	7.7	6.8	7.4	7.0	6.4	6.2	6.3	6.2	6.7	6.8	6.2	6.6	6.2	6.4	5.8
CM-MC2	7.7	6.9	7.4	7.3	6.2	6.1	6.2	6.2	6.8	6.7	6.1	6.8	6.2	6.3	6.1
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

Dissolved oxygen (mg/L)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control Water	6.0	6.3	6.1	6.1	6.1	6.0	6.0	6.4	5.6	5.8	6.1	6.0	6.4	6.0
FR-FRCPI	5.9	6.3	6.0	5.9	5.9	6.0	6.0	6.2	4.3	4.9	5.4	5.3	6.0	5.7
FR-FRABCH	6.0	6.4	6.1	5.9	6.0	6.1	6.0	6.3	5.0	5.2	5.6	5.4	6.1	5.3
FR-WFRI	6.1	6.3	6.0	6.0	5.9	5.9	5.8	6.2	5.2	5.4	5.8	5.8	6.3	5.6
GH-FRI	6.0	6.2	6.0	6.0	5.9	6.0	6.0	6.3	5.2	5.6	6.0	6.1	6.5	6.2
GH-ERC	5.9	6.3	5.9	5.9	6.1	6.0	5.9	6.2	5.7	5.9	6.2	6.1	6.4	6.0
GH-ER2	6.0	6.3	6.0	6.0	6.1	6.0	5.9	6.2	4.4	4.8	5.6	5.7	6.2	5.7
EV-HCI	6.1	6.4	6.0	5.9	6.0	5.9	5.9	6.1	5.5	5.7	6.0	6.0	6.5	6.1
EV-MC2	6.0	6.3	6.0	5.9	6.0	5.9	6.0	6.3	4.9	5.2	5.8	5.7	6.2	5.9
CM-MC1	6.1	6.2	6.0	5.9	5.9	6.0	6.1	6.2	5.1	5.4	5.9	5.8	6.3	5.8
CM-MC2	6.0	6.3	6.0	5.8	5.9	6.0	6.0	6.2	5.2	5.5	5.8	5.7	6.4	5.8
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

DO meter/probe: 3 13

Comments: 05.8

Reviewed by: *[Signature]*

Date Reviewed: Feb-26/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

2/2

Client: Teck
WO #: 190063
Sample ID: JRC below

Start Date: Jan 11/19
Termination Date: Feb 27/19
CER #: 6
Test Organism: *H. azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CM-MC3	8.2	6.7	7.4	6.9	6.4	6.4	6.3	6.4	6.8	6.9	6.4	6.8	6.5	6.5	6.0
LC-LCDSSLCC	8.3	6.8	7.3	7.0	6.5	6.1	6.0	6.0	6.1	6.7	6.1	6.9	6.4	6.2	5.9
LC-SLC	8.2	7.0	7.3	7.1	6.2	6.2	6.1	6.2	6.4	6.6	6.1	6.5	6.3	6.1	6.1
LC-LC3	8.3	6.8	7.4	7.0	6.3	6.2	6.0	6.1	6.5	6.8	6.0	6.6	6.1	6.3	6.0
LC-LC5	8.3	6.9	7.4	6.9	6.3	6.3	6.1	6.2	6.7	6.8	6.1	6.8	6.2	6.1	6.0
LC-DCDS	8.3	6.7	7.3	6.9	6.3	6.3	6.2	6.2	6.5	6.7	6.2	6.6	6.2	6.4	6.1
EDTA Control	7.1	7.0	7.4	7.0	6.4	6.2	6.0	6.1	6.6	6.7	6.5	6.6	6.1	6.3	6.0
FR-FRCPI+EDTA	8.0	6.9	7.3	7.0	6.2	6.1	6.0	6.1	6.5	6.6	6.4	6.6	6.2	6.1	5.9
FR-FRABCH+EDTA	7.6	6.9	7.2	6.9	6.4	6.2	6.0	6.1	6.7	6.8	6.4	6.7	6.2	6.4	5.8
CM-MC2+EDTA	7.7	7.0	7.3	6.9	6.5	6.2	6.1	6.1	6.5	6.7	6.3	6.6	6.3	6.4	5.8
Technician Initials	<i>J</i>	<i>um</i>	<i>a</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>u</i>	<i>u</i>

Dissolved oxygen (mg/L)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
CM-MC3	6.1	6.3	6.3	6.2	6.1	6.1	6.0	6.2	5.7	5.9	5.5	5.5	5.2	5.3
LC-LCDSSLCC	6.2	6.4	6.0	5.9	6.0	6.1	6.0	6.3	5.6	5.8	5.7	5.6	5.7	5.5
LC-SLC	6.1	6.3	6.1	6.0	6.0	6.0	6.0	6.2	6.0	6.1	6.0	5.9	5.8	5.8
LC-LC3	6.0	6.2	6.0	6.0	6.1	6.1	6.0	6.2	5.1	5.6	5.8	5.9	5.9	5.7
LC-LC5	6.1	6.3	6.1	6.0	6.0	6.1	5.9	6.3	6.1	6.2	6.1	6.0	5.9	5.8
LC-DCDS	6.0	6.3	6.0	5.9	5.9	6.0	5.9	6.4	5.8	6.0	5.9	6.0	6.0	6.0
EDTA Control	6.1	6.4	6.0	5.9	6.0	5.9	6.0	6.2	5.6	6.0	5.8	5.9	5.9	5.7
FR-FRCPI+EDTA	6.0	6.3	6.0	5.9	5.9	5.9	5.9	6.3	6.0	6.1	6.0	5.9	5.7	5.7
FR-FRABCH+EDTA	6.0	6.2	6.1	6.0	5.9	6.0	6.1	6.1	6.0	6.1	6.0	6.0	6.0	5.8
CM-MC2+EDTA	5.9	6.2	6.0	6.1	6.0	6.0	6.1	6.2	5.3	5.8	5.7	5.7	5.6	5.5
Technician Initials	<i>a</i>	<i>u</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>u</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>	<i>J</i>

DO meter/probe: 3, 13

Comments: _____

Reviewed by: Jen

Date Reviewed: Feb. 26/19

1/2

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

Client: Teck
WO #: 140063
Sample ID: see below

Start Date: Jan 11/19
Termination Date: Feb 8/19
CER #: 6
Test Organism: *H. azteca*

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Water	7.7	7.4	7.4	7.4	7.5	7.4	7.4	7.5	7.7	7.6	7.5	7.6	7.6	7.6	7.6
FR-FRCPI	7.6	7.8	7.8	7.8	8.0	8.0	8.1	8.0	7.9	7.9	8.0	7.9	7.9	7.6	7.8
FR-FRABCH	8.1	8.0	8.0	8.0	8.1	8.0	8.1	8.1	8.0	8.0	8.0	8.0	8.1	7.7	8.0
FR-UFR1	8.1	8.1	8.0	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.1	8.0	8.0	7.6	7.8
GH-FR1	8.1	8.0	8.0	8.0	8.1	8.0	8.0	8.0	8.0	8.0	8.1	8.0	8.0	7.6	8.0
GH-ERC	7.9	8.1	8.0	8.0	7.8	7.9	7.9	8.0	8.1	8.0	8.1	7.9	8.0	7.7	8.0
GH-ER2	8.0	8.1	8.1	8.1	7.9	7.9	8.0	8.0	8.0	8.0	8.0	7.9	8.0	7.6	7.8
EV-HCI	8.0	7.9	8.0	8.1	8.1	8.0	8.1	8.1	8.0	8.1	8.0	7.9	7.9	7.6	7.7
EV-MC2	8.1	8.0	8.0	8.1	8.0	8.1	8.0	8.1	8.1	8.0	8.1	8.0	8.1	7.6	7.8
CM-MC1	7.9	8.1	8.0	8.0	7.9	7.8	7.9	7.9	8.0	8.1	8.1	8.1	7.9	8.0	7.9
CM-MC2	8.1	8.0	8.0	8.1	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.0	8.1	7.7	7.9
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

pH

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control Water	7.5	7.5	7.6	7.5	7.5	7.6	7.5	7.4	7.4	7.5	7.5	7.5	7.5	7.6
FR-FRCPI	7.9	7.8	7.9	7.9	8.0	8.1	8.0	7.9	7.9	8.0	7.9	8.0	7.9	7.8
FR-FRABCH	8.0	8.0	8.0	8.0	8.0	8.1	8.0	7.9	7.9	7.9	7.8	8.0	8.0	7.9
FR-UFR1	8.0	8.0	7.9	7.9	7.9	8.0	7.9	7.8	7.8	7.9	7.9	8.0	8.0	7.9
GH-FR1	8.1	8.1	8.0	7.9	8.0	7.9	7.9	7.8	7.9	7.9	7.8	7.9	7.8	7.8
GH-ERC	8.0	8.0	8.0	8.0	7.9	8.0	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8
GH-ER2	8.0	8.0	7.9	7.9	8.0	8.0	7.9	7.8	7.7	7.9	7.8	7.9	7.9	7.8
EV-HCI	8.1	8.0	7.8	7.9	8.0	8.1	8.0	7.9	8.0	8.0	7.9	7.8	7.8	7.9
EV-MC2	8.0	7.9	7.9	7.9	8.0	8.0	7.9	7.8	7.8	8.0	7.9	7.9	7.8	7.8
CM-MC1	8.0	7.9	7.9	7.7	7.9	8.0	7.9	7.8	7.8	7.9	7.8	7.9	7.9	7.9
CM-MC2	8.0	8.0	7.9	8.0	8.0	8.1	8.0	7.8	7.9	7.9	7.8	7.9	7.8	7.9
Technician Initials	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

pH meter/probe: 3 13

Comments: _____

Reviewed by: *[Signature]*

Date Reviewed: Feb. 26/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

2/2

Client: Teck
WO #: 190063
Sample ID: See below

Start Date: Jan 11/19
Termination Date: Feb 8/19
CER #: 6
Test Organism: *H. azteca*

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CM-MC3	7.9	8.0	7.9	7.8	7.8	7.7	7.7	7.8	7.9	8.0	7.8	7.7	7.7	7.5	7.5
LC-LCDS/LCC	8.1	8.0	8.0	7.9	8.1	8.0	7.9	8.0	8.0	8.1	8.0	7.9	8.0	7.6	7.7
LC-SLC	8.0	8.1	8.0	7.9	7.9	7.7	7.8	7.8	8.0	8.1	7.9	7.8	7.9	7.6	7.6
LC-LC3	7.9	7.9	7.9	8.1	8.1	8.0	8.1	8.1	8.1	8.1	8.0	8.0	8.0	7.6	7.9
LC-LC5	8.1	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.0	8.1	8.0	8.0	8.0	7.7	7.8
LC-DCDS	8.1	8.0	8.0	8.0	7.9	7.9	8.0	8.0	8.1	8.0	8.0	7.9	7.9	7.6	7.7
EDTA Control	7.5	7.7	7.8	7.7	7.6	7.5	7.5	7.6	7.7	7.7	7.6	7.6	7.7	7.8	7.7
FR-FRCPI+EDTA	7.8	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.9	8.0	7.8	7.8	7.9	7.7	7.8
FR-FRABCH+EDTA	8.0	8.1	8.0	7.9	8.1	8.0	8.0	8.1	8.1	8.1	8.0	7.9	8.0	7.7	7.9
CM-MC2+EDTA	8.1	8.1	8.0	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.1	8.0	8.1	7.7	8.0
Technician Initials	<i>A</i>	<i>mm</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>mm</i>	<i>mm</i>

pH

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
CM-MC3	7.8	7.9	7.7	7.7	7.7	7.7	7.7	7.6	7.8	7.7	7.9	7.6	7.7	7.6	
LC-LCDS/LCC	7.8	8.0	7.7	7.7	7.8	7.7	7.8	7.6	7.9	7.8	7.7	7.7	7.8	7.7	
LC-SLC	7.9	8.0	7.9	7.8	7.8	7.7	7.8	7.7	7.9	7.9	7.8	7.7	7.7	7.7	
LC-LC3	7.8	7.9	7.9	7.9	7.8	7.8	7.8	7.7	7.9	7.9	7.7	7.8	7.8	7.8	
LC-LC5	7.8	8.0	7.8	7.9	7.9	7.8	7.8	7.6	8.0	7.9	7.7	7.7	7.8	7.7	
LC-DCDS	7.9	7.9	7.9	7.9	7.9	7.9	8.0	7.8	7.9	8.0	7.8	7.8	7.9	7.8	
EDTA Control	7.9	8.0	7.8	7.9	8.0	7.8	7.9	7.7	7.9	8.0	7.6	7.7	7.7	7.8	
FR-FRCPI+EDTA	8.0	8.0	8.0	7.9	8.0	7.9	7.9	7.7	7.9	8.0	7.9	7.9	7.9	7.9	
FR-FRABCH+EDTA	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.7	8.0	8.0	7.9	7.9	7.9	7.8	
CM-MC2+EDTA	8.0	8.0	8.0	7.9	8.1	8.0	8.1	8.0	7.9	8.0	8.0	7.9	7.9	7.9	
Technician Initials	<i>A</i>	<i>mm</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	

pH meter/probe: 313

Comments: _____

Reviewed by: *JG*

Date Reviewed: Feb. 26/19

1/6

H. azteca Sediment Toxicity Test Data Sheet
Freshwater Sediment 14-d Survival and Weight

Client: Teck
Work Order No: 190063
Sample ID: See below

Start Date: Jan 11/19
Termination Date: Feb 8/19
Test Organism: Hyalella azteca
Balance: _____

Sample ID	Pan No. <small>74 Green</small>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control-Sediment	1	A	10	0	0	DG	1019.55	1020.90	9 ^②	
	2	B	11	0	0		1019.51	1023.77	11	
	3	C	9	0	1		1009.01	1011.50	9	
	4	D	10	0	0		1017.46	1019.49	10	
	5	E	8	0	2		1020.01	1025.30	8	
FR_FRCP1	6	A	5	0	50		1014.88	1015.29	5	
	7	B	0	0	100		1015.01	—	—	
	8	C	0	0	100		1007.50	—	—	
	9	D	3	0	70		1027.48	1027.62	3	
	10	E	0	0	100		1023.74	—	—	
FR_FRABCM	11	A	10	0	0		1018.34	1022.18	10	
	12	B	10	0	0		1018.13	1019.05	10	
	13	C	7	1	2		1022.56	1022.93	7	
	14	D	9	0	1		1022.86	1023.72	9	
	15	E	8	0	2		1026.28	1028.11	8	
FR_UFRI	16	A	10	0	0		1026.07	1027.72	10	
	17	B	5 ⁰	0	5		1016.80	1017.53	5	
	18	C	9	0	1		1027.81	1028.72	9	
	19	D	10	0	0		1007.11	1009.59	10	
	20	E	10	0	0		1011.88	1014.83	10	

Comments:

① Debris. ② 1 lost in transfer | 10x RW: Pan#5=1018.34 Pan#20=1014.80
Pan#33=1022.75, Pan#41=1012.36 Pan#47=1022.75 Pan#58=1018.13 Pan#63=1012.99
Pan#71=1032.37, Pan#83=1016.42, Pan#104=1014.21

Reviewed by: STU

Date Reviewed: Feb. 26/19

2/6

H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment 14-d Survival and Weight

Client: Teck
 Work Order No: 190063
 Sample ID: See below

Start Date: Jan 11/19
 Termination Date: Feb 8/19
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	21	A	11	0	0	DG	1022.02	1023.05	11	
GH-FR2	22	B	6	0	4		1004.32	1005.07	6	
	23	C	9	0	1		1038.67	1039.95	9	
	24	D	8	0	2		1022.77	1024.14	8	
	25	E	10	0	0		1009.79	1012.41	10	
GH-ERC	26	A	10	0	0		1028.29	1030.17	10	
	27	B	10	0	0		1008.14	1010.75	10	
	28	C	8	0	2		1028.44	1029.31	8	
	29	D	4	0	4		1035.06	1035.48	4	
	30	E	8	0	2		1022.70	1026 1023.60	8	
GH-ER2	31	A	9	0	1		1027.06	1028.68	9	
	32	B	9	0	1		1013.71	1015.22	9	
	33	C	10	0	0		1018.48	1022.77	10	
	34	D	9	0	1		1034.88	1036.58	9	
	35	E	28	9	2		1014.99	1016.95	9	
EV-HC1	36	A	9	0	1		1022.44	1024.47	9	
	37	B	8	0	2		1034.41	1036.84	8	
	38	C	9	0	1		1020.33	1024.03	9	
	39	D	9	0	1		1011.46	1012.65	9	
	40	E	9	0	1		1022.23	1025.85	9	

Comments:

Reviewed by:

JGM

Date Reviewed:

Feb. 28/19

3/6

H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment 14-d Survival and Weight

Client:

Teck

Work Order No:

190063

Sample ID:

See below

Start Date:

Jan 11/19

Termination Date:

Feb 8/19

Test Organism:

Hyalella azteca

Balance:

1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	41	A	10	0	0	DG	1010.37	1012.35	10	
EV-MC2	42	B	9	0	1		1030.87	1032.45	9	
	43	C	7	0	3		1006.04	1007.06	7	
	44	D	11	0	0		1029.62	1031.40	11	
	45	E	10	0	0		1009.07	1010.88	10	
CM-MC1	46	A	9	0	1		1010.05	1011.70	9	
	47	B	10	0	0		1018.45	1022.77	10	
	48	C	9	0	1		1026.41	1031.76	9	
	49	D	9	0	1		1014.72	1018.98	9	
	50	E	7	0	3		1000.67	1004.84	7	
CM-MC2	51	A	7	0	3		1029.72	1030.17	7	
	52	B	5	0	5		1021.61	1021.76	5	
	53	C	5	0	5		1025.04	1025.40	5	
	54	D	9	0	1		1019.37	1020.14	9	
	55	E	8	0	3		1025.12	1025.64	7	
CM-MC3	56	A	8	0	2		1018.26	1020.27	8	
	57	B	4	0	6		1020.90	1021.36	4	
	58	C	10	0	0		1015.15	1018.15	10	
	59	D	7	0	3		1029.40	1030.64	7	
	60	E	9	0	1		1044.07	1046.53	9	

Comments:

① rechecked and confirmed.

Reviewed by:

PLi

Date Reviewed:

Feb. 26/19

4/6

H. azteca Sediment Toxicity Test Data Sheet
 Freshwater Sediment 14-d Survival and Weight

Client: Teck
 Work Order No: 190063
 Sample ID: See below

Start Date: Jan 11/19
 Termination Date: Feb 8/19
 Test Organism: Hyalella azteca
 Balance: 1

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	61	A	10	0	0	DG	1002.41	1003.17	10	✓
LC-LC05SLCC	62	B	6	0	4		1024.26	1024.88	6	
	63	C	10	0	0		1010.69	1013.08	10	
	64	D	5	0	5		1018.38	1018.81	5	
	65	E	4	0	6		1009.70	1010.05	4	
LC-SLC	66	A	10	0	0		1010.89	1012.13	10	
	67	B	9	0	1		1019.57	1021.76	9	
	68	C	9	0	1		1016.64	1019.49	9	
	69	D	9	0	1		1025.49	1026.12	8 ^①	
	70	E	9	0	1		1020.44	1023.80	9	
LC-LC3	71	A	10	0	0		1030.26	1032.35	10	
	72	B	8 ^①	0	2		1015.02	1017.77	9 ^②	
	73	C	10	0	0		1009.42	1012.24	10	
	74	D	10	0	0		1011.50	1014.19	10	
	75	E	9	0	1		1037.79	1040.49	9	
LC-LC5	76	A	9	0	1		1017.25	1019.06	9	
	77	B	8	0	2		1023.25	1024.12	8	
	78	C	10	0	0		1030.76	1034.45	10	
	79	D	7	1	2		1012.12	1012.83	7	
	80	E	8	0	2		1027.70	1028.24	8	

Comments: ① 1 lost in transfer ② rechecked and confirmed.

Reviewed by: JGw

Date Reviewed: Feb. 26/19

Client: Teck

W.O.#: 190063

Hardness and Alkalinity Datasheet

Sample ID	Subsample Date	Date Measured	Alkalinity				Hardness			Technician
			Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Control Water	Jan 11/19	Feb 12/19	50	3.2	3.3	62	50	6.4	128	✓
FR-FRCPI			10 ①	3.8	3.9	370	10 ①	19.9	1990	
FR-FRABCH			10 ①	2.6	2.7	250	10 ①	6.4	640	
FR-WFRI			50	7.8	7.9	154	50	6.1	122	
GH-FR1			10 ①	2.8	2.9	270	10 ①	4.9	490	
GH-ERC			50	7.9	8.0	156	50	8.0	160	
GH-ER2			50	7.7	7.8	152	50	6.8	136	
EV-HC1			50	10.5	10.6	208	50	17.1	342	
EV-MC2			50	10.0	10.1	198	50	14.6	292	
CM-MC1			50	7.6	7.7	150	50	6.8	136	
CM-MC2			10 ①	2.6	2.7	250	10 ①	6.2	620	
CM-MC3			50	8.1	8.2	160	50	9.3	186	
LC-LCDSLC			10 ①	2.7	2.8	260	10 ①	6.0	600	
LC-SLC			50	7.7	7.8	152	50	8.1	162	
LC-LC3			10 ①	2.9	3.0	280	10 ①	6.9	690	
LC-LC5			50	9.4	9.5	186	50	15.0	300	
LC-DCDS			50	8.6	8.8	168	50	14.1	282	

Notes: ① diluted to 100mL with D.I water.

Reviewed by: JGh

Date Reviewed: Feb. 27/19

Client: Teck

W.O.#: 190063

Week 2

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Control	Jan 18/19	Feb 26/19	50	3.2	3.3	62	50	6.4	128	✓
EV-HCl	↓	Feb 26/19	50	10.3	10.5	202	100	4.7	470	DG
EV-MC2	↓	↓	50	9.9	10.0	196	100	4.8	480	DG
GH-FR1	↓	↓	50	11.1	11.2	220	100	5.4	540	DG
GH-ERC	↓	↓	50	7.8	7.9	154	100	2.3	230	DG
GH-ER2	↓	↓	50	7.8	7.9	154	100	2.3	230	DG
CM-MC1	↓	Feb 26/19	50	7.4	7.5	146	50	7.8	156	DG
CM-MC2	↓	↓	10 ^⓪	2.2	2.3	210	10 ^⓪	5.8	580	✓
CM-MC3	↓	↓	50	8.2	8.3	162	50	9.6	192	↓
FR-FRCP1	↓	↓	10 ^⓪	3.7	3.8	360	10 ^⓪	20.2	2020	↓
FR-FRABH	↓	↓	10 ^⓪	2.4	2.5	230	10 ^⓪	6.0	600	↓
FR-UFRI	↓	↓	50	7.6	7.7	150	50	6.9	138	↓
LC-LCSSLCC	↓	↓	10 ^⓪	2.4	2.5	230	10 ^⓪	5.5	550	↓
LC-SLC	↓	↓	50	7.5	7.6	148	50	8.3	166	↓
LC-LC3	↓	↓	10 ^⓪	2.8	2.9	128 270	10 ^⓪	7.2	720	↓
LC-LC5	↓	↓	50	9.3	9.5	182	50	14.8	296	↓
LC-OCDS	↓	↓	10 ^⓪	2.0	2.1	190	10 ^⓪	3.5	350	↓

Week 2

Notes: ^⓪ Diluted to 100ml w/ D1

Reviewed by: Joh

Date Reviewed: Feb. 28/19

Client: Teck

W.O.#: 190063

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/L CaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
Control Water	Jan 24/19	Feb 28/19	50	3.2	3.3	62	50	6.5	130	
FR-FRCP1	JAN 25/19	FEB 28/19	10 ^⓪	3.1	3.2	300	10 ^⓪	16.9	1690	ST
FR-FRABCH	JAN 25/19	FEB 28/19	10 ^⓪	1.8	2.0	160	10 ^⓪	6.4	640	ST
FR-WFA1	JAN 25/19	FEB 28/19	50	6.7	6.8	132	50	10.1	202	ST
GH-FR1	JAN 25/19	FEB 28/19	10 ^⓪	1.9	2.0	180	10 ^⓪	4.4	440	ST
GH-FRC	JAN 25/19	FEB 28/19	50	7.2	7.3	142	50	8.8	176	ST
GH-FR2	JAN 25/19	FEB 28/19	50	7.2	7.3	142	50	8.8	176	ST
EV-HC1	JAN 25/19	FEB 28/19	50	9.8	10.0	192	50	17.3	346	ST
EV-MC2	JAN 25/19	FEB 28/19	50	9.6	9.7	190	50	14.1	282	ST
CM-MC1	JAN 25/19	FEB 28/19	50	7.4	7.5	146	50	8.0	160	ST
CM-MC2	JAN 25/19	FEB 28/19	10 ^⓪	1.7	1.8	160	10 ^⓪	4.7	470	ST
CM-MC3	JAN 25/19	FEB 28/19	50	9.3	9.4	184	50	11.5	230	ST
LC-LCDSLC	JAN 25/19	FEB 28/19	10 ^⓪	1.5	1.6	140	10 ^⓪	5.5	550	ST
LC-SLC	JAN 25/19	FEB 28/19	50	5.0	5.2	96	50	11.4	228	ST
LC-LC3	JAN 25/19	FEB 28/19	10 ^⓪	1.7	1.8	160	10 ^⓪	6.5	650	ST
LC-LC5	JAN 25/19	FEB 28/19	10 ^⓪	1.6 1.6	1.7	150	10 ^⓪	3.9	390	ST
LC-OCDS	JAN 25/19	FEB 28/19	10 ^⓪	1.2	1.4	100	10 ^⓪	3.7	370	ST

Week 3

Notes: ① sample diluted to 100ml w/ DI water

Reviewed by: SGW Date Reviewed: Feb. 28/19

Client: Teck

W.O.#: 190063

Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	
Control Water	Feb 8/19	Feb 12/19	50	3.4	3.5	66	50	7.1	142	
FR-FRCP1			10 ①	3.1	3.2	300	10 ①	20.1	2010	
FR-FRABCH			10 ①	2.5	2.6	240	10 ①	5.9	590	
FR-WFR1			50	8.2	8.4	160	50	8.0	160	
GH-FR1			10 ①	2.4	2.5	230	10 ①	5.5	550	
GH-ERC			50	8.0	8.1	158	50	8.1	162	
GH-ER2			50	7.9	8.0	156	50	7.9	158	
EV-HC1			10 ①	2.2	2.3	210	10 ①	4.7	470	
EV-MC2			10 ①	2.2	2.3	210	10 ①	4.9	490	
CM-MC1			50	7.9	8.0	156	50	6.7	134	
CM-MC2			10 ①	2.4	2.5	230	10 ①	6.4	640	
CM-MC3			50	8.0	8.1	158	50	10.1	202	
LC-LCDSLCC			10 ①	2.9	3.0	280	10 ①	5.9	590	
LC-SLC			50	7.26	7.87	150	50	10.5	210	
LC-LC3			10 ①	3.1	3.2	290 300	10 ①	8.4	840	
LC-LC5			10 ①	2.6	2.7	250	10 ①	5.7	570	
LC-DCDS			50	8.2	8.4	160	50	16.0	320	

July 28

Notes: ① diluted to 100mL with D.I water

Reviewed by: JGH Date Reviewed: Feb. 27/19

CETIS Summary Report

Report Date: 28 Feb-19 12:38 (p 1 of 20)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Batch ID: 11-3282-5253 Test Type: Survival-Growth Analyst: Karen Lee
 Start Date: 11 Jan-19 Protocol: EPA/600/R-99/064 (2000) (modified) Diluent:
 Ending Date: 08 Feb-19 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	15-3869-1310	11 Jan-19	11 Jan-19	n/a	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C) ✓		
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C) ✓		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C) ✓		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C) ✓		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C) ✓		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C) ✓		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C) ✓		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C) ✓		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C) ✓		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C) ✓		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C) ✓		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C) ✓		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C) ✓		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C) ✓		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C) ✓		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C) ✓		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	Water Sample	Teck Coal	Control	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
17-9479-1645	Mean Dry Weight-mg	Nemenyi-Damico-Wolfe Test	0.0421	GH_ERC failed mean dry weight-mg	1
17-9479-1645	Mean Dry Weight-mg	Nemenyi-Damico-Wolfe Test	0.0421	LC_SLC failed mean dry weight-mg	1
17-9479-1645	Mean Dry Weight-mg	Nemenyi-Damico-Wolfe Test	0.0421	Control failed mean dry weight-mg	1
17-9479-1645	Mean Dry Weight-mg	Nemenyi-Damico-Wolfe Test	0.0421	EV_HC1 failed mean dry weight-mg	1

CETIS Summary Report

Report Date: 28 Feb-19 12:38 (p 18 of 20)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	5	0.3356	0.08405	0.5872	0.15	0.6613	0.09062	0.2026	60.37%	0.00%
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.04667	0.08199	0.01766	0.02498	38.82%	80.83%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.05286	0.384	0.06107	0.1366	80.03%	49.16%
FR_UFR1		5	0.191	0.09316	0.2889	0.1011	0.295	0.03525	0.07882	41.26%	43.09%
GH_FR1		5	0.1588	0.07915	0.2385	0.09363	0.262	0.0287	0.06417	40.40%	52.68%
GH_ERC		5	0.155	0.06999	0.2401	0.105	0.261	0.03064	0.0685	44.18%	53.81%
GH_ER2		5	0.2367	0.1013	0.3721	0.1678	0.429	0.04878	0.1091	46.08%	29.48%
EV_HC1		5	0.295	0.1476	0.4424	0.1322	0.4111	0.05309	0.1187	40.25%	12.12%
EV_MC2		5	0.1724	0.1479	0.197	0.1457	0.198	0.00884	0.01977	11.46%	48.63%
CM_MC1		5	0.4558	0.2462	0.6653	0.1833	0.5957	0.07547	0.1688	37.03%	-35.79%
CM_MC2		5	0.06523	0.03902	0.09144	0.03	0.08556	0.009441	0.02111	32.36%	80.57%
CM_MC3		5	0.2233	0.1291	0.3176	0.115	0.3	0.03393	0.07588	33.97%	33.46%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.076	0.239	0.03047	0.06814	57.57%	64.73%
LC_SLC		5	0.2272	0.07225	0.3822	0.07875	0.3733	0.05581	0.1248	54.93%	32.30%
LC_LC3		5	0.2731	0.2251	0.3211	0.209	0.3056	0.01729	0.03867	14.16%	18.63%
LC_LC5		5	0.1696	0.01809	0.321	0.0675	0.369	0.05455	0.122	71.94%	49.48%
LC_DCDS		5	0.3542	0.1606	0.5477	0.1543	0.5586	0.06972	0.1559	44.02%	-5.52%
Control + EDTA		5	0.4415	0.1729	0.7101	0.116	0.6056	0.09676	0.2164	49.00%	-31.54%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.08285	0.165	0.01736	0.03883	32.20%	64.08%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.08999	0.2543	0.03093	0.06917	49.09%	58.02%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.08167	0.256	0.03231	0.07226	55.27%	61.05%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	5	0.9400	0.8289	1.0000	0.8000	1.0000	0.0400	0.0894	9.52%	0.00%
FR_FRCP1		5	0.1600	0.0000	0.4459	0.0000	0.5000	0.1030	0.2302	143.89%	82.98%
FR_FRABCH		5	0.8800	0.7181	1.0000	0.7000	1.0000	0.0583	0.1304	14.82%	6.38%
FR_UFR1		5	0.8800	0.6108	1.0000	0.5000	1.0000	0.0970	0.2168	24.64%	6.38%
GH_FR1		5	0.8600	0.6522	1.0000	0.6000	1.0000	0.0748	0.1673	19.46%	8.51%
GH_ERC		5	0.8000	0.4959	1.0000	0.4000	1.0000	0.1095	0.2449	30.62%	14.89%
GH_ER2		5	0.9200	0.8645	0.9755	0.9000	1.0000	0.0200	0.0447	4.86%	2.13%
EV_HC1		5	0.8800	0.8245	0.9355	0.8000	0.9000	0.0200	0.0447	5.08%	6.38%
EV_MC2		5	0.9200	0.7581	1.0000	0.7000	1.0000	0.0583	0.1304	14.17%	2.13%
CM_MC1		5	0.8800	0.7440	1.0000	0.7000	1.0000	0.0490	0.1095	12.45%	6.38%
CM_MC2		5	0.6600	0.4522	0.8678	0.5000	0.9000	0.0748	0.1673	25.35%	29.79%
CM_MC3		5	0.7600	0.4741	1.0000	0.4000	1.0000	0.1030	0.2302	30.29%	19.15%
LC_LCDSSLCC		5	0.7000	0.3488	1.0000	0.4000	1.0000	0.1265	0.2828	40.41%	25.53%
LC_SLC		5	0.9200	0.8645	0.9755	0.9000	1.0000	0.0200	0.0447	4.86%	2.13%
LC_LC3		5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-2.13%
LC_LC5		5	0.8400	0.6984	0.9816	0.7000	1.0000	0.0510	0.1140	13.57%	10.64%
LC_DCDS		5	0.8200	0.6581	0.9819	0.7000	1.0000	0.0583	0.1304	15.90%	12.77%
Control + EDTA		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-4.26%
FR_FRCP1 + EDTA		5	0.4800	0.1836	0.7764	0.1000	0.7000	0.1068	0.2387	49.74%	48.94%
FR_FRABCH+EDT		5	0.7200	0.4108	1.0000	0.3000	0.9000	0.1114	0.2490	34.58%	23.40%
CM_MC2 + EDTA		5	0.7800	0.5579	1.0000	0.6000	1.0000	0.0800	0.1789	22.93%	17.02%

CETIS Summary Report

Report Date: 28 Feb-19 12:38 (p 19 of 20)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	0.15	0.3873	0.2767	0.203	0.6613
FR_FRCP1		0.08199			0.04667	
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1		0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2		0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1		0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC		0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	1.0000	1.0000	0.9000	1.0000	0.8000
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1		1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2		0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1		0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC		1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

CETIS Summary Report

Report Date: 28 Feb-19 12:38 (p 20 of 20)
Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	10/10	11/11	9/10	10/10	8/10
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1		10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2		9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1		9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC		10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

CETIS Analytical Report

Report Date: 28 Feb-19 10:20 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 19-0377-5537	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 28 Feb-19 10:20	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	15-3869-1310	11 Jan-19	11 Jan-19	n/a	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	Water Sample	Teck Coal	Control	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_FRCP1*	0.0000	Exact	2.0E-15	Significant Effect
		FR_FRABCH	0.2338	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 28 Feb-19 10:20 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 19-0377-5537 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 10:20 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		FR_UFR1	0.2338	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.1592	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.0329	Exact	0.4271	Non-Significant Effect
		GH_ER2	0.4888	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.2338	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.2338	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0003	Exact	0.0062	Significant Effect
		CM_MC3	0.0102	Exact	0.1528	Non-Significant Effect
		LC_LCDSSLCC*	0.0014	Exact	0.0245	Significant Effect
		LC_SLC	0.4888	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.8126	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.0940	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.0565	Exact	0.6775	Non-Significant Effect
		Control + EDTA	0.9388	Exact	0.9388	Non-Significant Effect
		FR_FRCP1 + EDTA*	0.0000	Exact	2.9E-06	Significant Effect
		FR_FRABCH+EDTA*	0.0028	Exact	0.0453	Significant Effect
		CM_MC2 + EDTA	0.0186	Exact	0.2597	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits		Overlap	Decision
		Lower	Upper		
Control Resp	0.94	0.8	>>	Yes	Passes Criteria

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control	N	48	3	51	0.9412	0.05882	-17.65%
FR_FRCP1		8	42	50	0.16	0.84	80.0%
FR_FRABCH		44	6	50	0.88	0.12	-10.0%
FR_UFR1		44	6	50	0.88	0.12	-10.0%
GH_FR1		44	7	51	0.8627	0.1373	-7.84%
GH_ERC		40	10	50	0.8	0.2	0.0%
GH_ER2		46	4	50	0.92	0.08	-15.0%
EV_HC1		44	6	50	0.88	0.12	-10.0%
EV_MC2		47	4	51	0.9216	0.07843	-15.2%
CM_MC1		44	6	50	0.88	0.12	-10.0%
CM_MC2		33	17	50	0.66	0.34	17.5%
CM_MC3		38	12	50	0.76	0.24	5.0%
LC_LCDSSLCC		35	15	50	0.7	0.3	12.5%
LC_SLC		46	4	50	0.92	0.08	-15.0%
LC_LC3		48	2	50	0.96	0.04	-20.0%
LC_LC5		42	8	50	0.84	0.16	-5.0%
LC_DCDS		41	9	50	0.82	0.18	-2.5%
Control + EDTA		49	1	50	0.98	0.02	-22.5%
FR_FRCP1 + EDTA		24	26	50	0.48	0.52	40.0%
FR_FRABCH+EDTA		36	14	50	0.72	0.28	10.0%
CM_MC2 + EDTA		39	11	50	0.78	0.22	2.5%

CETIS Analytical Report

Report Date: 28 Feb-19 10:20 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 19-0377-5537 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 10:20 Analysis: STP 2xK Contingency Tables Status Level: 1

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	1.0000	1.0000	0.9000	1.0000	0.8000
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1		1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2		0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1		0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC		1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	10/10	11/11	9/10	10/10	8/10
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1		10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2		9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1		9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC		10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

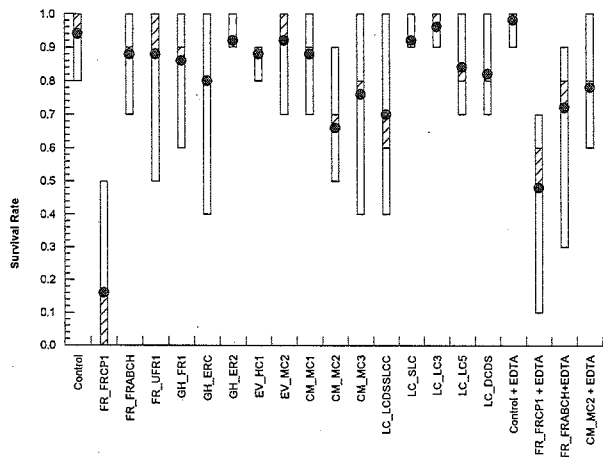
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 19-0377-5537 Endpoint: Survival Rate
Analyzed: 28 Feb-19 10:20 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 15 Feb-19 10:08 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-9479-1645 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:08 Analysis: Nonparametric-Control vs Treatments Status Level: 1
 Batch ID: 11-3282-5253 Test Type: Survival-Growth Analyst: Karen Lee
 Start Date: 11 Jan-19 Protocol: EPA/600/R-99/064 (2000) (modified) Diluent:
 Ending Date: 08 Feb-19 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	15-3869-1310	11 Jan-19	11 Jan-19	n/a	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	Water Sample	Teck Coal	Control	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

CETIS Analytical Report

Report Date: 15 Feb-19 10:08 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-9479-1645 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:08 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Nemenyi-Damico-Wolfe Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α :5%)
Negative Control		FR_FRCP1*	673	656.4	1	CDF	0.0421	Significant Effect
		FR_FRABCH	348	496.2	1	CDF	0.2528	Non-Significant Effect
		FR_UFR1	222	496.2	1	CDF	0.5730	Non-Significant Effect
		GH_FR1	302	496.2	1	CDF	0.3605	Non-Significant Effect
		GH_ERC	304	496.2	1	CDF	0.3555	Non-Significant Effect
		GH_ER2	112	496.2	1	CDF	0.8256	Non-Significant Effect
		EV_HC1	12	496.2	1	CDF	0.9483	Non-Significant Effect
		EV_MC2	240	496.2	1	CDF	0.5246	Non-Significant Effect
		CM_MC1	-146	496.2	1	CDF	0.9969	Non-Significant Effect
		CM_MC2*	675	496.2	1	CDF	0.0026	Significant Effect
		CM_MC3	122	496.2	1	CDF	0.8073	Non-Significant Effect
		LC_LCDSSLCC	478	496.2	1	CDF	0.0635	Non-Significant Effect
		LC_SLC	178	496.2	1	CDF	0.6858	Non-Significant Effect
		LC_LC3	-8	496.2	1	CDF	0.9614	Non-Significant Effect
		LC_LC5	330	496.2	1	CDF	0.2928	Non-Significant Effect
		LC_DCDS	-42	496.2	1	CDF	0.9775	Non-Significant Effect
		Control + EDTA	-90	496.2	1	CDF	0.9904	Non-Significant Effect
		FR_FRCP1 + EDTA	442	496.2	1	CDF	0.0986	Non-Significant Effect
		FR_FRABCH+EDTA	378	496.2	1	CDF	0.1933	Non-Significant Effect
		CM_MC2 + EDTA	423	496.2	1	CDF	0.1222	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :5%)
Treatment Effect	Fligner-Wolfe Omnibus Test	5107		0.0428	Significant Overall Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1.14453	0.0572264	20	4.542	5.3E-07	Significant Effect
Error	1.02066	0.0126008	81			
Total	2.16519		101			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variances	Bartlett Equality of Variance Test	49.01	37.57	3.1E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9706	0.966	0.0224	Normal Distribution

CETIS Analytical Report

Report Date: 15 Feb-19 10:08 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-9479-1645 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:08 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	N	5	0.3356	0.08405	0.5872	0.2767	0.15	0.6613	0.09062	60.37%	0.00%
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.06433	0.04667	0.08199	0.01766	38.82%	80.83%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.09555	0.05286	0.384	0.06107	80.03%	49.16%
FR_UFR1		5	0.191	0.09316	0.2889	0.165	0.1011	0.295	0.03525	41.26%	43.09%
GH_FR1		5	0.1588	0.07915	0.2385	0.1422	0.09363	0.262	0.0287	40.40%	52.68%
GH_ERC		5	0.155	0.06999	0.2401	0.1125	0.105	0.261	0.03064	44.18%	53.81%
GH_ER2		5	0.2367	0.1013	0.3721	0.1889	0.1678	0.429	0.04878	46.08%	29.48%
EV_HC1		5	0.295	0.1476	0.4424	0.3037	0.1322	0.4111	0.05309	40.25%	12.12%
EV_MC2		5	0.1724	0.1479	0.197	0.1756	0.1457	0.198	0.00884	11.46%	48.63%
CM_MC1		5	0.4558	0.2462	0.6653	0.4733	0.1833	0.5957	0.07547	37.03%	-35.79%
CM_MC2		5	0.06523	0.03902	0.09144	0.072	0.03	0.08556	0.009441	32.36%	80.57%
CM_MC3		5	0.2233	0.1291	0.3176	0.2513	0.115	0.3	0.03393	33.97%	33.46%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.08749	0.076	0.239	0.03047	57.57%	64.73%
LC_SLC		5	0.2272	0.07225	0.3822	0.2433	0.07875	0.3733	0.05581	54.93%	32.30%
LC_LC3		5	0.2731	0.2251	0.3211	0.282	0.209	0.3056	0.01729	14.16%	18.63%
LC_LC5		5	0.1696	0.01809	0.321	0.1087	0.0675	0.369	0.05455	71.94%	49.48%
LC_DCDS		5	0.3542	0.1606	0.5477	0.36	0.1543	0.5586	0.06972	44.02%	-5.52%
Control + EDTA		5	0.4415	0.1729	0.7101	0.576	0.116	0.6056	0.09676	49.00%	-31.54%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.1	0.08285	0.165	0.01736	32.20%	64.08%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.1089	0.08999	0.2543	0.03093	49.09%	58.02%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.1038	0.08167	0.256	0.03231	55.27%	61.05%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	N	0.15	0.3873	0.2767	0.203	0.6613
FR_FRCP1		0.08199	0.04667			
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1		0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2		0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1		0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC		0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

Hyaella 28-d Survival and Growth Sediment Test

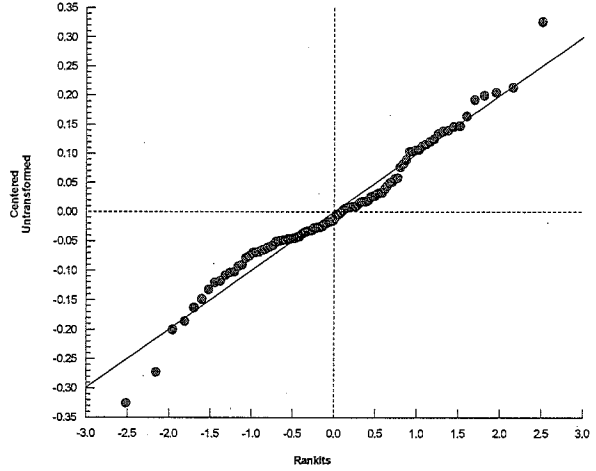
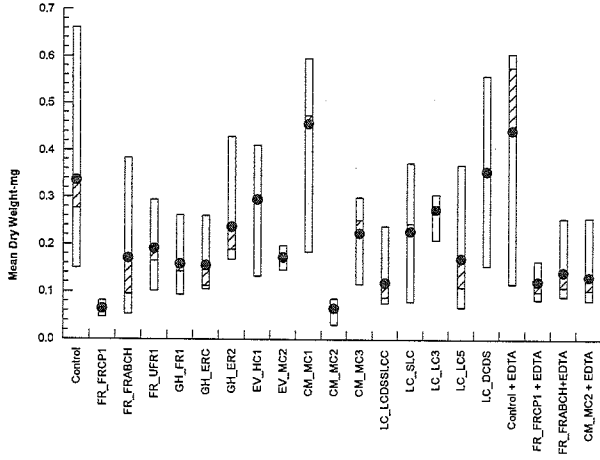
Nautilus Environmental

Analysis ID: 17-9479-1645
Analyzed: 15 Feb-19 10:08

Endpoint: Mean Dry Weight-mg
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 28 Feb-19 10:21 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-0662-1549	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 28 Feb-19 10:21	Analysis: STP 2XK Contingency Tables	Status Level: 1
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	1.8E-12	Significant Effect
(FR_UFR1)		FR_FRABCH	0.6202	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.5155	Exact	1.0000	Non-Significant Effect
		GH_ERC	0.2070	Exact	1.0000	Non-Significant Effect

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-0662-1549 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 10:21 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		GH_ER2	0.8411	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.6202	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.8489	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.6202	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0082	Exact	0.1386	Non-Significant Effect
		CM_MC3	0.0961	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.0239	Exact	0.3829	Non-Significant Effect
		LC_SLC	0.8411	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.9703	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.3871	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.2883	Exact	1.0000	Non-Significant Effect
		Control + EDTA	0.9938	Exact	0.9938	Non-Significant Effect
		FR_FRCP1 + EDTA*	0.0000	Exact	2.7E-04	Significant Effect
		FR_FRABCH+EDTA	0.0392	Exact	0.5883	Non-Significant Effect
		CM_MC2 + EDTA	0.1434	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1		8	42	50	0.16	0.84	80.0%
FR_FRABCH		44	6	50	0.88	0.12	-10.0%
FR_UFR1	XC	44	6	50	0.88	0.12	-10.0%
GH_FR1		44	7	51	0.8627	0.1373	-7.84%
GH_ERC		40	10	50	0.8	0.2	0.0%
GH_ER2		46	4	50	0.92	0.08	-15.0%
EV_HC1		44	6	50	0.88	0.12	-10.0%
EV_MC2		47	4	51	0.9216	0.07843	-15.2%
CM_MC1		44	6	50	0.88	0.12	-10.0%
CM_MC2		33	17	50	0.66	0.34	17.5%
CM_MC3		38	12	50	0.76	0.24	5.0%
LC_LCDSSLCC		35	15	50	0.7	0.3	12.5%
LC_SLC		46	4	50	0.92	0.08	-15.0%
LC_LC3		48	2	50	0.96	0.04	-20.0%
LC_LC5		42	8	50	0.84	0.16	-5.0%
LC_DCDS		41	9	50	0.82	0.18	-2.5%
Control + EDTA		49	1	50	0.98	0.02	-22.5%
FR_FRCP1 + EDTA		24	26	50	0.48	0.52	40.0%
FR_FRABCH+EDTA		36	14	50	0.72	0.28	10.0%
CM_MC2 + EDTA		39	11	50	0.78	0.22	2.5%

CETIS Analytical Report

Report Date: 28 Feb-19 10:21 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-0662-1549 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 10:21 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1	XC	1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2		0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1		0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC		1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1	XC	10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2		9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1		9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC		10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

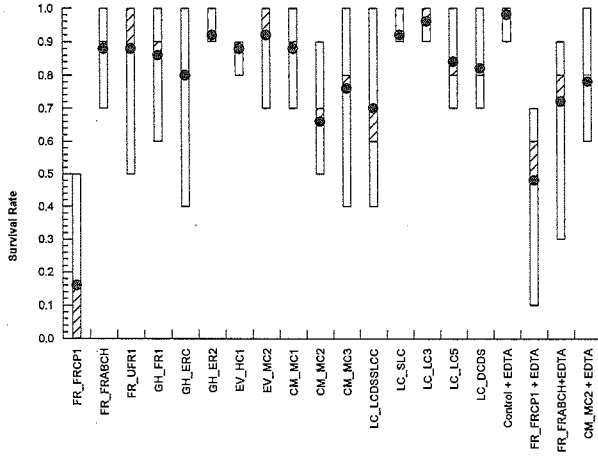
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-0662-1549 Endpoint: Survival Rate
Analyzed: 28 Feb-19 10:21 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 15 Feb-19 10:38 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6909-9432	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 15 Feb-19 10:38	Analysis: Nonparametric-Two Sample	Status Level: 1
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

CETIS Analytical Report

Report Date: 15 Feb-19 10:38 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6909-9432 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:38 Analysis: Nonparametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry weight-mg	64.93%
		FR_FRABCH passed mean dry weight-mg	64.93%
		GH_FR1 passed mean dry weight-mg	64.93%
		GH_ERC passed mean dry weight-mg	64.93%
		GH_ER2 passed mean dry weight-mg	64.93%
		EV_HC1 passed mean dry weight-mg	64.93%
		EV_MC2 passed mean dry weight-mg	64.93%
		CM_MC1 passed mean dry weight-mg	64.93%
		CM_MC2 failed mean dry weight-mg	64.93%
		CM_MC3 passed mean dry weight-mg	64.93%
		LC_LCDSSLCC failed mean dry weight-mg	64.93%
		LC_SLC passed mean dry weight-mg	64.93%
		LC_LC3 passed mean dry weight-mg	64.93%
		LC_LC5 passed mean dry weight-mg	64.93%
		LC_DCDS passed mean dry weight-mg	64.93%
		Control + EDTA passed mean dry weight-mg	64.93%
		FR_FRCP1 + EDTA failed mean dry weight-m	64.93%
		FR_FRABCH+EDTA passed mean dry weight-	64.93%
		CM_MC2 + EDTA passed mean dry weight-m	64.93%

Wilcoxon Rank Sum Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	3	n/a	0	5	Exact	0.0476	Significant Effect
		FR_FRABCH	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		GH_FR1	24	n/a	0	8	Exact	0.2738	Non-Significant Effect
		GH_ERC	25	n/a	0	8	Exact	0.3452	Non-Significant Effect
		GH_ER2	32	n/a	0	8	Exact	0.8452	Non-Significant Effect
		EV_HC1	34	n/a	0	8	Exact	0.9246	Non-Significant Effect
		EV_MC2	27	n/a	0	8	Exact	0.5000	Non-Significant Effect
		CM_MC1	38	n/a	0	8	Exact	0.9921	Non-Significant Effect
		CM_MC2*	15	n/a	0	8	Exact	0.0040	Significant Effect
		CM_MC3	32	n/a	0	8	Exact	0.8452	Non-Significant Effect
		LC_LCDSSLCC*	19	n/a	0	8	Exact	0.0476	Significant Effect
		LC_SLC	29	n/a	0	8	Exact	0.6548	Non-Significant Effect
		LC_LC3	36	n/a	0	8	Exact	0.9722	Non-Significant Effect
		LC_LC5	25	n/a	0	8	Exact	0.3452	Non-Significant Effect
		LC_DCDS	36	n/a	0	8	Exact	0.9722	Non-Significant Effect
		Control + EDTA	36	n/a	0	8	Exact	0.9722	Non-Significant Effect
		FR_FRCP1 + EDTA*	19	n/a	0	8	Exact	0.0476	Significant Effect
		FR_FRABCH+EDTA	22	n/a	0	8	Exact	0.1548	Non-Significant Effect
		CM_MC2 + EDTA	21	n/a	0	8	Exact	0.1111	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.07263	0.0564541	19	5.076	1.4E-07	Significant Effect
Error	0.856438	0.0111226	77			
Total	1.92907		96			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	44.53	36.19	8.0E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.963	0.9645	0.0078	Non-Normal Distribution

CETIS Analytical Report

Report Date: 15 Feb-19 10:38 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6909-9432 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:38 Analysis: Nonparametric-Two Sample Status Level: 1

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.06433	0.04667	0.08199	0.01766	38.82%	0.00%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.09555	0.05286	0.384	0.06107	80.03%	-165.23%
FR_UFR1	XC	5	0.191	0.09316	0.2889	0.165	0.1011	0.295	0.03525	41.26%	-196.93%
GH_FR1		5	0.1588	0.07915	0.2385	0.1422	0.09363	0.262	0.0287	40.40%	-146.87%
GH_ERC		5	0.155	0.06999	0.2401	0.1125	0.105	0.261	0.03064	44.18%	-141.01%
GH_ER2		5	0.2367	0.1013	0.3721	0.1889	0.1678	0.429	0.04878	46.08%	-267.91%
EV_HC1		5	0.295	0.1476	0.4424	0.3037	0.1322	0.4111	0.05309	40.25%	-358.50%
EV_MC2		5	0.1724	0.1479	0.197	0.1756	0.1457	0.198	0.00884	11.46%	-168.01%
CM_MC1		5	0.4558	0.2462	0.6653	0.4733	0.1833	0.5957	0.07547	37.03%	-608.45%
CM_MC2		5	0.06523	0.03902	0.09144	0.072	0.03	0.08556	0.009441	32.36%	-1.39%
CM_MC3		5	0.2233	0.1291	0.3176	0.2513	0.115	0.3	0.03393	33.97%	-247.17%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.08749	0.076	0.239	0.03047	57.57%	-83.99%
LC_SLC		5	0.2272	0.07225	0.3822	0.2433	0.07875	0.3733	0.05581	54.93%	-253.19%
LC_LC3		5	0.2731	0.2251	0.3211	0.282	0.209	0.3056	0.01729	14.16%	-324.52%
LC_LC5		5	0.1696	0.01809	0.321	0.1087	0.0675	0.369	0.05455	71.94%	-163.56%
LC_DCDS		5	0.3542	0.1606	0.5477	0.36	0.1543	0.5586	0.06972	44.02%	-450.51%
Control + EDTA		5	0.4415	0.1729	0.7101	0.576	0.116	0.6056	0.09676	49.00%	-586.29%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.1	0.08285	0.165	0.01736	32.20%	-87.42%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.1089	0.08999	0.2543	0.03093	49.09%	-119.03%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.1038	0.08167	0.256	0.03231	55.27%	-103.21%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.08199	0.04667			
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1	XC	0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2		0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1		0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC		0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

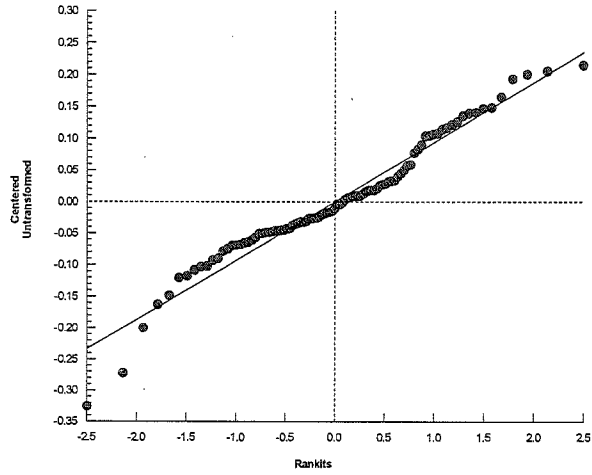
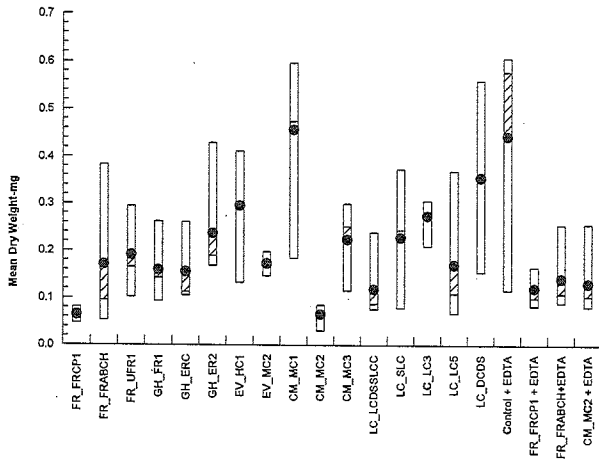
Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-6909-9432 Endpoint: Mean Dry Weight-mg
Analyzed: 15 Feb-19 10:38 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 28 Feb-19 10:35 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test			Nautilus Environmental		
Analysis ID: 13-2771-3307	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 28 Feb-19 10:35	Analysis: STP 2XK Contingency Tables	Status Level: 1			
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee			
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:			
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:			
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	3.2E-14	Significant Effect
<i>GH ER2</i>		FR_FRABCH	0.3703	Exact	1.0000	Non-Significant Effect
		FR_UFR1	0.3703	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.2740	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 28 Feb-19 10:35 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-2771-3307 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 10:35 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		GH_ERC	0.0739	Exact	0.8868	Non-Significant Effect
		EV_HC1	0.3703	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.6536	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.3703	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0013	Exact	0.0222	Significant Effect
		CM_MC3	0.0269	Exact	0.3764	Non-Significant Effect
		LC_LCDSSLCC	0.0047	Exact	0.0759	Non-Significant Effect
		LC_SLC	0.6425	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.8978	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.1783	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.1168	Exact	1.0000	Non-Significant Effect
		Control + EDTA	0.9719	Exact	0.9719	Non-Significant Effect
		FR_FRCP1 + EDTA*	0.0000	Exact	1.9E-05	Significant Effect
		FR_FRABCH+EDTA	0.0087	Exact	0.1304	Non-Significant Effect
		CM_MC2 + EDTA	0.0453	Exact	0.5884	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1		8	42	50	0.16	0.84	80.0%
FR_FRABCH		44	6	50	0.88	0.12	-10.0%
FR_UFR1		44	6	50	0.88	0.12	-10.0%
GH_FR1		44	7	51	0.8627	0.1373	-7.84%
GH_ERC		40	10	50	0.8	0.2	0.0%
GH_ER2	XC	46	4	50	0.92	0.08	-15.0%
EV_HC1		44	6	50	0.88	0.12	-10.0%
EV_MC2		47	4	51	0.9216	0.07843	-15.2%
CM_MC1		44	6	50	0.88	0.12	-10.0%
CM_MC2		33	17	50	0.66	0.34	17.5%
CM_MC3		38	12	50	0.76	0.24	5.0%
LC_LCDSSLCC		35	15	50	0.7	0.3	12.5%
LC_SLC		46	4	50	0.92	0.08	-15.0%
LC_LC3		48	2	50	0.96	0.04	-20.0%
LC_LC5		42	8	50	0.84	0.16	-5.0%
LC_DCDS		41	9	50	0.82	0.18	-2.5%
Control + EDTA		49	1	50	0.98	0.02	-22.5%
FR_FRCP1 + EDTA		24	26	50	0.48	0.52	40.0%
FR_FRABCH+EDTA		36	14	50	0.72	0.28	10.0%
CM_MC2 + EDTA		39	11	50	0.78	0.22	2.5%

CETIS Analytical Report

Report Date: 28 Feb-19 10:35 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-2771-3307 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 10:35 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1		1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2	XC	0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1		0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC		1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1		10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2	XC	9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1		9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC		10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

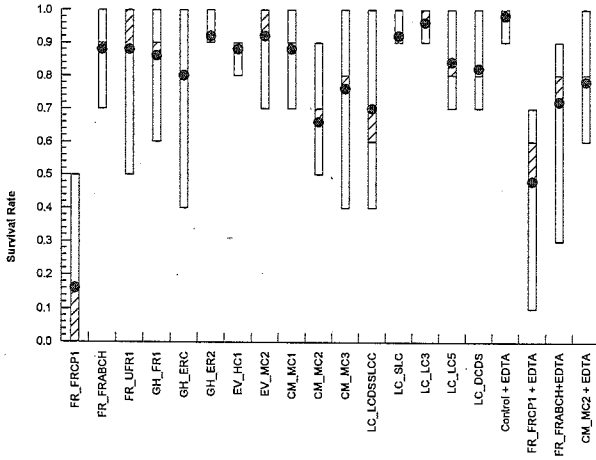
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-2771-3307 Endpoint: Survival Rate
Analyzed: 28 Feb-19 10:35 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 15 Feb-19 10:41 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-8959-8625 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:41 Analysis: Nonparametric-Two Sample Status Level: 1
 Batch ID: 11-3282-5253 Test Type: Survival-Growth Analyst: Karen Lee
 Start Date: 11 Jan-19 Protocol: EPA/600/R-99/064 (2000) (modified) Diluent:
 Ending Date: 08 Feb-19 Species: Hyaella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Feb-28/19

CETIS Analytical Report

Report Date: 15 Feb-19 10:41 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-8959-8625 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:41 Analysis: Nonparametric-Two Sample Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry weight-mg	52.40%
		FR_FRABCH passed mean dry weight-mg	52.40%
		FR_UFR1 passed mean dry weight-mg	52.40%
		GH_FR1 passed mean dry weight-mg	52.40%
		GH_ERC passed mean dry weight-mg	52.40%
		EV_HC1 passed mean dry weight-mg	52.40%
		EV_MC2 passed mean dry weight-mg	52.40%
		CM_MC1 passed mean dry weight-mg	52.40%
		CM_MC2 failed mean dry weight-mg	52.40%
		CM_MC3 passed mean dry weight-mg	52.40%
		LC_LCDSSLCC failed mean dry weight-mg	52.40%
		LC_SLC passed mean dry weight-mg	52.40%
		LC_LC3 passed mean dry weight-mg	52.40%
		LC_LC5 passed mean dry weight-mg	52.40%
		LC_DCDS passed mean dry weight-mg	52.40%
		Control + EDTA passed mean dry weight-mg	52.40%
		FR_FRCP1 + EDTA failed mean dry weight-m	52.40%
		FR_FRABCH+EDTA failed mean dry weight-	52.40%
		CM_MC2 + EDTA failed mean dry weight-mg	52.40%

Wilcoxon Rank Sum Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	3	n/a	0	5	Exact	0.0476	Significant Effect
		FR_FRABCH	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		FR_UFR1	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		GH_FR1	20	n/a	0	8	Exact	0.0754	Non-Significant Effect
		GH_ERC	21	n/a	0	8	Exact	0.1111	Non-Significant Effect
		EV_HC1	31	n/a	0	8	Exact	0.7897	Non-Significant Effect
		EV_MC2	21	n/a	0	8	Exact	0.1111	Non-Significant Effect
		CM_MC1	37	n/a	0	8	Exact	0.9841	Non-Significant Effect
		CM_MC2*	15	n/a	0	8	Exact	0.0040	Significant Effect
		CM_MC3	28	n/a	0	8	Exact	0.5794	Non-Significant Effect
		LC_LCDSSLCC*	19	n/a	0	8	Exact	0.0476	Significant Effect
		LC_SLC	27	n/a	0	8	Exact	0.5000	Non-Significant Effect
		LC_LC3	34	n/a	0	8	Exact	0.9246	Non-Significant Effect
		LC_LC5	22	n/a	0	8	Exact	0.1548	Non-Significant Effect
		LC_DCDS	33	n/a	0	8	Exact	0.8889	Non-Significant Effect
		Control + EDTA	34	n/a	0	8	Exact	0.9246	Non-Significant Effect
		FR_FRCP1 + EDTA*	15	n/a	0	8	Exact	0.0040	Significant Effect
		FR_FRABCH+EDTA*	19	n/a	0	8	Exact	0.0476	Significant Effect
		CM_MC2 + EDTA*	19	n/a	0	8	Exact	0.0476	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.07263	0.0564541	19	5.076	1.4E-07	Significant Effect
Error	0.856438	0.0111226	77			
Total	1.92907		96			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	44.53	36.19	8.0E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.963	0.9645	0.0078	Non-Normal Distribution

CETIS Analytical Report

Report Date: 15 Feb-19 10:41 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-8959-8625 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:41 Analysis: Nonparametric-Two Sample Status Level: 1

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.06433	0.04667	0.08199	0.01766	38.82%	0.00%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.09555	0.05286	0.384	0.06107	80.03%	-165.23%
FR_UFR1		5	0.191	0.09316	0.2889	0.165	0.1011	0.295	0.03525	41.26%	-196.93%
GH_FR1		5	0.1588	0.07915	0.2385	0.1422	0.09363	0.262	0.0287	40.40%	-146.87%
GH_ERC		5	0.155	0.06999	0.2401	0.1125	0.105	0.261	0.03064	44.18%	-141.01%
GH_ER2	XC	5	0.2367	0.1013	0.3721	0.1889	0.1678	0.429	0.04878	46.08%	-267.91%
EV_HC1		5	0.295	0.1476	0.4424	0.3037	0.1322	0.4111	0.05309	40.25%	-358.50%
EV_MC2		5	0.1724	0.1479	0.197	0.1756	0.1457	0.198	0.00884	11.46%	-168.01%
CM_MC1		5	0.4558	0.2462	0.6653	0.4733	0.1833	0.5957	0.07547	37.03%	-608.45%
CM_MC2		5	0.06523	0.03902	0.09144	0.072	0.03	0.08556	0.009441	32.36%	-1.39%
CM_MC3		5	0.2233	0.1291	0.3176	0.2513	0.115	0.3	0.03393	33.97%	-247.17%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.08749	0.076	0.239	0.03047	57.57%	-83.99%
LC_SLC		5	0.2272	0.07225	0.3822	0.2433	0.07875	0.3733	0.05581	54.93%	-253.19%
LC_LC3		5	0.2731	0.2251	0.3211	0.282	0.209	0.3056	0.01729	14.16%	-324.52%
LC_LC5		5	0.1696	0.01809	0.321	0.1087	0.0675	0.369	0.05455	71.94%	-163.56%
LC_DCDS		5	0.3542	0.1606	0.5477	0.36	0.1543	0.5586	0.06972	44.02%	-450.51%
Control + EDTA		5	0.4415	0.1729	0.7101	0.576	0.116	0.6056	0.09676	49.00%	-586.29%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.1	0.08285	0.165	0.01736	32.20%	-87.42%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.1089	0.08999	0.2543	0.03093	49.09%	-119.03%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.1038	0.08167	0.256	0.03231	55.27%	-103.21%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.08199	0.04667			
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1		0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2	XC	0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1		0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC		0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

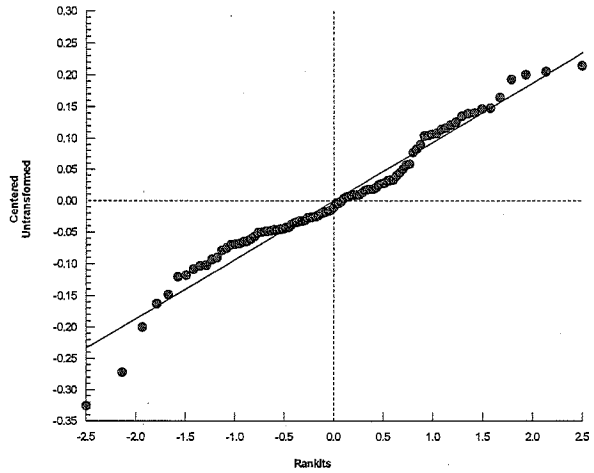
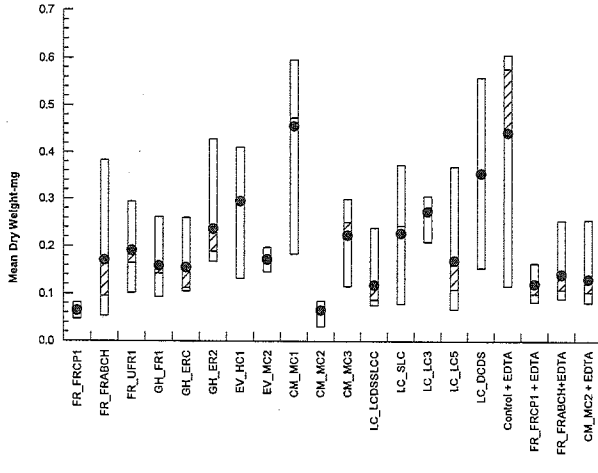
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 15-8959-8625 Endpoint: Mean Dry Weight-mg
Analyzed: 15 Feb-19 10:41 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



Feb. 28/19

CETIS Analytical Report

Report Date: 28 Feb-19 11:24 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-3906-4640	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 28 Feb-19 11:23	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	1.8E-12	Significant Effect
(CM MC1)		FR_FRABCH	0.6202	Exact	1.0000	Non-Significant Effect
		FR_UFR1	0.6202	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.5155	Exact	1.0000	Non-Significant Effect

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-3906-4640 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 11:23 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		GH_ERC	0.2070	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.8411	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.6202	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.8489	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0082	Exact	0.1386	Non-Significant Effect
		CM_MC3	0.0961	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.0239	Exact	0.3829	Non-Significant Effect
		LC_SLC	0.8411	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.9703	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.3871	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.2883	Exact	1.0000	Non-Significant Effect
		Control + EDTA	0.9938	Exact	0.9938	Non-Significant Effect
		FR_FRCP1 + EDTA*	0.0000	Exact	2.7E-04	Significant Effect
		FR_FRABCH+EDTA	0.0392	Exact	0.5883	Non-Significant Effect
		CM_MC2 + EDTA	0.1434	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1		8	42	50	0.16	0.84	80.0%
FR_FRABCH		44	6	50	0.88	0.12	-10.0%
FR_UFR1		44	6	50	0.88	0.12	-10.0%
GH_FR1		44	7	51	0.8627	0.1373	-7.84%
GH_ERC		40	10	50	0.8	0.2	0.0%
GH_ER2		46	4	50	0.92	0.08	-15.0%
EV_HC1		44	6	50	0.88	0.12	-10.0%
EV_MC2		47	4	51	0.9216	0.07843	-15.2%
CM_MC1	XC	44	6	50	0.88	0.12	-10.0%
CM_MC2		33	17	50	0.66	0.34	17.5%
CM_MC3		38	12	50	0.76	0.24	5.0%
LC_LCDSSLCC		35	15	50	0.7	0.3	12.5%
LC_SLC		46	4	50	0.92	0.08	-15.0%
LC_LC3		48	2	50	0.96	0.04	-20.0%
LC_LC5		42	8	50	0.84	0.16	-5.0%
LC_DCDS		41	9	50	0.82	0.18	-2.5%
Control + EDTA		49	1	50	0.98	0.02	-22.5%
FR_FRCP1 + EDTA		24	26	50	0.48	0.52	40.0%
FR_FRABCH+EDTA		36	14	50	0.72	0.28	10.0%
CM_MC2 + EDTA		39	11	50	0.78	0.22	2.5%

CETIS Analytical Report

Report Date: 28 Feb-19 11:24 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-3906-4640 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 11:23 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1		1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2		0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1	XC	0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC		1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1		10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2		9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1	XC	9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC		10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

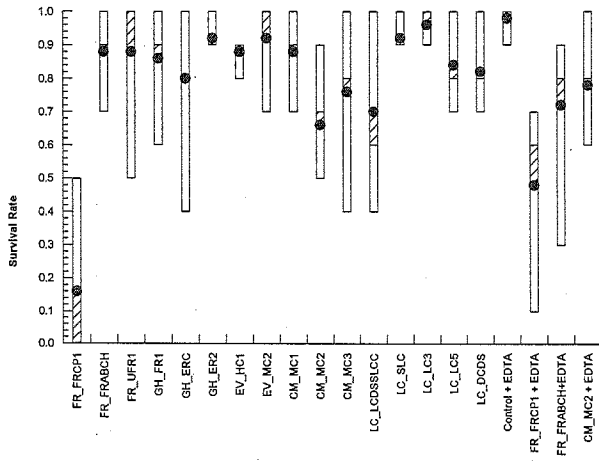
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 09-3906-4640 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 11:23 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 15 Feb-19 10:43 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test			Nautilus Environmental		
Analysis ID: 07-1116-5939	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4			
Analyzed: 15 Feb-19 10:43	Analysis: Nonparametric-Control vs Treatments	Status Level: 1			
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee			
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) <i>(modified)</i>	Diluent:			
Ending Date: 08 Feb-19	Species: Hyalella azteca	Brine:			
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

CETIS Analytical Report

Report Date: 15 Feb-19 10:43 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 07-1116-5939 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:43 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Nemenyi-Damico-Wolfe Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	785	621.1	1	CDF	0.0065	Significant Effect
		FR_FRABCH*	470	469.5	1	CDF	0.0497	Significant Effect
		FR_UFR1	346	469.5	1	CDF	0.2150	Non-Significant Effect
		GH_FR1	420	469.5	1	CDF	0.0961	Non-Significant Effect
		GH_ERC	422	469.5	1	CDF	0.0938	Non-Significant Effect
		GH_ER2	242	469.5	1	CDF	0.4778	Non-Significant Effect
		EV_HC1	150	469.5	1	CDF	0.7264	Non-Significant Effect
		EV_MC2	360	469.5	1	CDF	0.1875	Non-Significant Effect
		CM_MC2*	787	469.5	1	CDF	9.1E-05	Significant Effect
		CM_MC3	250	469.5	1	CDF	0.4552	Non-Significant Effect
		LC_LCDSSLCC*	594	469.5	1	CDF	0.0064	Significant Effect
		LC_SLC	306	469.5	1	CDF	0.3056	Non-Significant Effect
		LC_LC3	130	469.5	1	CDF	0.7722	Non-Significant Effect
		LC_LC5	450	469.5	1	CDF	0.0654	Non-Significant Effect
		LC_DCDS	98	469.5	1	CDF	0.8357	Non-Significant Effect
		Control + EDTA	52	469.5	1	CDF	0.9050	Non-Significant Effect
		FR_FRCP1 + EDTA*	558	469.5	1	CDF	0.0124	Significant Effect
		FR_FRABCH+EDTA*	496	469.5	1	CDF	0.0340	Significant Effect
		CM_MC2 + EDTA*	539	469.5	1	CDF	0.0171	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Treatment Effect	Fligner-Wolfe Omnibus Test	4688		7.0E-04	Significant Overall Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.07263	0.0564541	19	5.076	1.4E-07	Significant Effect
Error	0.856438	0.0111226	77			
Total	1.92907		96			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	44.53	36.19	8.0E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.963	0.9645	0.0078	Non-Normal Distribution

CETIS Analytical Report

Report Date: 15 Feb-19 10:43 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 07-1116-5939 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:43 Analysis: Nonparametric-Control vs Treatments Status Level: 1

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.06433	0.04667	0.08199	0.01766	38.82%	0.00%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.09555	0.05286	0.384	0.06107	80.03%	-165.23%
FR_UFR1		5	0.191	0.09316	0.2889	0.165	0.1011	0.295	0.03525	41.26%	-196.93%
GH_FR1		5	0.1588	0.07915	0.2385	0.1422	0.09363	0.262	0.0287	40.40%	-146.87%
GH_ERC		5	0.155	0.06999	0.2401	0.1125	0.105	0.261	0.03064	44.18%	-141.01%
GH_ER2		5	0.2367	0.1013	0.3721	0.1889	0.1678	0.429	0.04878	46.08%	-267.91%
EV_HC1		5	0.295	0.1476	0.4424	0.3037	0.1322	0.4111	0.05309	40.25%	-358.50%
EV_MC2		5	0.1724	0.1479	0.197	0.1756	0.1457	0.198	0.00884	11.46%	-168.01%
CM_MC1	XC	5	0.4558	0.2462	0.6653	0.4733	0.1833	0.5957	0.07547	37.03%	-608.45%
CM_MC2		5	0.06523	0.03902	0.09144	0.072	0.03	0.08556	0.009441	32.36%	-1.39%
CM_MC3		5	0.2233	0.1291	0.3176	0.2513	0.115	0.3	0.03393	33.97%	-247.17%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.08749	0.076	0.239	0.03047	57.57%	-83.99%
LC_SLC		5	0.2272	0.07225	0.3822	0.2433	0.07875	0.3733	0.05581	54.93%	-253.19%
LC_LC3		5	0.2731	0.2251	0.3211	0.282	0.209	0.3056	0.01729	14.16%	-324.52%
LC_LC5		5	0.1696	0.01809	0.321	0.1087	0.0675	0.369	0.05455	71.94%	-163.56%
LC_DCDS		5	0.3542	0.1606	0.5477	0.36	0.1543	0.5586	0.06972	44.02%	-450.51%
Control + EDTA		5	0.4415	0.1729	0.7101	0.576	0.116	0.6056	0.09676	49.00%	-586.29%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.1	0.08285	0.165	0.01736	32.20%	-87.42%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.1089	0.08999	0.2543	0.03093	49.09%	-119.03%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.1038	0.08167	0.256	0.03231	55.27%	-103.21%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.08199	0.04667			
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1		0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2		0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1	XC	0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC		0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

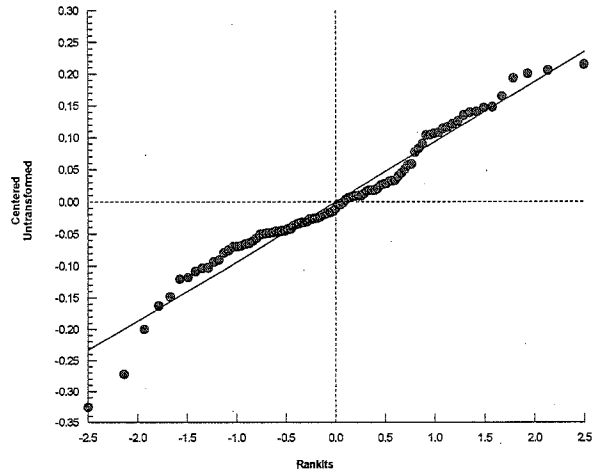
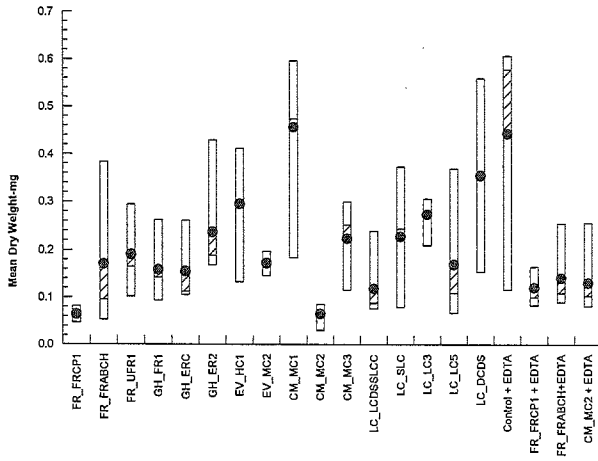
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 07-1116-5939 Endpoint: Mean Dry Weight-mg
Analyzed: 15 Feb-19 10:43 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 28 Feb-19 11:28 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyaella 28-d Survival and Growth Sediment Test			Nautilus Environmental		
Analysis ID: 12-2440-9501	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4			
Analyzed: 28 Feb-19 11:28	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Batch ID: 11-3282-5253	Test Type: Survival-Growth	Analyst: Karen Lee			
Start Date: 11 Jan-19	Protocol: EPA/600/R-99/064 (2000) (modified)	Diluent:			
Ending Date: 08 Feb-19	Species: Hyaella azteca	Brine:			
Test Length: 28d 0h	Taxon: Malacostraca	Source: Aquatic Biosystems, CO Age: 7-8d			

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	3.2E-14	Significant Effect
(LC-SLC)		FR_FRABCH	0.3703	Exact	1.0000	Non-Significant Effect
		FR_UFR1	0.3703	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.2740	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 28 Feb-19 11:28 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-2440-9501 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 28 Feb-19 11:28 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		GH_ERC	0.0739	Exact	0.8868	Non-Significant Effect
		GH_ER2	0.6425	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.3703	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.6536	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.3703	Exact	1.0000	Non-Significant Effect
		CM_MC2*	0.0013	Exact	0.0222	Significant Effect
		CM_MC3	0.0269	Exact	0.3764	Non-Significant Effect
		LC_LCDSSLCC	0.0047	Exact	0.0759	Non-Significant Effect
		LC_LC3	0.8978	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.1783	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.1168	Exact	1.0000	Non-Significant Effect
		Control + EDTA	0.9719	Exact	0.9719	Non-Significant Effect
		FR_FRCP1 + EDTA*	0.0000	Exact	1.9E-05	Significant Effect
		FR_FRABCH+EDTA	0.0087	Exact	0.1304	Non-Significant Effect
		CM_MC2 + EDTA	0.0453	Exact	0.5884	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1		8	42	50	0.16	0.84	80.0%
FR_FRABCH		44	6	50	0.88	0.12	-10.0%
FR_UFR1		44	6	50	0.88	0.12	-10.0%
GH_FR1		44	7	51	0.8627	0.1373	-7.84%
GH_ERC		40	10	50	0.8	0.2	0.0%
GH_ER2		46	4	50	0.92	0.08	-15.0%
EV_HC1		44	6	50	0.88	0.12	-10.0%
EV_MC2		47	4	51	0.9216	0.07843	-15.2%
CM_MC1		44	6	50	0.88	0.12	-10.0%
CM_MC2		33	17	50	0.66	0.34	17.5%
CM_MC3		38	12	50	0.76	0.24	5.0%
LC_LCDSSLCC		35	15	50	0.7	0.3	12.5%
LC_SLC	XC	46	4	50	0.92	0.08	-15.0%
LC_LC3		48	2	50	0.96	0.04	-20.0%
LC_LC5		42	8	50	0.84	0.16	-5.0%
LC_DCDS		41	9	50	0.82	0.18	-2.5%
Control + EDTA		49	1	50	0.98	0.02	-22.5%
FR_FRCP1 + EDTA		24	26	50	0.48	0.52	40.0%
FR_FRABCH+EDTA		36	14	50	0.72	0.28	10.0%
CM_MC2 + EDTA		39	11	50	0.78	0.22	2.5%

CETIS Analytical Report

Report Date: 28 Feb-19 11:28 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-2440-9501 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 11:28 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.5000	0.0000	0.0000	0.3000	0.0000
FR_FRABCH		1.0000	1.0000	0.7000	0.9000	0.8000
FR_UFR1		1.0000	0.5000	0.9000	1.0000	1.0000
GH_FR1		1.0000	0.6000	0.9000	0.8000	1.0000
GH_ERC		1.0000	1.0000	0.8000	0.4000	0.8000
GH_ER2		0.9000	0.9000	1.0000	0.9000	0.9000
EV_HC1		0.9000	0.8000	0.9000	0.9000	0.9000
EV_MC2		1.0000	0.9000	0.7000	1.0000	1.0000
CM_MC1		0.9000	1.0000	0.9000	0.9000	0.7000
CM_MC2		0.7000	0.5000	0.5000	0.9000	0.7000
CM_MC3		0.8000	0.4000	1.0000	0.7000	0.9000
LC_LCDSSLCC		1.0000	0.6000	1.0000	0.5000	0.4000
LC_SLC	XC	1.0000	0.9000	0.9000	0.9000	0.9000
LC_LC3		1.0000	0.9000	1.0000	1.0000	0.9000
LC_LC5		0.9000	0.8000	1.0000	0.7000	0.8000
LC_DCDS		0.9000	0.8000	1.0000	0.7000	0.7000
Control + EDTA		1.0000	0.9000	1.0000	1.0000	1.0000
FR_FRCP1 + EDTA		0.6000	0.7000	0.4000	0.6000	0.1000
FR_FRABCH+EDT		0.9000	0.3000	0.7000	0.8000	0.9000
CM_MC2 + EDTA		0.6000	0.8000	1.0000	0.9000	0.6000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		5/10	0/10	0/10	3/10	0/10
FR_FRABCH		10/10	10/10	7/10	9/10	8/10
FR_UFR1		10/10	5/10	9/10	10/10	10/10
GH_FR1		11/11	6/10	9/10	8/10	10/10
GH_ERC		10/10	10/10	8/10	4/10	8/10
GH_ER2		9/10	9/10	10/10	9/10	9/10
EV_HC1		9/10	8/10	9/10	9/10	9/10
EV_MC2		10/10	9/10	7/10	11/11	10/10
CM_MC1		9/10	10/10	9/10	9/10	7/10
CM_MC2		7/10	5/10	5/10	9/10	7/10
CM_MC3		8/10	4/10	10/10	7/10	9/10
LC_LCDSSLCC		10/10	6/10	10/10	5/10	4/10
LC_SLC	XC	10/10	9/10	9/10	9/10	9/10
LC_LC3		10/10	9/10	10/10	10/10	9/10
LC_LC5		9/10	8/10	10/10	7/10	8/10
LC_DCDS		9/10	8/10	10/10	7/10	7/10
Control + EDTA		10/10	9/10	10/10	10/10	10/10
FR_FRCP1 + EDTA		6/10	7/10	4/10	6/10	1/10
FR_FRABCH+EDT		9/10	3/10	7/10	8/10	9/10
CM_MC2 + EDTA		6/10	8/10	10/10	9/10	6/10

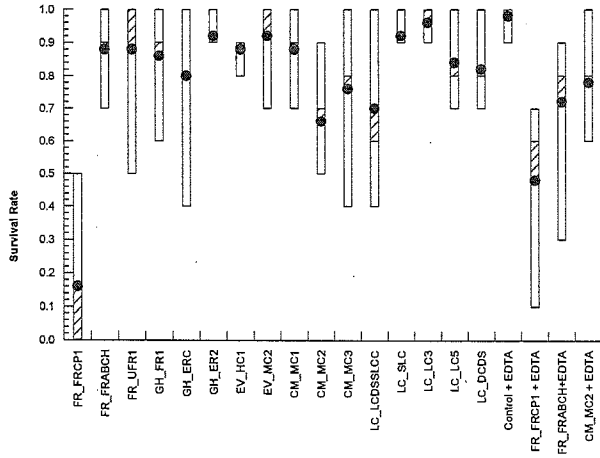
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 12-2440-9501 Endpoint: Survival Rate
 Analyzed: 28 Feb-19 11:28 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 15 Feb-19 10:45 (p 1 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-1742-1124 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 15 Feb-19 10:45 Analysis: Nonparametric-Two Sample Status Level: 1
 Batch ID: 11-3282-5253 Test Type: Survival-Growth Analyst: Karen Lee
 Start Date: 11 Jan-19 Protocol: EPA/600/R-99/064 (2000) (modified) Diluent:
 Ending Date: 08 Feb-19 Species: Hyalella azteca Brine:
 Test Length: 28d 0h Taxon: Malacostraca Source: Aquatic Biosystems, CO Age: 7-8d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	12-1994-7979	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)	Teck Coal	Teck Coal Q4 2018
FR_FRABCH	16-0219-4774	09 Jan-19 11:40	10 Jan-19 10:00	36h (0 °C)		
FR_UFR1	15-2786-8144	09 Jan-19 11:00	10 Jan-19 10:00	37h (2.9 °C)		
GH_FR1	06-9212-1942	09 Jan-19 10:16	10 Jan-19 10:00	38h (3.4 °C)		
GH_ERC	03-3635-6735	09 Jan-19 13:54	10 Jan-19 10:00	34h (3.6 °C)		
GH_ER2	05-4781-5701	09 Jan-19 13:03	10 Jan-19 10:00	35h (3.9 °C)		
EV_HC1	10-1665-3490	08 Jan-19 14:30	10 Jan-19 09:54	58h (5.5 °C)		
EV_MC2	20-5178-8554	09 Jan-19 14:05	11 Jan-19 10:20	34h (4.4 °C)		
CM_MC1	15-6620-4221	09 Jan-19	10 Jan-19 10:00	48h (4.2 °C)		
CM_MC2	06-0370-5814	09 Jan-19	10 Jan-19 10:00	48h (3.1 °C)		
CM_MC3	15-2084-9212	09 Jan-19	10 Jan-19 10:00	48h (2.8 °C)		
LC_LCDSSLCC	17-2255-9679	09 Jan-19 10:24	10 Jan-19 10:00	38h (1.2 °C)		
LC_SLC	11-0233-4373	09 Jan-19 11:43	10 Jan-19 10:00	36h (6.3 °C)		
LC_LC3	06-3811-2847	09 Jan-19 11:07	10 Jan-19 10:00	37h (6.4 °C)		
LC_LC5	18-6025-1030	09 Jan-19 09:38	10 Jan-19 10:00	38h (0 °C)		
LC_DCDS	20-3033-7365	09 Jan-19	10 Jan-19 10:00	48h (0.6 °C)		
Control + EDTA	11-6626-5992	11 Jan-19	11 Jan-19	n/a		
FR_FRCP1 + EDTA	12-7293-9505	09 Jan-19 12:39	10 Jan-19 10:00	35h (0.4 °C)		Teck Coal Q4 2018
FR_FRABCH+EDT	04-8662-3598	09 Jan-19 11:40	10 Jan-19 10:00	36h		
CM_MC2 + EDTA	11-0713-9937	09 Jan-19	10 Jan-19 10:00	48h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_MON_2019-01	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_MON_2019-01-0	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2019-11-27-	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2019-11-27	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2019_11-27	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2019-01_MO	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2019_Q1_Q	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_2019-01	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_2019-01	
CM_MC3	Water Sample	Teck Coal	CM_MC3_Q4_WS_2019-01	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_MNT_201	
LC_SLC	Water Sample	Teck Coal	LC_SLC_MNT_2019-01-07	
LC_LC3	Water Sample	Teck Coal	LC_LC3_MNT_2019-01-07	
LC_LC5	Water Sample	Teck Coal	LC_LC5_MNT_2019-01-07	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_MNT_2019-01-0	
Control + EDTA	Water Sample	Teck Coal	Control + EDTA	
FR_FRCP1 + EDTA	Water Sample	Teck Coal	FR_FRCP1 + EDTA	
FR_FRABCH+EDT	Water Sample	Teck Coal	FR_FRABCH_MON_2019-	
CM_MC2 + EDTA	Water Sample	Teck Coal	CM_MC2 + EDTA	

CETIS Analytical Report

Report Date: 15 Feb-19 10:45 (p 2 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-1742-1124 Endpoint: Mean Dry Weight-mg
 Analyzed: 15 Feb-19 10:45 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 passed mean dry weight-mg	54.59%
		FR_FRABCH passed mean dry weight-mg	54.59%
		FR_UFR1 passed mean dry weight-mg	54.59%
		GH_FR1 passed mean dry weight-mg	54.59%
		GH_ERC passed mean dry weight-mg	54.59%
		GH_ER2 passed mean dry weight-mg	54.59%
		EV_HC1 passed mean dry weight-mg	54.59%
		EV_MC2 passed mean dry weight-mg	54.59%
		CM_MC1 passed mean dry weight-mg	54.59%
		CM_MC2 failed mean dry weight-mg	54.59%
		CM_MC3 passed mean dry weight-mg	54.59%
		LC_LCDSSLCC passed mean dry weight-mg	54.59%
		LC_LC3 passed mean dry weight-mg	54.59%
		LC_LC5 passed mean dry weight-mg	54.59%
		LC_DCDS passed mean dry weight-mg	54.59%
		Control + EDTA passed mean dry weight-mg	54.59%
		FR_FRCP1 + EDTA passed mean dry weight-	54.59%
		FR_FRABCH+EDTA passed mean dry weight-	54.59%
		CM_MC2 + EDTA passed mean dry weight-m	54.59%

Wilcoxon Rank Sum Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	4	n/a	0	5	Exact	0.0952	Non-Significant Effect
		FR_FRABCH	24	n/a	0	8	Exact	0.2738	Non-Significant Effect
		FR_UFR1	26	n/a	0	8	Exact	0.4206	Non-Significant Effect
		GH_FR1	25	n/a	0	8	Exact	0.3452	Non-Significant Effect
		GH_ERC	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		GH_ER2	28	n/a	0	8	Exact	0.5794	Non-Significant Effect
		EV_HC1	32	n/a	0	8	Exact	0.8452	Non-Significant Effect
		EV_MC2	25	n/a	0	8	Exact	0.3452	Non-Significant Effect
		CM_MC1	37	n/a	0	8	Exact	0.9841	Non-Significant Effect
		CM_MC2*	16	n/a	0	8	Exact	0.0079	Significant Effect
		CM_MC3	27	n/a	0	8	Exact	0.5000	Non-Significant Effect
		LC_LCDSSLCC	20	n/a	0	8	Exact	0.0754	Non-Significant Effect
		LC_LC3	29	n/a	0	8	Exact	0.6548	Non-Significant Effect
		LC_LC5	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		LC_DCDS	34	n/a	0	8	Exact	0.9246	Non-Significant Effect
		Control + EDTA	35	n/a	0	8	Exact	0.9524	Non-Significant Effect
		FR_FRCP1 + EDTA	22	n/a	0	8	Exact	0.1548	Non-Significant Effect
		FR_FRABCH+EDTA	23	n/a	0	8	Exact	0.2103	Non-Significant Effect
		CM_MC2 + EDTA	23	n/a	0	8	Exact	0.2103	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.07263	0.0564541	19	5.076	1.4E-07	Significant Effect
Error	0.856438	0.0111226	77			
Total	1.92907		96			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	44.53	36.19	8.0E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.963	0.9645	0.0078	Non-Normal Distribution

CETIS Analytical Report

Report Date: 15 Feb-19 10:45 (p 3 of 4)
 Test Code/ID: 190063 / 08-2326-3848

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-1742-1124 Endpoint: Mean Dry Weight-mg
 Analyzed: 15 Feb-19 10:45 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1		2	0.06433	-0.1601	0.2887	0.06433	0.04667	0.08199	0.01766	38.82%	0.00%
FR_FRABCH		5	0.1706	0.001071	0.3402	0.09555	0.05286	0.384	0.06107	80.03%	-165.23%
FR_UFR1		5	0.191	0.09316	0.2889	0.165	0.1011	0.295	0.03525	41.26%	-196.93%
GH_FR1		5	0.1588	0.07915	0.2385	0.1422	0.09363	0.262	0.0287	40.40%	-146.87%
GH_ERC		5	0.155	0.06999	0.2401	0.1125	0.105	0.261	0.03064	44.18%	-141.01%
GH_ER2		5	0.2367	0.1013	0.3721	0.1889	0.1678	0.429	0.04878	46.08%	-267.91%
EV_HC1		5	0.295	0.1476	0.4424	0.3037	0.1322	0.4111	0.05309	40.25%	-358.50%
EV_MC2		5	0.1724	0.1479	0.197	0.1756	0.1457	0.198	0.00884	11.46%	-168.01%
CM_MC1		5	0.4558	0.2462	0.6653	0.4733	0.1833	0.5957	0.07547	37.03%	-608.45%
CM_MC2		5	0.06523	0.03902	0.09144	0.072	0.03	0.08556	0.009441	32.36%	-1.39%
CM_MC3		5	0.2233	0.1291	0.3176	0.2513	0.115	0.3	0.03393	33.97%	-247.17%
LC_LCDSSLCC		5	0.1184	0.03375	0.203	0.08749	0.076	0.239	0.03047	57.57%	-83.99%
LC_SLC	XC	5	0.2272	0.07225	0.3822	0.2433	0.07875	0.3733	0.05581	54.93%	-253.19%
LC_LC3		5	0.2731	0.2251	0.3211	0.282	0.209	0.3056	0.01729	14.16%	-324.52%
LC_LC5		5	0.1696	0.01809	0.321	0.1087	0.0675	0.369	0.05455	71.94%	-163.56%
LC_DCDS		5	0.3542	0.1606	0.5477	0.36	0.1543	0.5586	0.06972	44.02%	-450.51%
Control + EDTA		5	0.4415	0.1729	0.7101	0.576	0.116	0.6056	0.09676	49.00%	-586.29%
FR_FRCP1 + EDTA		5	0.1206	0.07236	0.1688	0.1	0.08285	0.165	0.01736	32.20%	-87.42%
FR_FRABCH+EDT		5	0.1409	0.05502	0.2268	0.1089	0.08999	0.2543	0.03093	49.09%	-119.03%
CM_MC2 + EDTA		5	0.1307	0.04101	0.2204	0.1038	0.08167	0.256	0.03231	55.27%	-103.21%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_FRCP1		0.08199	0.04667			
FR_FRABCH		0.384	0.092	0.05286	0.09555	0.2287
FR_UFR1		0.165	0.146	0.1011	0.248	0.295
GH_FR1		0.09363	0.125	0.1422	0.1712	0.262
GH_ERC		0.188	0.261	0.1088	0.105	0.1125
GH_ER2		0.18	0.1678	0.429	0.1889	0.2178
EV_HC1		0.2256	0.3037	0.4111	0.1322	0.4022
EV_MC2		0.198	0.1756	0.1457	0.1618	0.181
CM_MC1		0.1833	0.432	0.5944	0.4733	0.5957
CM_MC2		0.0643	0.03	0.072	0.08556	0.07429
CM_MC3		0.2513	0.115	0.3	0.1771	0.2733
LC_LCDSSLCC		0.076	0.1033	0.239	0.086	0.08749
LC_SLC	XC	0.124	0.2433	0.3167	0.07875	0.3733
LC_LC3		0.209	0.3056	0.282	0.269	0.3
LC_LC5		0.2011	0.1087	0.369	0.1014	0.0675
LC_DCDS		0.4367	0.2613	0.36	0.5586	0.1543
Control + EDTA		0.576	0.6056	0.321	0.116	0.589
FR_FRCP1 + EDTA		0.1	0.08285	0.165	0.095	0.16
FR_FRABCH+EDT		0.1089	0.08999	0.2543	0.0925	0.1589
CM_MC2 + EDTA		0.08167	0.1038	0.256	0.08556	0.1267

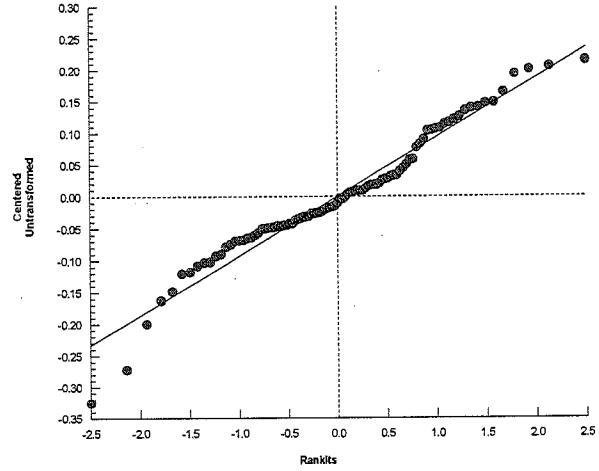
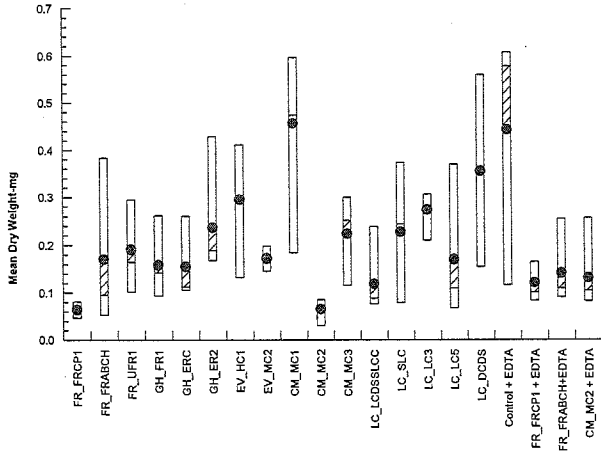
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 00-1742-1124 Endpoint: Mean Dry Weight-mg
 Analyzed: 15 Feb-19 10:45 Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Graphics



APPENDIX D – *Pimephales promelas* Toxicity Test Data

Fathead Minnow Bench Sheet
Pans labeled - AP

Method FMD 32 Day ELS Client TEC164/NAU104 Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Organism Information

Source: Aquatic Biosystems Batch: 20181108FM ELS Egg Stage: B3 smites Organisms Received in Good Condition: Yes No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review
					AM	PM		
20181109	0	1400	CB/ML	2	-	-	60 mins	LC
20181110	1	1145	CB	2	-	-	60 mins	LC
20181111	2	1130	ML	2	-	-	60 min.	ill
20181112	3	1130	ML	2	-	-	60 min	ill
20181113	4	1030	CB	2	-	✓	60 mins	MW
20181114	5	1010	CB	2	✓	✓	60 mins	AP
20181115	6	1120	CB	2	✓	✓	60 mins	AP
20181116	7	1145	ST	2	✓	✓	60 mins	FD
20181117	8	1000	ST	2	✓	✓	60 mins	VF
20181118	9	1145	ML	2	✓	✓	60 min	ill
20181119	10	1135	ML	2	✓	✓	60 min	AP
20181120	11	1210	CB	2	✓	✓	60 mins	AP
20181121	12	0950	CB	2	✓	✓	60 mins	ill
20181122	13	1000	CB	2	✓	✓	60 mins	KK
20181123	14	0955	CB	2	✓	✓	60 mins	SS
20181124	15	1100	ST	2	✓	✓	60 mins	LF
20181125	16	1120	ML	2	✓	✓	60 min	KK
20181126	17	1030	KL	2	✓	-	60 min	FD
20181127	18	1350	CB	2	✓	✓	60 mins	AP
20181128	19	1000	ST	2	✓	✓	60 mins	LF
20181129	20	1030	CB	2	✓	✓	60 mins	AP
20181130	21	1200	CB	2	✓	✓	60 mins	SS
20181201	22	1200	ML	2	✓	✓	60 min	ST
20181202	23	1130	KL	2	✓	✓	60 min	AP
20181203	24	1105	CB	2	✓	✓	60 mins	KL
20181204	25	1050	KL	2	✓	✓	60 mins	FD
20181205	26	1015	KL	2	✓	✓	60 mins	AP
20181206	27	1030	CB	2	✓	✓	60 mins	AP
20181207	28	1205	CB	2	✓	✓	60 mins	LF
20181208	29	1050	ST	2	✓	✓	60 mins	LF
20181209	30	1020	CB	2	✓	✓	60 mins	FD
20181210	31	1020	CB	2	✓	✓	60 mins	ST
20181211	32	1120	ML/ML	2	-	-		VF

Reviewed By: LD

Date Reviewed: 20181220

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	1819-0343 10ug/L		1819-0344 10 ug/L		1819-0345 10 ug/L		1818-0346 10 ug/L		1819-0347 10 ug/L		1819-0348 10 ug/L		1819-0349 10 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	14	1	15	0	15	0	15	0	14	1	15	0	15	0
b	14	1	15	0	13	2	15	0	15	0	13	2	15	0
c	14	1	15	0	15	0	15	0	15	0	14	1	15	0
d	14	1	15	0	15	0	15	0	14	1	14	1	15	0
e	29	0	28	2	30	0	27	3	30	0	29	1	28	2
f	30	0	30	0	28	2	27	3	29	1	27	3	28	2

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

1819-0343 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	14	0
b	14	0	15
c	14	0	15
d	14	0	15
e	29	1	
f	29	1	

1819-0344 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	13	2
b	15	0	15
c	15	0	15
d	15	0	15
e	29	0	
f	30	0	

1819-0345 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	14	1
b	12	1	15
c	15	0	15
d	15	0	15
e	30	0	
f	28	0	

1818-0346 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	14	1
b	14	1	15
c	15	0	15
d	15	0	15
e	27	0	
f	26	1	

1819-0347 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	13	1
b	15	0	15
c	15	0	15
d	13	1	15
e	29	1	
f	29	0	

1819-0348 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	14	1
b	13	0	15
c	15	0	15
d	15	0	15
e	27	1	
f	28	0	

1819-0349 10 ug/L

replicate	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
	a	15	0
b	13	0	15
c	15	0	15
d	15	0	15
e	27	1	
f	28	0	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:

1819-0345 - white precipitate on bottom of jar cued (to surface)

Reviewed By: LD

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Control hatching success must be >66% (≥ 10 per replicate). Post hatch survival must be >70%.

1819-0343 10ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
4	1	10	0
6	0	8	1
5	0	10	0
3	1	11	1

MLZ

1819-0344 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
10	0	5	0
14	0	1	0
13	0	2	0
8	0	6	0

7

1819-0345 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
14	0	1	0
11	0	4	0
14	0	1	0
14	0	1	0

1818-0346 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
13	0	2	0
12	0	3	0
11	0	4	0
14	0	1	0

1819-0347 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
15	0	0	0
15	0	0	0
13	0	2	0
11	0	4	0

1819-0348 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
10	0	5	0
12	0	3	0
10	0	5	0
12	1	2	0

1819-0349 10 ug/L

Day 3			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
12	1	2	0
15	0	0	0
16	0	4	0
13	0	2	0

1819-0343 10ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	1	10	3
0	0	9	5
0	0	11	4
0	0	11	2

1819-0344 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
2	0	13	0
4	0	11	0
0	0	15	0
1	0	14	0

1819-0345 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
8	0	7	0
1	0	14	0
3	0	12	0
5	0	10	0

1818-0346 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
4	0	11	0
2	0	13	0
0	0	15	0
2	0	13	0

1819-0347 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
8	0	7	0
12	0	3	0
0	0	15	0
3	0	12	0

1819-0348 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
1	0	14	0
3	0	12	0
4	0	11	0
0	0	14	0

1819-0349 10 ug/L

Day 4			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
3	0	12	0
0	0	15	0
2	0	13	0

Comments/Observations

Reviewed By: LO

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

1819-0343 10ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	5	5
0	0	5	4
0	0	6	5
0	0	9	2

1819-0344 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	15	0
0	1	14	0

1819-0345 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
1	0	14	0
0	0	15	0
0	0	15	0
0	0	15	0

1818-0346 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	1
0	0	15	0
0	0	15	0
0	0	15(1)	0

1819-0347 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
2	0	13	0
0	0	13	0
0	0	15	0

1819-0348 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	15	0
0	0	14(1)	0

1819-0349 10 ug/L

Day 5			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	15	0
0	0	15	0
0	0	15	0

1819-0343 10ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	4	1
0	0	1	4
0	0	4	2
0	0	8	1

1819-0344 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	15	0
0	0	15	0
0	0	14	0

1819-0345 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	15	0
0	0	14	0
0	0	15	0
0	0	15	0

1818-0346 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	15	0
0	0	15	0
0	0	15(1)	0

1819-0347 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	1
0	0	15	0
0	0	15	0
0	0	15	0

1819-0348 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	10	5
0	0	15	0
0	0	15	0
0	0	12(1)	2

1819-0349 10 ug/L

Day 6			
Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
0	0	14	0
0	0	15	0
0	0	15	0
0	0	15	0

Comments/Observations

Reviewed By: W

Date Reviewed: 2021/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	15(2)	15	14	14	9	14
b	0	15(3)	14	15	15	15	15
c	4(4)	15	15	15	15	15	15
d	4(4)	14	15	15(0)	15	12(1)	15(0)

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	11(2)*	15	14(1)	14	9	14
b	0	12(2)	15	15	15	14	15
c	2(2)	14(1)*	15	15(0)	15	15(2)	15
d	*2(2)	13(1)*	15	15(1)	15	12(1)	15(0)

Comments/Observations:

* Microbial

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	10	14	12*	15	14	12
c	1(1)	10*	15	15	15	15(3)	15
d	1(1)	13	15	15	15	12(1)	15(0)

Comments/Observations:

* Microbial

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	14	14	14	11*
c	0	10	15	15	15	15(2)	15
d	1(1)	13	15	13(0)*	15	12(1)	15

Comments/Observations:

* Microbial growth H/TZ
* Microbial
* * * (neglected in food)

Reviewed By: W

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client :164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 11	Day 11	Day 11	Day 11	Day 11	Day 11	Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	11	14	14	11
c	0	10	15	15	15	14	14
d	1	12	15	12(1)	15	12(1)	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 12	Day 12	Day 12	Day 12	Day 12	Day 12	Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	11	14	14	11
c	0	10	15	15	15	14	14
d	1	12	15	11	15	12(1)	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 13	Day 13	Day 13	Day 13	Day 13	Day 13	Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	11	14	14	11
c	0	9	15	15	15	14(1)	14
d	1	12	15	11(1)	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 14	Day 14	Day 14	Day 14	Day 14	Day 14	Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	11	14	14	11
c	0	9	15	15	15	14	14
d	1	12	15	10(1)	15	11	15

Comments/Observations: + Microbial growth

Reviewed By: W

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 15	Day 15	Day 15	Day 15	Day 15	Day 15	Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	11(1)	14	14	11
c	0	9	15	15(1)	15	14(1)	14(1)
d	1(1)	11*	13	10	15	11	15

Comments/Observations: * Microbial

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	11(1)	14	14	11
c	0	8	15	15(1)	15	14(1)	14
d	1(1)	10*	15	10	15	11	15

Comments/Observations: Microbial

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	11(1)	14	14	11
c	0	8	15	15(1)	15	14(1)	14
d	1(1)	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	11(1)	14	14	11
c	0	8	15	15(1)	15	14(1)	14
d	1	10	15	10	15	11	15

Comments/Observations: * Microbial growth

Reviewed By: LD

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104 Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	11(1)	14	14	11
c	0	8	15	15(1)	15	14(1)	14
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	10	14	14	11
c	0	8	15	14	15	14	14
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7(1)	14	10	14	14	11
c	0	8	15	14	15	14	14
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	15	10	14	14	11
c	0	8	15	14	15	14	13(1)
d	1(1)	10	15	10	15	11	15

Comments/Observations:

Reviewed By: LO Date Reviewed: 2018/02/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14(1)	14	9	12
b	0	7	14	10	14	14	10
c	0	8	15	14	15	14	13(1)
d	1(1)	10	15 14 ^{ex}	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	14	14	10
c	0	8	15	14	15	14	13(1)
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	14	14	10
c	0	8	15	14	15	14	13(1)
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	14	14	10
c	0	8	15	14	15	14	13(1)
d	1	10	15	10	15	11	15

Comments/Observations:

Reviewed By: AO

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client :164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	15	14	13(1)
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 28	Day 28	Day 28	Day 28	Day 28	Day 28	Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	14	14	13(1)
d	1	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 29	Day 29	Day 29	Day 29	Day 29	Day 29	Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	14	14	13(1)
d	1(1)	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1819-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 30	Day 30	Day 30	Day 30	Day 30	Day 30	Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	14	14	13(1)
d	1(1)	10	15	10	15	11	15

Comments/Observations:

Reviewed By: W Date Reviewed: 2018/02/20
W12

Method FMD 32 Day ELS Client 164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

Number of Alive Embryos and Hatched Organisms

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	14	14	13(1)
d	1(1)	10	15	10	15	11	15

Comments/Observations:

	1819-0343 10ug/L	1819-0344 10 ug/L	1819-0345 10 ug/L	1818-0346 10 ug/L	1819-0347 10 ug/L	1819-0348 10 ug/L	1819-0349 10 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	0	6	15	14	14	9	12
b	0	7	14	10	13	14	10
c	0	8	15	14	14	14	13(1)
d	1(1)	10	15	10	15	11	15

Comments/Observations:

Reviewed By: LO

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L,
1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

New Solutions

Conc. (%)	1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L

#78
#81

Day	0	1	2	3	4	5	6	7	8
0	8.0	8.1	8.3	8.3	8.4	8.3	8.3		
1	7.9	8.1	8.3	8.2	8.2	8.7	8.2		
2	8.1	8.1	8.3	8.1	8.3	8.2	8.1		
3	8.0	8.1	8.3	8.2	8.2	8.2	8.2		
4	8.0	8.2	8.3	8.3	8.3	8.3	8.3		
5	7.9	8.1	8.3	8.2	8.2	8.2	8.2		
6	7.9	8.2	8.2	8.2	8.4	8.2	8.3		
7	7.8	8.2	8.4	8.1	8.3	8.7	8.3		
8	7.8	8.1	8.3	8.2	8.2	8.1	8.2		

Conductance (µS/cm)

Day	0	1	2	3	4	5	6	7	8
0	3110	3105	3911	3865	334	3668	280		
1	3110	3090	377	963	327	861	278		
2	320	977	20	24	369	848	266		
3	380	106	35	81	316	846	260		
4	2070	1019	73	312	330	823	278		
5	2840	9157	269	783	301	808	258		
6	3000	958	330	761	291	957	270		
7	2880	986	341	785	309	965	275		
8	2996	975	336	773	297	959	279		

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	0	1	2	3	4	5	6	7	8
0	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
1	7.3	7.3	7.3	7.3	7.3	7.2	7.3		
2	7.3	7.3	7.3	7.3	7.3	7.3	7.2		
3	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
5	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
6	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
7	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
8	7.3	7.3	7.3	7.3	7.3	7.3	7.3		

7.3

Temperature (°C)

Day	0	1	2	3	4	5	6	7	8
0	24	24	24	24	24	24	24		
1	24	24	24	24	24	24	24		
2	24	24	24	24	24	24	24		
3	24	24	24	24	24	24	24		
4	24	24	24	24	24	24	24		
5	24	24	24	24	24	24	24		
6	24	24	24	24	24	24	24		
7	24	24	24	24	24	24	24		
8	24	24	24	24	24	24	24		

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: LD

Date Reviewed: 2018/12/20

0343 0344 0345 Old solutions 0346 0347 0348 0349

0%	0%	0%	0%	0%	0%	0%
----	----	----	----	----	----	----

Day	0	1	2	3	4	5	6	7	8
0	8.0	8.1	8.2	8.4	8.4	8.2	8.3		
1	7.8	7.9	8.2	8.2	8.3	8.1	8.2		
2	7.8	7.9	8.3	8.2	8.3	8.2	8.3		
3	7.8	7.9	8.3	8.2	8.3	8.2	8.3		
4	7.8	8.1	8.4	8.3	8.3	8.2	8.3		
5	7.9	8.0	8.3	8.2	8.3	8.2	8.3		
6	7.9	8.0	8.1	8.1	8.2	8.2	8.1		
7	7.9	8.0	8.1	8.1	8.2	8.0	8.1		
8	7.7	7.9	8.1	8.1	8.1	8.0	8.1		

Conductance (µS/cm)

Day	0	1	2	3	4	5	6	7	8
0	3000	1028	395	806	362	844	279		
1	3000	1116	412	887	291	849	290		
2	2900	1011	448	897	291	852	330		
3	2900	1011	448	897	291	852	330		
4	2900	1011	448	897	291	852	330		
5	2800	957	384	790	343	778	278		
6	2810	962	395	785	332	769	285		
7	2870	968	358	780	303	825	271		
8	2850	94	345	770	305	823	286		

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	0	1	2	3	4	5	6	7	8
0	7.3	7.3	7.3	7.2	7.1	7.2	7.2		
1	7.3	7.3	7.3	7.3	7.3	7.3	7.2		
2	7.3	7.3	7.3	7.3	7.3	7.3	7.2		
3	7.3	7.3	7.3	7.3	7.3	7.3	7.2		
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
5	7.3	7.3	7.1	7.3	7.2	7.2	7.1		
6	6.8	6.9	7.1	6.8	6.6	6.6	6.5		
7	6.8	6.8	6.7	6.7	6.7	6.6	6.8		
8	6.6	6.7	6.6	6.5	6.7	6.6	6.6		

Temperature (°C)

Day	0	1	2	3	4	5	6	7	8
0	24	24	24	24	24	24	24		
1	24	24	24	24	24	24	24		
2	24	24	24	24	24	24	24		
3	24	24	24	24	24	24	24		
4	24	24	24	24	24	24	24		
5	24	24	24	24	24	24	24		
6	24	24	24	24	24	24	24		
7	24	24	24	24	24	24	24		
8	24	24	24	24	24	24	24		

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L,
1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

New Solutions							
Conc. (%)	1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349
Day	10ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)						
9	7.8	8.0	8.2	8.2	8.1	8.1	8.2
10	7.9	8.0	8.2	8.2	8.2	8.1	8.0
11	7.9	8.1	8.2	8.2	8.3	8.1	8.0
12	7.9	8.1	8.2	8.2	8.1	8.1	8.1
13	7.8	8.0	8.2	8.1	8.2	8.0	8.1
14	7.8	8.0	8.2	8.1	8.2	8.1	8.1
15	7.8	8.1	8.2	8.2	8.2	8.1	8.2
16	7.7	8.1	8.3	8.2	8.3	8.2	8.1
17	7.7	8.1	8.1	8.1	8.1	8.0	8.1

Conductance (µS/cm)							
9	2170	1025	323	113	2170	1025	323
10	2150	1025	323	113	2150	1025	323
11	2030	1025	332	110	2030	1025	332
12	2200	1028	363	860	315	1066	293
13	2350	1100	388	908	326	1098	306
14	2400	1055	383	878	350	1083	297
15	3220	1115	379	861	324	1069	303
16	3800	1055	391	902	328	1001	298
17	3550	1057	368	860	319	972	303

Dissolved Oxygen (mg/L) (40-100% saturation)							
9	7.3	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.2	7.3	7.3	7.3	7.3
14	7.2	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)							
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Reviewed By: lw

Comments:

Old Solutions							
Conc. (%)	1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349
Day	10ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)						
9	7.8	7.8	7.9	8.1	8.0	7.9	8.0
10	7.7	7.8	8.2	8.2	8.0	8.0	8.1
11	7.6	7.9	8.2	8.2	8.0	8.0	8.1
12	7.7	8.0	8.2	8.2	8.1	8.0	8.1
13	7.7	7.8	7.9	8.1	8.0	7.9	7.9
14	7.6	7.9	7.9	8.1	7.9	7.9	7.9
15	7.7	7.9	8.0	8.1	8.0	8.0	7.9
16	7.6	7.8	8.1	8.1	8.1	7.9	7.9
17	7.5	7.8	7.9	7.9	7.8	7.8	7.8

Conductance (µS/cm)							
9	2130	1127	353	814	252	953	340
10	2010	1025	318	810	242	936	312
11	2510	994	358	791	360	1017	308
12	3150	1098	418	876	368	1056	341
13	3230	1060	386	870	337	1043	373
14	3310	1122	451	933	401	1039	387
15	2330	1104	413	904	354	983	327
16	3880	1164	424	921	399	1006	351
17	3510	1081	399	903	341	992	317

Dissolved Oxygen (mg/L) (40-100% saturation)							
9	6.3	6.2	6.4	6.2	6.1	6.0	5.9
10	6.4	6.2	6.3	6.6	6.5	6.5	6.5
11	6.8	6.8	6.8	6.8	6.8	6.8	6.6
12	6.4	6.5	6.9	6.4	6.4	6.4	6.4
13	6.7	7.0	6.7	6.5	6.7	6.5	6.3
14	6.5	6.2	5.9	5.8	5.6	5.4	5.6
15	6.8	6.8	6.7	6.3	6.0	6.0	5.9
16	7.1	6.4	6.3	6.3	6.2	6.1	5.9
17	6.0	6.5	6.5	6.4	5.7	5.9	5.4

Temperature (°C)							
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

Date Reviewed: 10/21/20

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L,
1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

New Solutions							
Conc. (%)	1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349
Day	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
pH (units)							
18	7.9	8.2	8.3	8.2	8.3	8.1	8.2
19	7.8	8.0	8.1	8.0	8.2	8.0	8.1
20	7.8	8.0	8.1	8.0	8.2	8.0	8.1
21	8.0	8.0	8.3	8.2	8.3	8.1	8.1
22	8.0	8.1	8.3	8.3	8.3	8.2	8.3
23	8.0	8.1	8.3	8.2	8.4	8.2	8.3
24	7.8	8.0	8.2	8.2	8.2	8.1	8.2
25	7.9	8.1	8.2	8.2	8.3	8.1	8.2
26	8.0	8.1	8.4	8.3	8.4	8.2	8.3
Conductance (µS/cm)							
18	340	108	372	886	330	991	308
19	340	113	400	877	346	1004	319
20	340	107	363	870	323	949	310
21	340	112	375	887	336	955	316
22	340	112	372	886	332	937	311
23	338	115	392	875	335	936	323
24	335	122	380	889	336	948	317
25	320	110	379	871	341	925	318
26	340	107	467	897	341	955	320
Dissolved Oxygen (mg/L) (40-100% saturation)							
18	7.3	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.5	7.3	7.5	7.5	7.3	7.5
24	7.3	7.3	7.3	7.3	7.3	7.3	7.3
25	7.3	7.3	7.3	7.3	7.3	7.3	7.3
26	7.6	7.8	7.3	7.7	7.6	7.3	7.5
Temperature (°C)							
18	24	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

Old Solutions							
1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349	
10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	
pH (units)							
18	7.7	7.9	7.9	8.1	8.0	7.9	8.0
19	7.7	7.9	8.0	8.1	8.0	7.9	8.0
20	7.4	7.8	7.8	8.1	7.9	7.8	7.9
21	7.6	7.9	8.0	8.0	8.0	8.0	8.0
22	7.7	7.8	7.8	8.1	7.9	7.9	7.9
23	7.7	7.8	8.0	8.1	8.0	7.9	7.9
24	7.7	7.8	7.8	8.1	7.9	7.9	8.0
25	7.5	7.7	7.6	8.0	7.8	7.8	7.9
26	7.4	7.9	7.9	8.1	7.9	7.9	7.9
Conductance (µS/cm)							
18	3420	1143	424	988	377	984	371
19	3540	1107	406	879	374	981	300
20	3340	1080	394	908	385	933	319
21	3290	1168	388	910	333	988	372
22	3370	1122	376	924	332	968	340
23	3580	1290	450	980	368	994	400
24	3250	1116	398	895	372	960	352
25	3250	1168	404	929	384	940	380
26	3220	1204	491	929	397	954	304
Dissolved Oxygen (mg/L) (40-100% saturation)							
18	6.2	6.2	6.0	5.9	5.9	5.8	5.8
19	6.9	6.9	6.3	6.8	6.3	6.2	6.0
20	6.9	6.8	6.2	6.1	6.6	6.1	5.8
21	6.8	6.5	5.9	6.0	6.2	5.9	5.9
22	6.8	6.6	6.3	6.4	6.3	6.0	5.9
23	6.8	6.9	6.5	6.2	6.0	5.6	5.7
24	6.5	6.9	6.3	5.4	6.2	6.2	6.0
25	6.8	6.2	6.1	6.2	5.7	5.2	5.1
26	6.4	6.5	6.3	5.6	6.2	5.0	4.9
Temperature (°C)							
18	24	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: LD

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client TEC164/NAU104

Sample 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L,
1819-0346 10 ug/L, 1819-0347 10 ug/L,
1819-0348 10 ug/L, 1819-0349 10 ug/L

New Solutions							
Conc. (%)	1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349
Day	10ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)						
27	7.9	8.1	8.2	8.2	8.3	8.2	8.2
28	7.8	8.1	8.2	8.2	8.3	8.1	8.2
29	7.9	8.1	8.3	8.2	8.3	8.1	8.3
30	8.0	8.2	8.3	8.3	8.3	8.1	8.3
31	8.0	8.2	8.3	8.3	8.4	8.1	8.3
32							

Old Solutions							
1819-0343	1819-0344	1819-0345	1818-0346	1819-0347	1819-0348	1819-0349	
10ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L	10 ug/L
	pH (units)						
27	7.7	7.8	7.9	7.9	7.9	7.8	7.8
28	7.7	7.8	8.0	8.0	8.1	8.0	8.0
29	7.5	7.9	8.0	8.0	7.9	7.8	7.9
30	7.6	7.8	7.8	8.0	7.8	7.8	7.8
31	7.4	7.8	7.8	8.0	7.8	7.8	7.8
32	7.6	7.8	8.0	8.0	7.7	7.7	7.7

Conductance (µS/cm)							
27	5540	1130	4160	926	361	1109	344
28	3470	1124	411	931	331	1095	349
29	3330	1118	3870	105	333	1061	517
30	4380	1127	3990	23	345	1104	321
31	3440	1116	406	923	357	1131	338
32							

Conductance (µS/cm)							
27	3330	1045	380	884	332	945	311
28	2250	1105	424	917	369	1025	355
29	3140	1113	412	910	353	1061	325
30	3250	1178	439	918	382	1074	358
31	3280	1128	433	926	381	1071	355
32	3370	1300	485	899	347	1057	317

Dissolved Oxygen (mg/L) (40-100% saturation)							
27	7.3	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3	7.3
29	7.2	7.1	7.3	7.3	7.2	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3	7.3
32							

Dissolved Oxygen (mg/L) (40-100% saturation)							
27	6.5	6.5	6.5	6.0	6.5	5.9	6.4
28	6.0	6.0	5.7	5.6	5.3	5.4	5.6
29	6.9	6.0	6.2	6.0	6.0	6.2	6.1
30	5.8	6.0	5.6	5.4	5.4	5.2	5.3
31	5.8	5.8	5.6	5.0	4.8	4.8	5.0
32	6.4	6.4	6.4	6.8	6.4	5.9	6.3

Temperature (°C)							
27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24
29	24	24	24	24	24	24	24
30	24	24	24	24	24	24	24
31	24	24	24	24	24	24	24
32							

Temperature (°C)							
27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24
29	24	24	24	24	24	24	24
30	24	24	24	24	24	24	24
31	24	24	24	24	24	24	24
32	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: W

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 1819-0343 10ug/L
OAS D
* NOT Swimming Correctly, appears stressed

Replicate # <u>D</u>	Replicate # <u>B</u>	Replicate # <u>S</u>	Replicate # <u>8</u>
Fish	Fish	Fish	Fish
Length (mm)	Length (mm)	Length (mm)	Length (mm)
Normal/Abnormal	Normal/Abnormal	Normal/Abnormal	Normal/Abnormal
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

Comments

Replicate # <u>A</u>	Replicate # <u>B</u>	Replicate # <u>C</u>	Replicate # <u>D</u>
Fish	Fish	Fish	Fish
Length (mm)	Length (mm)	Length (mm)	Length (mm)
Normal/Abnormal	Normal/Abnormal	Normal/Abnormal	Normal/Abnormal
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

Comments

Reviewed By: VP Date Reviewed: 2008/12/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Test Termination

for normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
1819-
0345 10
ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	N	1	11	N	1	12	N	1	11	N
2	10	N	2	12	N	2	13	N	2	13	N
3	11	N	3	11	N	3	11	N	3	13	N
4	11	N	4	11	N	4	13	N	4	11	N
5	12	N	5	12	N	5	12	N	5	11	N
6	12	N	6	12	N	6	11	N	6	12	N
7	12	N	7	14	N	7	11	N	7	14	N
8	11	N	8	12	N	8	12	N	8	11	N
9	11	N	9	12	N	9	12	N	9	13	N
10	11	N	10	12	N	10	13	N	10	11	N
11	11	N	11	13	N	11	11	N	11	11	N
12	12	N	12	13	N	12	11	N	12	12	N
13	12	N	13	10	N	13	12	N	13	12	N
14	11	N	14	10	N	14	13	N	14	11	N
15	13	N	15	-	-	15	12	N	15	11	N

Comments

1818-
0346 10
ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	AS	1	11	N	1	11	N	1	12	N
2	11	N	2	13	N	2	12	N	2	13	N
3	11	N	3	14	N	3	10	N	3	13	N
4	13	N	4	13	N	4	10	N	4	10	N
5	10	N	5	12	N	5	12	N	5	12	N
6	11	N	6	10	N	6	9	N	6	12	N
7	12	N	7	12	N	7	12	N	7	12	N
8	8	N	8	13	N	8	12	N	8	10	N
9	12	N	9	12	N	9	13	N	9	10	N
10	12	N	10	11	N	10	11	N	10	15	N
11	9	N	11	13 mm	N	11	12	N	11	-	-
12	12	N	12	-	-	12	12	N	12	-	-
13	10	N	13	-	-	13	12	N	13	-	-
14	11	N	14	-	-	14	12	N	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: 10 Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 1819- 0347 10 ug/L	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	11	N	1	13	N	1	13	N	1	13	N
2	12	12	N	2	12	N	2	12	N	2	12	N
3	11	11	N	3	13	N	3	11	N	3	10	N
4	13	13	N	4	12	N	4	12	N	4	11	N
5	12	12	N	5	11	N	5	11	N	5	14	N
6	13	13	N	6	14	N	6	11	N	6	12	N
7	12	12	N	7	13	N	7	15	N	7	11	N
8	11	11	N	8	11	N	8	10	N	8	12	N
9	15	15	N	9	10	N	9	14	N	9	13	N
10	12	12	N	10	11	N	10	13	N	10	15	N
11	12	12	N	11	13	N	11	11	N	11	11	N
12	11	11	N	12	13	N	12	11	N	12	13	N
13	11	11	N	13	11	N	13	13	N	13	12	N
14	11	11	N	14	11	N	14	9	N	14	10	N
15	-	-	-	15	-	-	15	-	-	15	12	N

Comments

1819- 0348 10 ug/L	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	11	11	N	1	7	N	1	10	N	1	12	N
2	13	13	N	2	10	N	2	11	N	2	13	N
3	14	14	N	3	12	N	3	10	N	3	12	N
4	11	11	N	4	12	N	4	12	N	4	12	N
5	11	11	N	5	12	N	5	13	N	5	11	N
6	11	11	N	6	11	N	6	10	N	6	13	N
7	13	13	N	7	14	N	7	14	N	7	14	N
8	11	11	N	8	9	N	8	14	N	8	12	N
9	11	11	N	9	10	N	9	8	N	9	11	N
10	-	-	-	10	11	N	10	8	N	10	12	N
11	-	-	-	11	11	N	11	7	N	11	11	N
12	-	-	-	12	9	N	12	11	N	12	-	-
13	-	-	-	13	12	N	13	13	N	13	-	-
14	-	-	-	14	11	N	14	8	N	14	-	-
15	-	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed By: W Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client EC164/NAU104

Sample: 1819-0343 10 ug/L, 1819-0344 10 ug/L, 1819-0345 10 ug/L, 1819-0346 10 ug/L, 1819-0347 10 ug/L, 1819-0348 10 ug/L, 1819-0349 10 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
1819-
0349 10
ug/L

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	13	N	1	11	N	1	8	AS	1	13	N
2	11		2	13		2	9	AS	2	10	
3	11		3	13		3	12	N	3	10	
4	12		4	10		4	10		4	8	
5	12		5	13		5	11		5	10	
6	13		6	12		6	11		6	11	
7	11		7	13		7	12		7	10	
8	11		8	11		8	9		8	10	
9	12		9	10		9	12		9	9	
10	13		10	11		10	11		10	13	
11	11		11	11		11	12		11	8	
12	10		12	11		12	9		12	13	
13	11		13	11		13	12		13	11	
14	11		14	11		14	11		14	12	
15	11		15	11		15	11		15	12	

Comments

Reviewed By: W Date Reviewed: 2018/12/20

Client TEC164 Sample 10µg 32 day Organism FM Batch _____

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2018/11/29	AD	Mettler 1
Final Weight (mg):	dried pan + organisms	2018/12/18	AP	Mettler 1

* same balance must be used for initial and final weights
* for FM/HA/CT, must use scale with 0.01 mg accuracy

Replicate	Concentration 343 10µg		Concentration 344 10µg		Concentration 345 10µg		Concentration 346 10µg		Concentration 347 10µg		Concentration 348 10µg	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1021.24	1027.74	1019.57	1049.56	1021.42	1067.53	1018.18	1057.91	1017.29	1067.47	1021.96	1054.49
b	1019.53	1019.53	1017.34	1045.66	1016.44	1062.64	1019.89	1061.19	1026.30	1071.82	1024.22	1061.92
c	1016.68	1016.68	1030.25	1057.58	1011.76	1062.16	1019.88	1056.97	1022.39	1069.13	1006.43	1044.51
d	1026.76	1026.76	1020.14	1047.13	1029.89	1080.55	1022.14	1061.82	1019.13	1075.53	1026.26	1067.92
e		1027.74										

Replicate	Concentration 349 10µg											
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1022.34	1061.67										
b	1015.32	1053.89										
c	1016.99	1051.96										
d	1014.65	1056.16										
e												

Balance Calibration Check:

	Initial	Final
first pan weighed:	343 A	343 D
weight of first pan:	1021.24	1027.74
first pan after all		
other pans weighed:	1021.23	1027.70

Test Validity Met: Yes/No/NA

Results are Logical**: Yes/No

** no negative numbers, consistent values across replicates

% difference <5%: Yes/No Yes/No

$$\% \text{ difference} = \frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$$

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Reviewed By: W Date Reviewed: 2018/12/20

Pans labelled - AP

Method: FMD 32 Day ELS Client: TEC164/NAU104 Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Organism Information

Source: Aquatic Biosystems Batch: 20181109FMEs Egg Stage: Benthic Organisms Received in Good Condition: Yes/No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Fed		Sample Pre-Aeration Time	Bench Sheet Review
					AM	PM		
2018/11/09	0	1400	CB, ML	2	-	-	60 mins	LC
2018/11/10	1	1050	CB	2	-	-	60 mins	LC
2018/11/11	2	1200	ML	2	-	-	60 mins	ML
2018/11/12	3	1200	ML	2	-	-	60 mins	ML
2018/11/13	4	1120	CB	2	-	✓	60 mins	MW
2018/11/14	5	1105	CB	2	✓	✓	60 mins	AP
2018/11/15	6	1200	CB	2	✓	✓	60 mins	UF
2018/11/16	7	1100	ST	2	✓	✓	60 mins	FD
2018/11/17	8	1035	ST	2	✓	✓	60 mins	UF
2018/11/18	9	1205	ML	2	✓	✓	60 mins	ML
2018/11/19	10	1200	ML	2	✓	✓	60 mins	MW
2018/11/20	11	1250	CB	2	✓	✓	60 mins	AP
2018/11/21	12	1018	CB	2	✓	✓	60 mins	KL
2018/11/22	13	0930	CB	2	✓	✓	60 mins	KL
2018/11/22	14	1020	CB	2	✓	✓	60 mins	SS
2018/11/24	15	1000	ST	2	✓	✓	60 mins	LF
2018/11/25	16	1120	ML	2	✓	✓	60 mins	KL
2018/11/26	17	1000	KL	2	✓	✓	60 min	FD
2018/11/27	18	1405	CB	2	✓	✓	60 mins	AP
2018/11/28	19	1000	ST	2	✓	✓	60 mins	LF
2018/11/29	20	1055	CB	2	✓	✓	60 mins	AP
2018/11/30	21	1220	CB	2	✓	✓	60 mins	SS
2018/12/01	22	1140	ML	2	✓	✓	60 mins	ST
2018/12/02	23	1145	KL	2	✓	✓	60 min	AP
2018/12/03	24	1130	CB	2	✓	✓	60 mins	KL
2018/12/04	25	1115	KL	2	✓	✓	60 mins	FD
2018/12/05	26	1055	KL	2	✓	✓	60 mins	AP
2018/12/06	27	1100	CB	2	✓	✓	60 mins	AP
2018/12/07	28	1230	CB	2	✓	✓	60 mins	LF
2018/12/08	29	1050	ST	2	✓	✓	60 mins	LF
2018/12/09	30	1040	CB	2	✓	✓	60 mins	FD
2018/12/10	31	1000	CB	2	✓	✓	60 mins	ST
2018/12/11	32	1105	AP	2	✓	✓	-	UF

Reviewed By: JP

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	CTL		CTL10		CTL20		1819-0343 20 ug/L		1819-0344 20 ug/L		1819-0346 20 ug/L		1819-0348 20 ug/L	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos
a	13	2	15	0	14	1	15	0	14	1	15	0	15	0
b	12	3	11	4	14	1	15	0	15	0	14	1	15	0
c	15	0	15	0	15	0	15	0	15	0	15	0	15	0
d	12	3	15	0	13	2	14	1	14	1	15	0	15	0
e	29	0	30	0	28	2	30	0	28	2	27	3	28	2
f	30	0	29	1	29	1	30	0	29	1	26	4	29	1

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL			CTL10			CTL20			1819-0343 20 ug/L		
	Day 2			Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	13	0	15	15	0	15	14	0	15	13	2	15
b	12	0	15	11	0	15	14	0	15	15	1	15
c	15	0	15	15	0	15	15	0	15	14	1	15
d	12	0	15	15	0	15	13	0	15	13	1	15
e	30	0	15	28	0	15	28	0	15	29	1	15
f	30	0	15	29	0	15	29	0	15	28	2	15

replicate	1819-0344 20 ug/L			1819-0346 20 ug/L			1819-0348 20 ug/L		
	Day 2			Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	14	0	15	15	0	15	15	0	15
b	15	0	15	14	0	15	15	0	15
c	15	0	15	15	0	15	15	0	15
d	14	0	15	14	1	15	15	0	15
e	28	0	15	27	0	15	26	2	15
f	29	0	15	25	1	15	28	1	15

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:
1819-0344 → white precipitate on bottom of jar and H₂O surface

Reviewed By: DP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client TEC164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	13	0	2	0
b	13	0	2	0
c	14	0	1	0
d	12	0	3	0

CTL10
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	11	0	4	0
b	14	0	1	0
c	14	0	1	0
d	13	0	2	0

CTL20
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	15	0	0	0
b	14	0	1	0
c	14	0	1	0
d	14	0	1	0

1819-0343 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	9	0	5	1
b	12	0	2	1
c	7	1	5	2
d	8	0	7	0

1819-0344 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	14	0	1	0
b	13	0	2	0
c	14	0	1	0
d	14	0	1	0

1819-0346 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	14	0	1	0
b	13	0	2	0
c	15	0	0	0
d	15	0	0	0

1819-0348 20 ug/L
Day 3

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	14	0	1	0
b	14	0	1	0
c	15	0	0	0
d	15	0	0	0

CTL
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	1	0	14	0
b	2	0	13	0
c	3	0	12	0
d	1	0	14	0

CTL10
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	2	0	13	0
c	1	0	14	0
d	4	0	11	0

CTL20
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	7	0	8	0
b	0	0	15	0
c	2	0	13	0
d	1	0	14	0

1819-0343 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	14	0
b	2	0	11	2
c	0	0	12	0
d	3	0	11	1

1819-0344 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	3	0	12	0
b	5	0	10	0
c	4	0	11	0
d	0	0	14	1

1819-0346 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	2	0	13	0
b	6	0	9	0
c	1	0	14	0
d	11	0	4	0

1819-0348 20 ug/L
Day 4

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	5	0	10	0
b	9	0	9	0
c	8	0	7	0
d	2	0	13	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/10/28

Method FMD 32 Day ELS Client :164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

CTL
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15(1)	0
d	0	0	15(1)	0

CTL10
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15(1)	0
b	0	0	15	0
c	0	0	14	1
d	0	0	15	0

CTL20
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	1
c	0	0	15	0
d	0	0	15	0

1819-0343 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	7	7
b	0	0	6	7
c	0	0	7	5
d	0	0	8	6

1819-0344 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	14	1
d	0	0	14	0

1819-0346 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15	0
d	0	0	15	0

1819-0348 20 ug/L
Day 5

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	15	0
d	0	0	15	0

CTL
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	15(1)	0
d	0	0	14	1

CTL10
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15(1)	0
b	0	0	15	0
c	0	0	14	0
d	0	0	15	0

CTL20
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	0
c	0	0	15	0
d	0	0	15	0

1819-0343 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	2	5
b	0	0	2	4
c	0	0	2	5
d	0	0	3	5

1819-0344 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	14	0
d	0	0	14	0

1819-0346 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	15	0
c	0	0	13	0
d	0	0	15	0

1819-0348 20 ug/L
Day 6

	Alive Embryos	Dead Embryos	Alive Hatched	Dead Hatched
a	0	0	15	0
b	0	0	14	1
c	0	0	15	0
d	0	0	15	0

Comments/Observations

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client 164/NAU104

Sample: CTL CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 7	CTL10 Day 7	CTL20 Day 7	1819-0343 20 ug/L Day 7	1819-0344 20 ug/L Day 7	1819-0346 20 ug/L Day 7	1819-0348 20 ug/L Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(1)	15(2)	15-	0	15(1)	15	14(1)
b	15	15	14	1	15	15(2)	13
c	15(1)	14	15(1)	20(1)	14	15	15(1)
d	14	15(1)	15(1)	0	14(1)	15	14

Comments/Observations:

	CTL Day 8	CTL10 Day 8	CTL20 Day 8	1819-0343 20 ug/L Day 8	1819-0344 20 ug/L Day 8	1819-0346 20 ug/L Day 8	1819-0348 20 ug/L Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(2)	13(1)	15	0	15(1)	15	15
b	15	15	14	1	15(1)	14(1)	13
c	15(1)	14	15	20(1)	14	15	14(1)
d	14	15(1)	15(1)	0	14(1)	15	14(2)

Comments/Observations:

	CTL Day 9	CTL10 Day 9	CTL20 Day 9	1819-0343 20 ug/L Day 9	1819-0344 20 ug/L Day 9	1819-0346 20 ug/L Day 9	1819-0348 20 ug/L Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15(2)	12	15	0	11	15	15
b	15	15	14	1(1)	10	14(1)	13
c	14	14	15	20(2)	14	15	14(1)
d	14	14	15	0	13(1)	15	13(1)

Comments/Observations:
 * L1 is very small, L1 is very bent * * I very bent (1) read clumps a lot, only sight
 (2) microbial on fish

	CTL Day 10	CTL10 Day 10	CTL20 Day 10	1819-0343 20 ug/L Day 10	1819-0344 20 ug/L Day 10	1819-0346 20 ug/L Day 10	1819-0348 20 ug/L Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	12	15	0	10	15	15
b	15	15	14(1)	1(1)	10(1)	14(1)	13
c	14	14	15(1)	20(2)	14	15	14(1)
d	14	14	15(1)	0	13(1)	15	13(1)

Comments/Observations:

Reviewed By: TP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client '164/NAU104 Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 11	CTL10 Day 11	CTL20 Day 11	1819-0343 20 ug/L Day 11	1819-0344 20 ug/L Day 11	1819-0346 20 ug/L Day 11	1819-0348 20 ug/L Day 11
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	12	15	0	8	15	14
b	15	15	14	1	7	14(1)	13
c	14	14	15	1	13	15	14
d	14	14	15(1)	0	12	15	13

Comments/Observations:

	CTL Day 12	CTL10 Day 12	CTL20 Day 12	1819-0343 20 ug/L Day 12	1819-0344 20 ug/L Day 12	1819-0346 20 ug/L Day 12	1819-0348 20 ug/L Day 12
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	12	15	0	8	15	14
b	15	15	14	1	5	14(1)	13
c	14	14	15	0	13	15	14
d	14	14	15(1)	0	12	15	13

Comments/Observations:

	CTL Day 13	CTL10 Day 13	CTL20 Day 13	1819-0343 20 ug/L Day 13	1819-0344 20 ug/L Day 13	1819-0346 20 ug/L Day 13	1819-0348 20 ug/L Day 13
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	12	15	0	7*	13	14
b	15	15	14	1	5	14(1)	13
c	14	14	15	0	13(1)*	15	13
d	14	14	15(1)	0	12	15	13

Comments/Observations: *microbial growth

	CTL Day 14	CTL10 Day 14	CTL20 Day 14	1819-0343 20 ug/L Day 14	1819-0344 20 ug/L Day 14	1819-0346 20 ug/L Day 14	1819-0348 20 ug/L Day 14
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13	14
b	15	15	14	1	5	14(1)	13
c	14	14	15	0	12*	15	13
d	14	14	15(1)	0	12	15	13

Comments/Observations: *microbial growth

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client :164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 15	CTL10 Day 15	CTL20 Day 15	1819-0343 20 ug/L Day 15	1819-0344 20 ug/L Day 15	1819-0346 20 ug/L Day 15	1819-0348 20 ug/L Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(3)	14
b	15	15	14	0	5	14(3)	13(3)
c	14	14	15	0	12	15	13
d	14	14	15(0)	0	12	15	13(1)

Comments/Observations:

	CTL Day 16	CTL10 Day 16	CTL20 Day 16	1819-0343 20 ug/L Day 16	1819-0344 20 ug/L Day 16	1819-0346 20 ug/L Day 16	1819-0348 20 ug/L Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(3)	14
b	15	15	14	0	5	13	13(2)
c	14	14	15	0	12	15	13
d	14(2)	14	15(1)	0	12	15	13

Comments/Observations:

	CTL Day 17	CTL10 Day 17	CTL20 Day 17	1819-0343 20 ug/L Day 17	1819-0344 20 ug/L Day 17	1819-0346 20 ug/L Day 17	1819-0348 20 ug/L Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(3)	14
b	15	15	14	1	5	13	13(2)
c	14	14	15	0	12	15	13
d	14(1)	14	15(1)	0	12	15	13

Comments/Observations:

	CTL Day 18	CTL10 Day 18	CTL20 Day 18	1819-0343 20 ug/L Day 18	1819-0344 20 ug/L Day 18	1819-0346 20 ug/L Day 18	1819-0348 20 ug/L Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13(1)
c	14(1)	14	15	0	12	15	13
d	14(1)	14	14	0	12	15	13

Comments/Observations:

Reviewed By: TP

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS Client 164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 19	CTL10 Day 19	CTL20 Day 19	1819-0343 20 ug/L Day 19	1819-0344 20 ug/L Day 19	1819-0346 20 ug/L Day 19	1819-0348 20 ug/L Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13(0)
c	14(1)	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 20	CTL10 Day 20	CTL20 Day 20	1819-0343 20 ug/L Day 20	1819-0344 20 ug/L Day 20	1819-0346 20 ug/L Day 20	1819-0348 20 ug/L Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13
c	13	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 21	CTL10 Day 21	CTL20 Day 21	1819-0343 20 ug/L Day 21	1819-0344 20 ug/L Day 21	1819-0346 20 ug/L Day 21	1819-0348 20 ug/L Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13
c	12	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 22	CTL10 Day 22	CTL20 Day 22	1819-0343 20 ug/L Day 22	1819-0344 20 ug/L Day 22	1819-0346 20 ug/L Day 22	1819-0348 20 ug/L Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13
c	12	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client 164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 23	CTL10 Day 23	CTL20 Day 23	1819-0343 20 ug/L Day 23	1819-0344 20 ug/L Day 23	1819-0346 20 ug/L Day 23	1819-0348 20 ug/L Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14	12	15	0	7	13(1)	14
b	15	15	14	1	5	13	13
c	11	14	15	6	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 24	CTL10 Day 24	CTL20 Day 24	1819-0343 20 ug/L Day 24	1819-0344 20 ug/L Day 24	1819-0346 20 ug/L Day 24	1819-0348 20 ug/L Day 24
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	15	0	7	13	14
b	15	15	14	1	5	13	13
c	11	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 25	CTL10 Day 25	CTL20 Day 25	1819-0343 20 ug/L Day 25	1819-0344 20 ug/L Day 25	1819-0346 20 ug/L Day 25	1819-0348 20 ug/L Day 25
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12*	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	6	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations: *Perd ingills, tried to blow it off

	CTL Day 26	CTL10 Day 26	CTL20 Day 26	1819-0343 20 ug/L Day 26	1819-0344 20 ug/L Day 26	1819-0346 20 ug/L Day 26	1819-0348 20 ug/L Day 26
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12(1)	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client :164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL Day 27	CTL10 Day 27	CTL20 Day 27	1819-0343 20 ug/L Day 27	1819-0344 20 ug/L Day 27	1819-0346 20 ug/L Day 27	1819-0348 20 ug/L Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 28	CTL10 Day 28	CTL20 Day 28	1819-0343 20 ug/L Day 28	1819-0344 20 ug/L Day 28	1819-0346 20 ug/L Day 28	1819-0348 20 ug/L Day 28
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 29	CTL10 Day 29	CTL20 Day 29	1819-0343 20 ug/L Day 29	1819-0344 20 ug/L Day 29	1819-0346 20 ug/L Day 29	1819-0348 20 ug/L Day 29
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12(1)	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL Day 30	CTL10 Day 30	CTL20 Day 30	1819-0343 20 ug/L Day 30	1819-0344 20 ug/L Day 30	1819-0346 20 ug/L Day 30	1819-0348 20 ug/L Day 30
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	11	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

Reviewed By: DP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client 164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Number of Alive Embryos and Hatched Organisms

	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	11	15	0	7	13	14
b	15	15	14	1	5	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	11	15	0	7	13	14
b	15	15	14	1	3	13	13
c	10	14	15	0	12	15	13
d	13	14	14	0	12	15	13

Comments/Observations:

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS

Client TEC164/NAU104

CTL CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L
Sample 1819-0346 20 ug/L, 1819-0348 20 ug/L

New Solutions							
Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
	pH (units)						
0	8.2	8.2	8.2	8.1	8.3	8.3	8.3
1	8.0	8.0	8.2	7.9	8.1	8.2	8.2
2	8.2	8.2	8.2	8.0	8.1	8.0	8.1
3	8.2	8.2	8.2	8.0	8.1	8.2	8.1
4	8.2	8.2	8.2	7.9	8.1	8.4	8.2
5	8.2	8.2	8.2	7.9	8.0	8.2	8.1
6	8.3	8.3	8.2	7.9	8.1	8.4	8.1
7	8.1	8.2	8.3	7.9	8.1	8.3	8.2
8	8.3	8.3	8.3	7.9	8.1	8.2	8.1

Old Solutions							
Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
	pH (units)						
0							
1	8.1	8.2	8.2	7.9	8.1	8.4	8.3
2	8.0	8.1	8.1	7.7	7.8	8.2	8.2
3	7.8	7.9	8.0	7.7	7.8	8.1	8.1
4	8.2	8.2	8.2	7.9	8.0	8.3	8.1
5	8.1	8.1	8.1	7.7	8.0	8.2	8.1
6	7.9	7.9	7.9	7.6	7.9	8.0	8.1
7	8.0	8.1	8.1	7.7	8.0	8.2	8.1
8	7.8	7.9	7.9	7.6	7.8	8.1	8.0

Conductance (µS/cm)							
0	3166	411	404	3270	1083	924	934
1	407	413	388	3230	1078	849	903
2	264	407	324	3200	1078	808	808
3	319	397	302	3200	1079	881	899
4	884	397	402	3100	1069	834	891
5	292	373	378	3240	100	8528	846
6	311	407	411	3280	978	799	999
7	324	374	408	308	984	804	1000
8	390	381	391	3070	981	806	1000

Conductance (µS/cm)							
0							
1	406	439	426	2980	1157	935	923
2	313	424	416	3010	1183	951	940
3	385	411	402	2820	1180	844	935
4	373	397	392	2930	1018	874	854
5	367	382	379	2760	961	791	796
6	316	383	340	2800	1002	873	848
7	367	406	413	2810	970	784	901
8	390	407	414	2830	967	790	947

Dissolved Oxygen (mg/L) (40-100% saturation)							
0	7.3	7.3	7.3	7.3	7.3	7.3	7.2
1	7.3	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3	7.3

Dissolved Oxygen (mg/L) (40-100% saturation)							
0							
1	7.0	7.1	7.1	7.2	7.3	7.2	7.2
2	7.3	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3
5	6.9	6.8	6.8	6.8	6.9	7.0	7.0
6	6.8	6.7	6.6	6.7	6.4	6.3	6.5
7	6.2	7.1	6.8	6.7	6.6	6.9	6.9
8	6.4	6.8	6.6	6.5	6.4	6.4	6.6

Temperature (°C)							
0	24	24	24	24	24	24	24
1	24	24	24	24	24	24	24
2	24	24	24	24	24	24	24
3	24	24	24	24	24	24	24
4	24	24	24	24	24	24	24
5	24	24	24	24	24	24	24
6	24	24	24	24	24	24	24
7	24	24	24	24	24	24	24
8	24	24	24	24	24	24	24

Temperature (°C)							
0							
1	24	24	24	24	24	24	24
2	24	24	24	24	24	24	24
3	24	24	24	24	24	24	24
4	24	24	24	24	24	24	24
5	24	24	24	24	24	24	24
6	24	24	24	24	24	24	24
7	24	24	24	24	24	24	24
8	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: OP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample CTL CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L,
1819-0346 20 ug/L, 1819-0348 20 ug/L
1819-0348 10 ug/L, 1819-0349 10 ug/L

New Solutions

Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
	pH (units)						
9	8.1	8.2	8.2	7.8	8.0	8.2	8.1
10	7.9	7.8	7.9	7.8	7.9	8.1	8.1
11	8.2	7.8	8.1	7.8	8.0	8.2	8.1
12	8.1	8.1	8.1	7.9	8.0	8.2	8.1
13	8.0	8.0	8.0	7.8	7.9	8.1	8.0
14	8.0	8.0	8.1	7.8	7.9	8.1	8.1
15	8.3	8.3	8.3	7.6	7.9	8.2	8.1
16	8.1	8.1	8.1	7.8	8.0	8.2	8.1
17	8.0	8.1	8.1	7.8	8.0	8.2	8.1

Old Solutions

Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
	pH (units)						
9	7.9	7.9	7.9	7.7	7.8	8.0	8.0
10	7.9	7.8	7.9	7.6	7.8	8.1	8.0
11	7.8	7.8	7.8	7.6	7.9	8.1	7.9
12	7.9	7.8	8.0	7.7	7.9	8.2	8.0
13	7.7	7.8	7.8	7.6	7.8	8.0	7.8
14	7.7	7.8	7.8	7.5	7.8	8.1	8.0
15	7.6	7.8	7.8	7.7	7.9	8.1	8.1
16	8.0	7.8	7.8	7.6	7.8	8.1	8.0
17	7.7	7.5	7.6	7.5	7.8	8.0	7.9

Conductance (µS/cm)

4972

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	416	384	384	360	385	377	393
10	387	388	371	380	388	388	385
11	385	408	413	3050	2978	298	485
12	428	439	450	3200	1080	995	1112
13	390	433	438	3180	1108	955	1045
14	386	419	427	3510	1107	971	1040
15	387	403	410	3510	1112	916	1036
16	387	404	413	3550	1105	941	1031
17	395	451	410	3340	1000	800	940

Conductance (µS/cm)

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	383	401	404	2660	1078	811	1001
10	379	388	371	280	1173	881	1000
11	377	388	364	2920	1061	807	930
12	438	459	465	2130	1085	904	1074
13	422	457	464	3220	1069	886	1066
14	416	419	402	3250	1121	962	1047
15	431	451	468	3240	1187	910	1036
16	427	374	440	325	1147	918	1083
17	400	379	424	3220	1073	951	1026

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	7.3	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3	7.3
12	7.0	7.1	7.0	7.3	7.3	7.3	7.3
13	7.1	7.1	7.2	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3	7.3
15	7.2	7.2	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3	7.3

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	6.4	6.5	6.4	6.7	6.8	6.6	6.3
10	6.0	6.8	6.8	6.7	6.8	6.5	6.4
11	6.0	6.5	6.1	6.6	6.6	6.4	6.5
12	6.5	6.3	6.0	6.3	6.4	6.2	6.1
13	6.5	6.2	6.1	6.6	6.6	6.7	6.5
14	5.5	5.6	5.6	5.7	5.8	5.8	5.8
15	6.7	6.7	6.4	6.8	6.7	6.7	6.3
16	6.1	6.1	6.1	6.5	6.5	6.4	6.0
17	6.0	5.5	5.4	6.4	6.4	6.4	6.0

Temperature (°C)

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

Temperature (°C)

Day	CTL	CTL10	CTL20	1819-0343	1819-0344	1819-0346	1819-0348
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: OP

Date Reviewed: 2018/12/20

Method FMD 32 Day ELS

Client TEC164/NAU104

Sample CTL CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

New Solutions							
Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
pH (units)							
18	8.1	8.1	8.1	7.9	8.1	8.2	8.1
19	8.0	8.1	8.1	7.8	8.0	8.1	8.1
20	8.0	8.0	8.1	7.8	7.9	8.1	8.0
21	8.0	8.1	8.2	7.9	7.9	8.1	8.2
22	8.1	8.2	8.2	8.0	8.0	8.4	8.2
23	8.1	8.2	8.2	8.0	8.1	8.3	8.2
24	8.1	8.1	8.2	7.8	8.1	8.2	8.1
25	8.0	8.1	8.1	8.0	8.0	8.2	8.1
26	8.1	8.3	8.2	8.0	8.2	8.3	8.2
Conductance (µS/cm)							
18	401	433	444	349	1085	919	1024
19	295	443	43	3560	1134	871	1084
20	208	425	420	3500	1120	911	984
21	459	420	418	3490	1269	1098	984
22	466	431	431	3470	1209	991	997
23	447	453	463	3460	1178	978	991
24	440	453	460	3470	1114	927	978
25	444	423	430	3420	1121	970	982
26	423	422	425	3530	1103	928	986
Dissolved Oxygen (mg/L) (40-100% saturation)							
18	7.1	7.1	7.2	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.4	7.3
24	7.3	7.3	7.3	7.3	7.3	7.3	7.3
25	7.5	7.4	7.3	7.3	7.0	7.5	7.6
26	7.5	7.4	7.3	7.3	7.7	7.6	7.5
Temperature (°C)							
18	25	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

Old Solutions							
Conc. (%)	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
Day	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L
pH (units)							
18	7.7	7.8	7.8	7.5	7.8	7.9	7.9
19	7.6	7.7	7.7	7.5	7.8	8.0	7.9
20	7.5	7.6	7.6	7.5	7.8	8.0	7.9
21	7.8	7.8	7.8	7.5	7.8	8.1	8.0
22	7.8	7.8	7.7	7.5	7.8	8.1	8.0
23	7.8	7.8	7.7	7.5	7.6	8.1	7.9
24	7.7	7.7	7.7	7.4	7.7	8.0	7.9
25	7.8	7.5	7.5	7.4	7.8	7.9	7.8
26	7.8	7.6	7.5	7.4	7.0	8.0	7.9
Conductance (µS/cm)							
18	416	467	464	324	1098	918	976
19	417	469	465	3220	1113	897	989
20	411	468	447	3310	1130	901	1094
21	451	452	443	3270	1089	963	1034
22	462	442	435	3210	1135	985	1028
23	500	526	529	3130	1255	998	1624
24	453	471	479	3280	1150	902	989
25	521	471	475	3280	1228	969	1001
26	484	501	449	3100	1221	971	1008
Dissolved Oxygen (mg/L) (40-100% saturation)							
18	5.8	5.6	5.5	5.9	5.5	6.0	5.9
19	5.9	5.6	5.4	6.4	6.3	6.0	6.1
20	5.4	5.3	5.1	6.2	6.8	6.5	5.4
21	6.1	6.1	6.1	6.2	6.6	6.1	5.8
22	6.2	6.2	6.0	6.0	6.0	6.2	5.8
23	5.4	5.4	5.4	5.4	5.4	5.7	5.5
24	5.5	5.2	5.0	5.9	6.6	6.2	5.6
25	5.1	5.1	5.0	5.4	5.4	5.4	5.1
26	5.9	5.1	5.0	4.9	5.0	5.3	5.1
Temperature (°C)							
18	24	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client TEC164/NAU104

Sample CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L,
1819-0346 20 ug/L, 1819-0348 20 ug/L

Conc. (%) Day	New Solutions							
	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L	
	pH (units)							
27	8.2	8.2	8.1	7.9	8.2	8.2	8.0	
28	8.1	8.2	8.2	7.9	8.2	8.2	8.1	
29	8.1	8.2	8.2	7.9	8.2	8.3	8.1	
30	8.1	8.2	8.2	7.9	8.2	8.3	8.1	
31	8.2	8.2	8.2	8.0	8.2	8.3	8.1	
32								

Conc. (%) Day	Old Solutions							
	CTL	CTL10	CTL20	1819-0343 20 ug/L	1819-0344 20 ug/L	1819-0346 20 ug/L	1819-0348 20 ug/L	
	pH (units)							
27	7.7	7.6	7.6	7.4	7.7	8.0	7.9	
28	7.7	7.7	7.9	7.5	7.8	8.1	8.0	
29	7.4	7.5	7.6	7.5	7.9	7.8	7.8	
30	7.6	7.6	7.5	7.4	7.8	8.0	7.8	
31	7.7	7.7	7.6	7.5	7.8	8.0	7.8	
32	7.5	7.6	7.6	7.4	7.8	7.8	7.7	

Day	Conductance (µS/cm)							
	27	404	423	427	370	1143	945	1104
28	493	493	486	357	1140	950	1114	
29	457	457	430	350	1118	955	1130	
30	443	432	430	370	1130	944	1138	
31	421	421	430	350	1119	945	1137	
32								

Day	Conductance (µS/cm)							
	27	409	433	445	325	1090	888	952
28	408	438	450	329	1117	938	1047	
29	455	475	477	326	1108	973	1088	
30	467	463	461	330	1129	948	1118	
31	466	459	463	326	1128	930	1112	
32	413	395	485	336	1100	973	1114	

Day	Dissolved Oxygen (mg/L) (40-100% saturation)							
	27	7.3	7.3	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
29	7.2	7.3	7.3	7.1	7.1	7.2	7.0	
30	7.3	7.2	7.3	7.3	7.3	7.3	7.3	
31	7.0	7.2	7.3	7.3	7.3	7.3	7.3	
32								

Day	Dissolved Oxygen (mg/L) (40-100% saturation)							
	27	5.0	5.2	5.1	5.6	6.3	6.5	6.1
28	5.2	5.2	5.0	5.2	5.8	5.5	4.5	
29	5.9	5.8	5.3	6.4	6.4	6.1	6.0	
30	5.0	5.1	4.9	5.4	5.8	5.5	5.5	
31	5.6	5.4	5.1	5.6	5.6	5.4	5.5	
32	6.5	6.4	6.3	6.3	6.5	6.3	6.3	

Day	Temperature (°C)							
	27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24	
29	25	24	24	24	24	24	25	
30	24	24	24	24	24	24	24	
31	25	24	24	24	24	24	24	
32								

Day	Temperature (°C)							
	27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24	
29	24	24	24	24	24	24	24	
30	24	24	24	24	24	24	24	
31	24	24	24	24	24	24	24	
32	24	24	24	24	24	24	24	

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.5 to 7.2 mg/L at 25°C
4.3 to 7.1 mg/L at 26°C

Comments:

Reviewed By: JP

Date Reviewed: 2018/12/29

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: **H=**head, **O=**oral, **E=**eyes, **G=**gills, **F=**fins, **S=**spine

Conc. _____

CTL

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	13	N	1	12	N	1	13	N	1	10	N
2	10		2	12		2	14		2	11	
3	8		3	12		3	14		3	10	
4	9		4	11		4	10		4	11	
5	9		5	10		5	11		5	12	
6	13		6	11		6	13		6	12	
7	10		7	13		7	12		7	13	
8	12		8	11		8	9		8	13	
9	12		9	11		9	8		9	10	
10	11		10	11		10	13		10	12	
11	11		11	12		11	11		11	11	
12	12		12	13		12	11		12	13	
13	13		13	11		13	11		13	10	
14	-		14	10		14	11		14	-	
15	-		15	11		15	11		15	-	

Comments

CTL10

Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>D</u>		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
1	12	N	1	11	N	1	9	N	1	10	N
2	12		2	12		2	8		2	9	
3	13		3	10		3	12		3	11	
4	10		4	11		4	13		4	10	
5	14		5	12		5	13		5	11	
6	14		6	12		6	12		6	11	
7	10		7	12		7	13		7	13	
8	14		8	11		8	13		8	13	
9	12		9	11		9	12		9	13	
10	11		10	11		10	12		10	11	
11	13		11	11		11	11		11	12	
12	-		12	9		12	12		12	12	
13	-		13	11		13	11		13	11	
14	-		14	9		14	10		14	10	
15	-		15	10		15	-		15	-	

Comments

Reviewed By: JP Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

CTL20

Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1	11	N	B	1	11	N	C	1	10	N	D	1	11	N
A	2	12		B	2	11		C	2	12		D	2	11	
A	3	11		B	3	12		C	3	12		D	3	12	
A	4	12		B	4	14		C	4	10		D	4	10	
A	5	10		B	5	12		C	5	11		D	5	11	
A	6	12		B	6	11		C	6	10		D	6	13	
A	7	12		B	7	10		C	7	12		D	7	12	
A	8	9		B	8	3		C	8	10		D	8	10	
A	9	11		B	9	12		C	9	11		D	9	12	
A	10	11		B	10	13		C	10	13		D	10	13	
A	11	11		B	11	12		C	11	10		D	11	10	
A	12	12		B	12	12		C	12	11		D	12	12	
A	13	10		B	13	11		C	13	13		D	13	10	
A	14	11		B	14	12		C	14	12		D	14	10	
A	15	10		B	15	-		C	15	10		D	15	-	

Comments

1819-0343 20 ug/L

Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1			B	1	14	N	E	1			D	1		
A	2			B	2	-		E	2			D	2		
A	3			B	3			E	3			D	3		
A	4			B	4			E	4			D	4		
A	5			B	5			E	5			D	5		
A	6			B	6			E	6			D	6		
A	7			B	7			E	7			D	7		
A	8			B	8			E	8			D	8		
A	9			B	9			E	9			D	9		
A	10			B	10			E	10			D	10		
A	11			B	11			E	11			D	11		
A	12			B	12			E	12			D	12		
A	13			B	13			E	13			D	13		
A	14			B	14			E	14			D	14		
A	15			B	15			E	15			D	15		

Comments

Reviewed By: JP Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL, CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L,
1819-0346 20 ug/L, 1819-0348 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. 1819-0344 20 ug/L

Replicate #	A			B			C			D		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	
1	13	N	1	13	N	1	9	N	1	10	N	
2	10		2	12		2	9		2	10		
3	12		3	11		3	9		3	10		
4	15		4	13		4	10		4	10		
5	11		5	11		5	10		5	10		
6	11		6	-		6	10		6	10		
7	12		7	11		7	11		7	12		
8	12		8	11		8	11		8	12		
9	11		9	11		9	10		9	13		
10	11		10	11		10	12		10	10		
11	11		11	11		11	11		11	11		
12	11		12	11		12	11		12	9		
13	11		13	11		13	11		13	11		
14	11		14	11		14	11		14	11		
15	11		15	11		15	11		15	11		

Comments

Conc. 1819-0346 20 ug/L

Replicate #	A			B			C			D		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	
1	13	N	1	10	N	1	10	N	1	9	N	
2	15		2	9		2	10		2	10		
3	10		3	12		3	9		3	12		
4	10		4	11		4	12		4	11		
5	10		5	11		5	12		5	11		
6	10		6	11		6	10		6	11		
7	10		7	11		7	12		7	11		
8	10		8	11		8	13		8	11		
9	10		9	10		9	12		9	10		
10	10		10	11		10	9		10	11		
11	11		11	11		11	10		11	9		
12	11		12	11		12	10		12	9		
13	11		13	11		13	11		13	9		
14	11		14	11		14	10		14	10		
15	11		15	11		15	11		15	12		

Comments

Reviewed By: JP Date Reviewed: 2018/12/28

Method FMD 32 Day ELS Client EC164/NAU104

Sample: CTL CTL 10, CTL 20, 1819-0343 20 ug/L, 1819-0344 20 ug/L, 1819-0346 20 ug/L, 1819-0348 20 ug/L

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.
1819-0348 20 ug/L

Replicate #	A			B			C			D		
Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	
1	6	N	1	9	N	1	13	N	1	13	N	
2	10	↓	2	8	↓	2	9	↓	2	13	↓	
3	10	↓	3	9	↓	3	11	↓	3	12	↓	
4	11	↓	4	13	↓	4	10	↓	4	11	↓	
5	9	↓	5	12	↓	5	13	↓	5	10	↓	
6	11	↓	6	10	↓	6	9	↓	6	11	↓	
7	9	↓	7	13	↓	7	9	↓	7	9	↓	
8	10	↓	8	10	↓	8	11	↓	8	12	↓	
9	12	↓	9	8	↓	9	12	↓	9	12	↓	
10	13	↓	10	8	↓	10	13	↓	10	13	↓	
11	13	↓	11	11	↓	11	13	↓	11	9	↓	
12	12	↓	12	12	↓	12	11	↓	12	8	↓	
13	12	↓	13	12	↓	13	10	↓	13	12	↓	
14	10	↓	14	-	-	14	-	-	14	-	-	
15	-	-	15	-	-	15	-	-	15	-	-	

Comments

Reviewed By: JP Date Reviewed: 2018/12/28

Client TEC164 Sample 32 day Organism FM Batch 20181108^{FM} ELS

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2018/11/29	AD	Mettler 1
Final Weight (mg):	dried pan + organisms	2018/12/18	GF	Mettler 1

* same balance must be used for initial and final weights
* for FM/HA/CT, must use scale with 0.01 mg accuracy

Concentration

Replicate	CTL		CTL 10		CTL 20		343 20mg		344 20mg		346 20mg	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1024.71	1074.50	1020.24	1070.66	1025.89	1072.30	1008.55	1008.55	1014.99	1044.54	1014.59	1053.02
b	1004.72	1052.40	1023.16	1069.41	1027.27	1076.99	1027.75	1036.50	1017.50	1045.53	1014.41	1053.35
c	1005.56	1050.08	1028.24	1076.92	1025.97	1075.46	1034.19	1034.19	1026.88	1053.98	1014.12	1053.28
d	1027.49	1079.67	1026.33	1076.96	1028.16	1076.21	1026.78	1026.78	1023.73	1053.92	1019.25	1056.92
e												

Concentration

Replicate	348 20mg											
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1032.55	1074.72										
b	1030.72	1070.67										
c	1018.48	1061.32										
d	1022.89	1070.36										
e												

Balance Calibration Check:

	Initial	Final
first pan weighed:	CTL A	CTL UPTA
weight of first pan:	1024.71	1074.47
first pan after all		
other pans weighed:	1024.74	1074.51

Test Validity Met: Yes/No/NA

Results are Logical**: Yes/No

** no negative numbers, consistent values across replicates

% difference <5%: Yes/No Yes/No

$$\% \text{ difference} = \frac{(\text{initial weight} - \text{reweight})}{(\text{initial weight} + \text{reweight}) / 2} \times 100\%$$

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Reviewed By: JP Date Reviewed: 2018/12/28

CETIS Summary Report

Report Date: 05 Mar-19 13:01 (p 1 of 52)

Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-5223-4443	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h		
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h		
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	MC_MC2 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	Lab Control passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	Cu Ctrl 20µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_UFR1 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	GH_ER2 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	CM_MC1 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_FRCP1 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	GH_FR1 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_FRABCH passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_FRCP120µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_FRABCH 20 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	GH_FR1 20µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	CM_MC2 20 µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	FR_UFR1 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	Cu Ctrl 10µg/L passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	GH_ER2 passed hatched rate	1
08-0759-0010	Hatched Rate	Fisher Exact Test	1.0000	MC_MC2 passed hatched rate	1

Handwritten signature: Emma Marus

CETIS Summary Report

Report Date: 05 Mar-19 13:01 (p 49 of 52)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	LC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
Cu Ctrl 10µg/L	N	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
Cu Ctrl 20µg/L	MC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_UFR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_ER2		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	1.67%
FR_FRCP1		4	0.9500	0.8484	1.0000	0.8667	1.0000	0.0319	0.0638	6.72%	5.00%
GH_FR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
MC_MC2		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	1.67%
FR_FRABCH		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	1.67%
FR_FRCP120µg/L		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	1.67%
CM_MC2 20 µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_FR1 20µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_FRABCH 20		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	LC	4	11.43	10.78	12.09	11.08	12	0.2043	0.4087	3.57%	0.00%
Cu Ctrl 10µg/L	N	4	11.34	10.39	12.29	10.7	12.09	0.2987	0.5974	5.27%	0.83%
Cu Ctrl 20µg/L	MC	4	11.25	10.8	11.69	11	11.64	0.1386	0.2772	2.46%	1.66%
FR_UFR1		4	11.67	11.32	12.03	11.4	11.9	0.1109	0.2217	1.90%	-2.10%
GH_ER2		4	11.98	11.81	12.16	11.86	12.08	0.05393	0.1079	0.90%	-4.81%
CM_MC1		4	11.16	10.21	12.12	10.62	11.7	0.3005	0.6009	5.38%	2.36%
FR_FRCP1		1	7			7	7	0	0	0.00%	38.78%
GH_FR1		4	11.59	10.76	12.42	10.93	12.1	0.261	0.522	4.50%	-1.36%
MC_MC2		4	11.3	10.21	12.4	10.64	12	0.3435	0.687	6.08%	1.16%
FR_FRABCH		4	11.81	10.31	13.31	11	13.17	0.4708	0.9415	7.97%	-3.28%
FR_FRCP120µg/L		1	14			14	14	0	0	0.00%	-22.43%
CM_MC2 20 µg/L		4	10.8	10.2	11.39	10.39	11.15	0.1875	0.375	3.47%	5.57%
GH_FR1 20µg/L		4	10.58	10.38	10.78	10.47	10.69	0.06351	0.127	1.20%	7.48%
FR_FRABCH 20		4	11.13	9.234	13.02	9.92	12.4	0.5951	1.19	10.70%	2.69%

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	LC	4	3.226	2.904	3.548	2.968	3.439	0.1011	0.2023	6.27%	0.00%
Cu Ctrl 10µg/L	N	4	3.266	3.051	3.481	3.083	3.375	0.0676	0.1352	4.14%	-1.25%
Cu Ctrl 20µg/L	MC	4	3.234	3.091	3.378	3.121	3.315	0.04524	0.09048	2.80%	-0.26%
FR_UFR1		4	3.223	2.955	3.491	3.074	3.377	0.08428	0.1686	5.23%	0.10%
GH_ER2		4	3.314	2.797	3.831	3.035	3.76	0.1626	0.3251	9.81%	-2.72%
CM_MC1		4	2.573	2.285	2.861	2.331	2.767	0.09063	0.1813	7.04%	20.25%
FR_FRCP1		4	0.01633	-0.03565	0.06831	0	0.06533	0.01633	0.03267	200.00%	99.49%
GH_FR1		4	2.635	2.491	2.778	2.539	2.753	0.04513	0.09026	3.43%	18.33%
MC_MC2		4	2.5	2.101	2.898	2.169	2.777	0.1253	0.2506	10.03%	22.52%
FR_FRABCH		4	1.877	1.734	2.02	1.799	1.999	0.04486	0.08971	4.78%	41.81%
FR_FRCP120µg/L		4	0.1458	-0.3183	0.6099	0	0.5833	0.1458	0.2917	200.00%	95.48%
CM_MC2 20 µg/L		4	2.874	2.539	3.209	2.663	3.165	0.1053	0.2106	7.33%	10.92%
GH_FR1 20µg/L		4	2.57	2.5	2.64	2.511	2.611	0.02205	0.0441	1.72%	20.34%
FR_FRABCH 20		4	1.915	1.765	2.064	1.807	2.013	0.04695	0.09389	4.90%	40.66%

CETIS Summary Report

Report Date: 07 Feb-19 11:19 (p 44 of 46)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	LC	4	0.8500	0.6313	1.0000	0.6667	1.0000	0.0687	0.1374	16.17%	0.00%
Cu Ctrf 10µg/L	N	4	0.9000	0.7163	1.0000	0.7333	1.0000	0.0577	0.1155	12.83%	-5.88%
Cu Ctrf 20µg/L	MC	4	0.9667	0.9054	1.0000	0.9333	1.0000	0.0193	0.0385	3.98%	-13.73%
FR_UFR1		4	0.9833	0.9303	1.0000	0.9333	1.0000	0.0167	0.0333	3.39%	-15.69%
GH_ER2		4	0.9333	0.8467	1.0000	0.8667	1.0000	0.0272	0.0544	5.83%	-9.80%
CM_MC1		4	0.8333	0.6125	1.0000	0.6667	1.0000	0.0694	0.1388	16.65%	1.96%
FR_FRCP1		4	0.0167	0.0000	0.0697	0.0000	0.0667	0.0167	0.0333	200.00%	98.04%
GH_FR1		4	0.8000	0.5550	1.0000	0.6667	0.9333	0.0770	0.1540	19.25%	5.88%
MC_MC2		4	0.8000	0.5402	1.0000	0.6000	0.9333	0.0817	0.1633	20.41%	5.88%
FR_FRABCH		4	0.5167	0.3355	0.6978	0.4000	0.6667	0.0569	0.1139	22.04%	39.22%
FR_FRCP120µg/L		4	0.0167	0.0000	0.0697	0.0000	0.0667	0.0167	0.0333	200.00%	98.04%
CM_MC2 20 µg/L		4	0.8833	0.8303	0.9364	0.8667	0.9333	0.0167	0.0333	3.77%	-3.92%
GH_FR1 20µg/L		4	0.9333	0.8108	1.0000	0.8667	1.0000	0.0385	0.0770	8.25%	-9.80%
FR_FRABCH 20		4	0.6000	0.2225	0.9775	0.3333	0.8000	0.1186	0.2373	39.54%	29.41%

CETIS Summary Report

Report Date: 05 Mar-19 13:01 (p 51 of 52)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 10µg/L	N	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L	MC	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000
CM_MC1		0.9333	1.0000	1.0000	1.0000
FR_FRCP1		0.8667	1.0000	1.0000	0.9333
GH_FR1		1.0000	1.0000	1.0000	1.0000
MC_MC2		1.0000	1.0000	1.0000	0.9333
FR_FRABCH		1.0000	1.0000	1.0000	0.9333
FR_FRCP120µg/L		1.0000	1.0000	0.9333	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	11.08	11.2	12	11.46
Cu Ctrl 10µg/L	N	12.09	10.7	11.5	11.07
Cu Ctrl 20µg/L	MC	11	11.64	11.13	11.21
FR_UFR1		11.4	11.6	11.9	11.8
GH_ER2		11.93	12.08	11.86	12.07
CM_MC1		11.67	11.7	10.62	10.67
FR_FRCP1					7
GH_FR1		10.93	12.1	11.43	11.9
MC_MC2		11.78	10.79	10.64	12
FR_FRABCH		13.17	11.57	11.5	11
FR_FRCP120µg/L			14		
CM_MC2 20 µg/L		10.57	10.39	11.08	11.15
GH_FR1 20µg/L		10.69	10.69	10.47	10.47
FR_FRABCH 20		11.86	12.4	9.92	10.33

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	3.319	3.179	2.968	3.439
Cu Ctrl 10µg/L	N	3.361	3.083	3.245	3.375
Cu Ctrl 20µg/L	MC	3.121	3.315	3.299	3.203
FR_UFR1		3.074	3.08	3.36	3.377
GH_ER2		3.345	3.035	3.116	3.76
CM_MC1		2.622	2.571	2.331	2.767
FR_FRCP1		0	0	0	0.06533
GH_FR1		2.601	2.753	2.539	2.645
MC_MC2		2.169	2.513	2.539	2.777
FR_FRABCH		1.999	1.888	1.822	1.799
FR_FRCP120µg/L		0	0.5833	0	0
CM_MC2 20 µg/L		2.811	2.663	2.856	3.165
GH_FR1 20µg/L		2.562	2.596	2.611	2.511
FR_FRABCH 20		1.97	1.869	1.807	2.013

EW
 March 5/19

CETIS Summary Report

Report Date: 07 Feb-19 11:19 (p 46 of 46)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	0.8667	1.0000	0.6667	0.8667
Cu Ctrl 10µg/L	N	0.7333	1.0000	0.9333	0.9333
Cu Ctrl 20µg/L	MC	1.0000	0.9333	1.0000	0.9333
FR_UFR1		1.0000	0.9333	1.0000	1.0000
GH_ER2		0.9333	0.8667	0.9333	1.0000
CM_MC1		0.8000	0.6667	0.8667	1.0000
FR_FRCP1		0.0000	0.0000	0.0000	0.0667
GH_FR1		0.9333	0.6667	0.9333	0.6667
MC MC2		0.6000	0.9333	0.9333	0.7333
FR_FRABCH		0.4000	0.4667	0.5333	0.6667
FR_FRCP120µg/L		0.0000	0.0667	0.0000	0.0000
CM_MC2 20 µg/L		0.9333	0.8667	0.8667	0.8667
GH_FR1 20µg/L		0.8667	0.8667	1.0000	1.0000
FR_FRABCH 20		0.4667	0.3333	0.8000	0.8000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	15/15	15/15	15/15	15/15
Cu Ctrl 10µg/L	N	15/15	15/15	15/15	15/15
Cu Ctrl 20µg/L	MC	15/15	15/15	15/15	15/15
FR_UFR1		15/15	15/15	15/15	15/15
GH_ER2		15/15	15/15	15/15	15/15
CM_MC1		14/15	15/15	15/15	15/15
FR_FRCP1		13/15	15/15	15/15	14/15
GH_FR1		15/15	15/15	15/15	15/15
MC MC2		15/15	15/15	15/15	14/15
FR_FRABCH		15/15	15/15	15/15	14/15
FR_FRCP120µg/L		15/15	15/15	14/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20µg/L		15/15	15/15	15/15	15/15
FR_FRABCH 20		15/15	15/15	15/15	15/15

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	13/15	15/15	10/15	13/15
Cu Ctrl 10µg/L	N	11/15	15/15	14/15	14/15
Cu Ctrl 20µg/L	MC	15/15	14/15	15/15	14/15
FR_UFR1		15/15	14/15	15/15	15/15
GH_ER2		14/15	13/15	14/15	15/15
CM_MC1		12/15	10/15	13/15	15/15
FR_FRCP1		0/15	0/15	0/15	1/15
GH_FR1		14/15	10/15	14/15	10/15
MC MC2		9/15	14/15	14/15	11/15
FR_FRABCH		6/15	7/15	8/15	10/15
FR_FRCP120µg/L		0/15	1/15	0/15	0/15
CM_MC2 20 µg/L		14/15	13/15	13/15	13/15
GH_FR1 20µg/L		13/15	13/15	15/15	15/15
FR_FRABCH 20		7/15	5/15	12/15	12/15

CETIS Summary Report

Report Date: 28 Feb-19 09:43 (p 3 of 4)
 Test Code/ID: 181877181878 / 12-4924-3989

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	MC_MC2 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRABCH 20 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRABCH passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	MC_MC2 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20 µg/L passed proportion norm	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 10µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Cu Ctrl 20µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRABCH 20 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Lab Control passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	MC_MC2 passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 20µg/L passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRABCH passed proportion normal	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 20 µg/L passed proportion norm	1
03-8515-2087	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1

Proportion Normal Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	LC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
Cu Ctrl 10µg/L	N	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
Cu Ctrl 20µg/L	MC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_UFR1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_ER2		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_FR1		4	0.9821	0.9253	1.0000	0.9286	1.0000	0.0179	0.0357	3.64%	1.79%
MC_MC2		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_FRABCH		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
CM_MC2 20 µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
GH_FR1 20µg/L		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
FR_FRABCH 20		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%

CETIS Summary Report

Report Date: 28 Feb-19 09:43 (p 4 of 4)
 Test Code/ID: 181877181878 / 12-4924-3989

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 10µg/L	N	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L	MC	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000
GH_FR1		0.9286	1.0000	1.0000	1.0000
MC_MC2		1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	13/13	15/15	10/10	13/13
Cu Ctrl 10µg/L	N	11/11	15/15	14/14	14/14
Cu Ctrl 20µg/L	MC	15/15	14/14	15/15	14/14
FR_UFR1		15/15	14/14	15/15	15/15
GH_ER2		14/14	13/13	14/14	15/15
CM_MC1		12/12	10/10	13/13	15/15
GH_FR1		13/14	10/10	14/14	10/10
MC_MC2		9/9	14/14	14/14	11/11
FR_FRABCH		6/6	7/7	8/8	10/10
CM_MC2 20 µg/L		14/14	13/13	13/13	13/13
GH_FR1 20µg/L		13/13	13/13	15/15	15/15
FR_FRABCH 20		7/7	5/5	12/12	12/12

CETIS Analytical Report

Report Date: 07 Feb-19 11:07 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-8125-3292	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 07 Feb-19 11:07	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	0.9935	Exact	0.9935	Non-Significant Effect
(Cu Ctrl) (10µg/L)		GH_ER2	0.8388	Exact	0.8388	Non-Significant Effect
		CM_MC1	0.2106	Exact	0.2106	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	4.7E-26	Significant Effect
		GH_FR1	0.1002	Exact	0.1002	Non-Significant Effect
		MC_MC2	0.1002	Exact	0.1002	Non-Significant Effect
		FR_FRABCH*	0.0000	Exact	2.8E-06	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	54	6	60	0.9	0.1	-8.0%
FR_UFR1		59	1	60	0.9833	0.01667	-18.0%
GH_ER2		56	4	60	0.9333	0.06667	-12.0%
CM_MC1		50	10	60	0.8333	0.1667	0.0%
FR_FRCP1		1	59	60	0.01667	0.9833	98.0%
GH_FR1		48	12	60	0.8	0.2	4.0%
MC_MC2		48	12	60	0.8	0.2	4.0%
FR_FRABCH		31	29	60	0.5167	0.4833	38.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	0.7333	1.0000	0.9333	0.9333
FR_UFR1		1.0000	0.9333	1.0000	1.0000
GH_ER2		0.9333	0.8667	0.9333	1.0000
CM_MC1		0.8000	0.6667	0.8667	1.0000
FR_FRCP1		0.0000	0.0000	0.0000	0.0667
GH_FR1		0.9333	0.6667	0.9333	0.6667
MC_MC2		0.6000	0.9333	0.9333	0.7333
FR_FRABCH		0.4000	0.4667	0.5333	0.6667

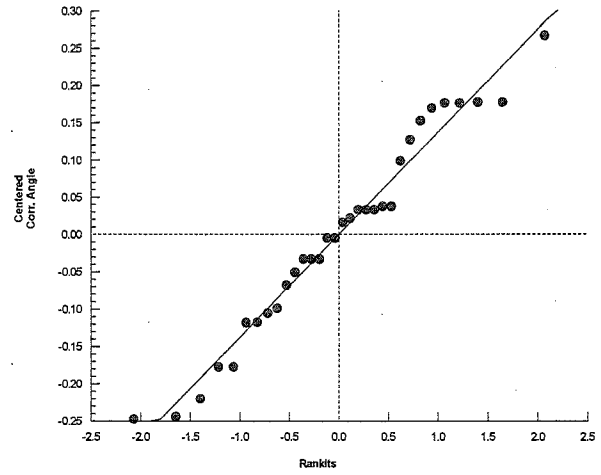
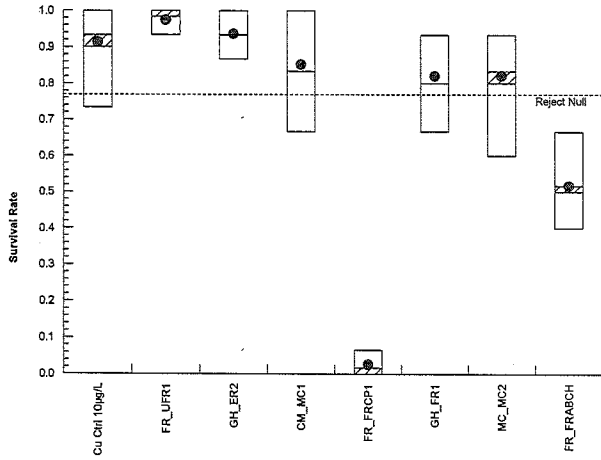
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 13-3383-1812 Endpoint: Survival Rate
Analyzed: 25 Jan-19 16:54 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 07 Feb-19 11:07 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

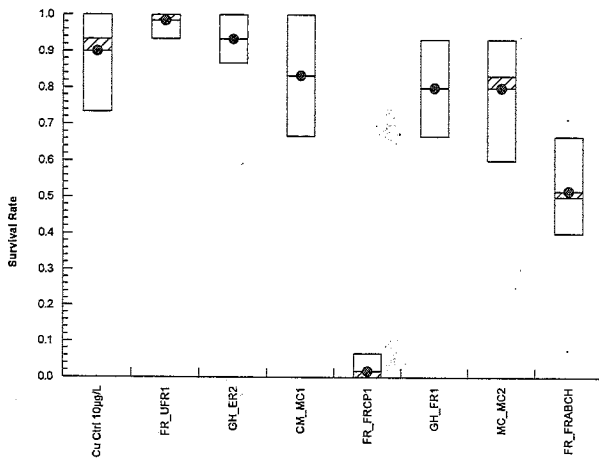
Analysis ID: 16-8125-3292 Endpoint: Survival Rate
 Analyzed: 07 Feb-19 11:07 Analysis: Single 2x2 Contingency Table

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	11/15	15/15	14/15	14/15
FR_UFR1		15/15	14/15	15/15	15/15
GH_ER2		14/15	13/15	14/15	15/15
CM_MC1		12/15	10/15	13/15	15/15
FR_FRCP1		0/15	0/15	0/15	1/15
GH_FR1		14/15	10/15	14/15	10/15
MC_MC2		9/15	14/15	14/15	11/15
FR_FRABCH		6/15	7/15	8/15	10/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:55 (p 3 of 7)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-9664-5223	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:54	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry biomass-mg	4.83%
		GH_ER2 passed mean dry biomass-mg	4.83%
		CM_MC1 failed mean dry biomass-mg	4.83%
		FR_FRCP1 failed mean dry biomass-mg	4.83%
		GH_FR1 failed mean dry biomass-mg	4.83%
		CM_MC2 failed mean dry biomass-mg	4.83%
		FR_FRABCH failed mean dry biomass-mg	4.83%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	0.4026	1.943	0.21	6	CDF	0.3506	Non-Significant Effect
(Cu Ctrl 10µg/L)		GH_ER2	-0.2707	1.943	0.342	6	CDF	0.6022	Non-Significant Effect
		CM_MC1*	6.132	1.943	0.22	6	CDF	4.3E-04	Significant Effect
		FR_FRCP1*	46.73	1.943	0.135	6	CDF	<1.0E-37	Significant Effect
		GH_FR1*	7.772	1.943	0.158	6	CDF	1.2E-04	Significant Effect
		CM_MC2*	5.386	1.943	0.277	6	CDF	8.4E-04	Significant Effect
		FR_FRABCH*	17.12	1.943	0.158	6	CDF	1.3E-06	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	33.2317	4.74738	7	143.1	<1.0E-37	Significant Effect
Error	0.795936	0.033164	24			
Total	34.0276		31			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	13.92	18.48	0.0527	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9739	0.9081	0.6141	Normal Distribution

CETIS Analytical Report

Report Date: 25 Jan-19 16:55 (p 4 of 7)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-9664-5223 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 16:54 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

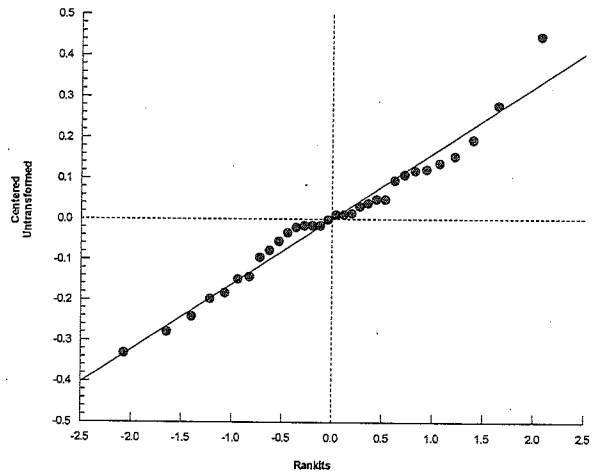
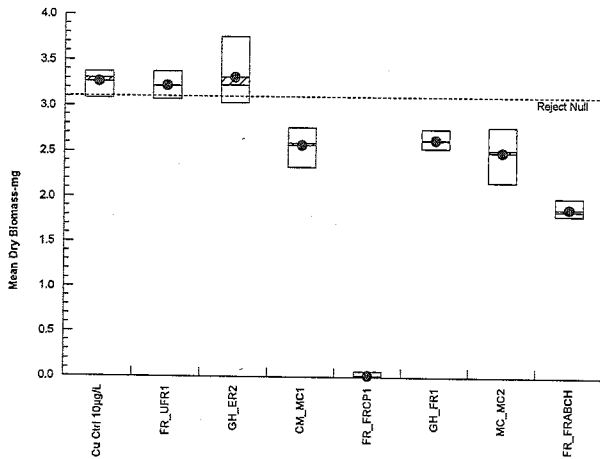
Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	N	4	3.266	3.051	3.481	3.303	3.083	3.375	0.0676	4.14%	0.00%
FR_UFR1		4	3.223	2.955	3.491	3.22	3.074	3.377	0.08428	5.23%	1.33%
GH_ER2		4	3.314	2.797	3.831	3.231	3.035	3.76	0.1626	9.81%	-1.46%
CM_MC1		4	2.573	2.285	2.861	2.597	2.331	2.767	0.09063	7.04%	21.23%
FR_FRCP1		4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	99.50%
GH_FR1		4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	19.34%
MC_MC2		4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	23.48%
FR_FRABCH		4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	42.53%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	3.361	3.083	3.245	3.375
FR_UFR1		3.074	3.08	3.36	3.377
GH_ER2		3.345	3.035	3.116	3.76
CM_MC1		2.622	2.571	2.331	2.767
FR_FRCP1		0	0	0	0.06533
GH_FR1		2.601	2.753	2.539	2.645
MC_MC2		2.169	2.513	2.539	2.777
FR_FRABCH		1.999	1.888	1.822	1.799

Graphics



CETIS Analytical Report

Report Date: 05 Mar-19 12:03 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-8490-9303	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:03	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	9.55%
		CM_MC1 passed length-mm	9.55%
		FR_FRCP1 failed length-mm	9.55%
		GH_FR1 passed length-mm	9.55%
		MC_MC2 passed length-mm	9.55%
		FR_FRABCH passed length-mm	9.55%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	-1.051	1.943	0.619	6	CDF	0.8332	Non-Significant Effect
(Cu Ctrl) 10µg/L		CM_MC1	0.4131	1.943	0.823	6	CDF	0.3470	Non-Significant Effect
		FR_FRCP1*	6.498	2.353	1.572	3	CDF	0.0037	Significant Effect
		GH_FR1	-0.6303	1.943	0.771	6	CDF	0.7241	Non-Significant Effect
		MC_MC2	0.08238	1.943	0.885	6	CDF	0.4685	Non-Significant Effect
		FR_FRABCH	-0.843	1.943	1.083	6	CDF	0.7842	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	20.5086	3.4181	6	8.552	1.7E-04	Significant Effect
Error	7.19427	0.399682	18			
Total	27.7029		24			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	1.949	4.015	0.1274	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9548	0.8877	0.3201	Normal Distribution

March 5/19

CETIS Analytical Report

Report Date: 05 Mar-19 12:03 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-8490-9303 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:03 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

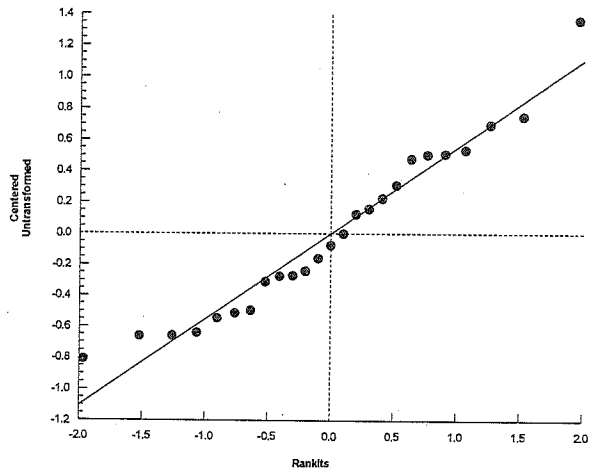
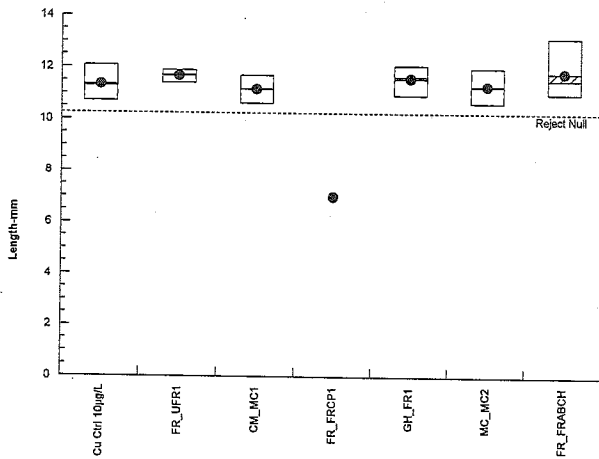
Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10µg/L	N	4	11.34	10.39	12.29	11.28	10.7	12.09	0.2987	5.27%	0.00%
FR_UFR1		4	11.67	11.32	12.03	11.7	11.4	11.9	0.1109	1.90%	-2.95%
CM_MC1		4	11.16	10.21	12.12	11.17	10.62	11.7	0.3005	5.38%	1.54%
FR_FRCP1		1	7			7	7	7	0	0.00%	38.27%
GH_FR1		4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	-2.20%
MC_MC2		4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	0.33%
FR_FRABCH		4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	-4.14%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	12.09	10.7	11.5	11.07
FR_UFR1		11.4	11.6	11.9	11.8
CM_MC1		11.67	11.7	10.62	10.67
FR_FRCP1		7			
GH_FR1		10.93	12.1	11.43	11.9
MC_MC2		11.78	10.79	10.64	12
FR_FRABCH		13.17	11.57	11.5	11

Graphics



March 5/19

CETIS Analytical Report

Report Date: 25 Jan-19 16:56 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-9475-4177	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:55	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
(Cu Ctrl 10µg/L)		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRCP1	0.1218	Exact	0.8529	Non-Significant Effect
		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		MC_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	60	0	60	1	0	-1.7%
FR_UFR1		60	0	60	1	0	-1.7%
GH_ER2		60	0	60	1	0	-1.7%
CM_MC1		59	1	60	0.9833	0.01667	0.0%
FR_FRCP1		57	3	60	0.95	0.05	3.39%
GH_FR1		60	0	60	1	0	-1.7%
MC_MC2		59	1	60	0.9833	0.01667	0.0%
FR_FRABCH		59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000
CM_MC1		0.9333	1.0000	1.0000	1.0000
FR_FRCP1		0.8667	1.0000	1.0000	0.9333
GH_FR1		1.0000	1.0000	1.0000	1.0000
MC_MC2		1.0000	1.0000	1.0000	0.9333
FR_FRABCH		1.0000	1.0000	1.0000	0.9333

CETIS Analytical Report

Report Date: 25 Jan-19 16:56 (p 2 of 2)
Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

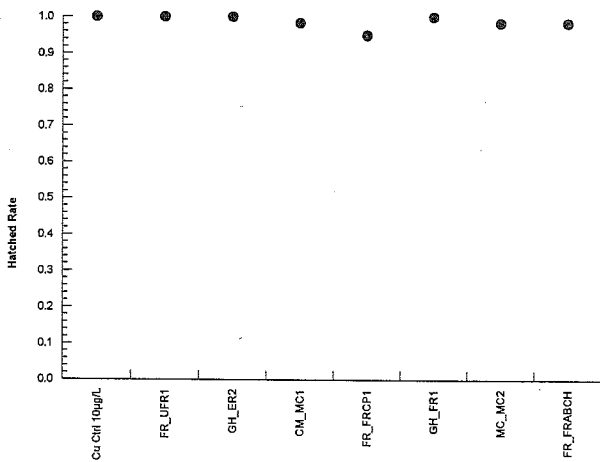
Analysis ID: 18-9475-4177 Endpoint: Hatched Rate
Analyzed: 25 Jan-19 16:55 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	15/15	15/15	15/15	15/15
FR_UFR1		15/15	15/15	15/15	15/15
GH_ER2		15/15	15/15	15/15	15/15
CM_MC1		14/15	15/15	15/15	15/15
FR_FRCP1		13/15	15/15	15/15	14/15
GH_FR1		15/15	15/15	15/15	15/15
MC_MC2		15/15	15/15	15/15	14/15
FR_FRABCH		15/15	15/15	15/15	14/15

Graphics



CETIS Analytical Report

Report Date: 28 Feb-19 09:43 (p 1 of 2)
 Test Code/ID: 181877181878 / 12-4924-3989

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-8515-2087	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 28 Feb-19 9:43	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 17-3395-9039	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h		
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h		
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
GH_ER2	Water Sample	Teck Coal	GH_ER2	
CM_MC1	Water Sample	Teck Coal	CM_MC1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_ER2	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC1	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.4706	Exact	1.0000	Non-Significant Effect
		MC_MC2	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	1.0000	Exact	1.0000	Non-Significant Effect
		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		GH_FR1 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH 20	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L	N	54	0	54	1	0	0.0%
FR_UFR1		59	0	59	1	0	0.0%
GH_ER2		56	0	56	1	0	0.0%
CM_MC1		50	0	50	1	0	0.0%
GH_FR1		47	1	48	0.9792	0.02083	2.08%
MC_MC2		48	0	48	1	0	0.0%
FR_FRABCH		31	0	31	1	0	0.0%
CM_MC2 20 µg/L		53	0	53	1	0	0.0%
GH_FR1 20µg/L		56	0	56	1	0	0.0%
FR_FRABCH 20		36	0	36	1	0	0.0%

CETIS Analytical Report

Report Date: 28 Feb-19 09:43 (p 2 of 2)
 Test Code/ID: 181877181878 / 12-4924-3989

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-8515-2087 Endpoint: Proportion Normal
 Analyzed: 28 Feb-19 9:43 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

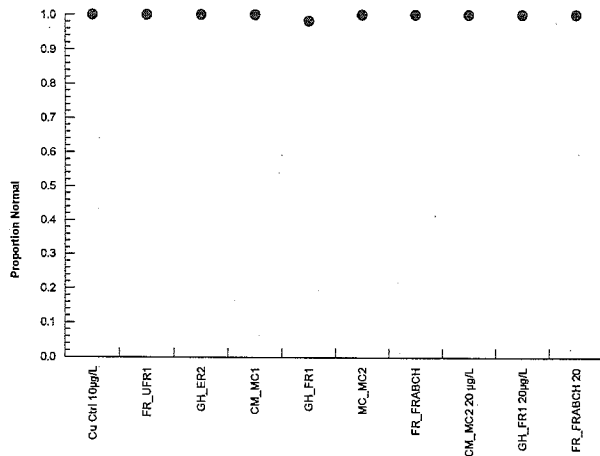
Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	1.0000	1.0000	1.0000	1.0000
FR_UFR1		1.0000	1.0000	1.0000	1.0000
GH_ER2		1.0000	1.0000	1.0000	1.0000
CM_MC1		1.0000	1.0000	1.0000	1.0000
GH_FR1		0.9286	1.0000	1.0000	1.0000
MC_MC2		1.0000	1.0000	1.0000	1.0000
FR_FRABCH		1.0000	1.0000	1.0000	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	N	11/11	15/15	14/14	14/14
FR_UFR1		15/15	14/14	15/15	15/15
GH_ER2		14/14	13/13	14/14	15/15
CM_MC1		12/12	10/10	13/13	15/15
GH_FR1		13/14	10/10	14/14	10/10
MC_MC2		9/9	14/14	14/14	11/11
FR_FRABCH		6/6	7/7	8/8	10/10
CM_MC2 20 µg/L		14/14	13/13	13/13	13/13
GH_FR1 20µg/L		13/13	13/13	15/15	15/15
FR_FRABCH 20		7/7	5/5	12/12	12/12

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:58 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-2764-5990	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:57	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	1.5E-31	Significant Effect
FR_UFR1		GH_FR1*	0.0010	Exact	0.0020	Significant Effect
		CM_MC2*	0.0010	Exact	0.0020	Significant Effect
		FR_FRABCH*	0.0000	Exact	1.2E-09	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	XC	59	1	60	0.9833	0.01667	-22.92%
FR_FRCP1		1	59	60	0.01667	0.9833	97.92%
GH_FR1		48	12	60	0.8	0.2	0.0%
MC_MC2		48	12	60	0.8	0.2	0.0%
FR_FRABCH		31	29	60	0.5167	0.4833	35.42%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	1.0000	0.9333	1.0000	1.0000
FR_FRCP1		0.0000	0.0000	0.0000	0.0667
GH_FR1		0.9333	0.6667	0.9333	0.6667
MC_MC2		0.6000	0.9333	0.9333	0.7333
FR_FRABCH		0.4000	0.4667	0.5333	0.6667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	15/15	14/15	15/15	15/15
FR_FRCP1		0/15	0/15	0/15	1/15
GH_FR1		14/15	10/15	14/15	10/15
MC_MC2		9/15	14/15	14/15	11/15
FR_FRABCH		6/15	7/15	8/15	10/15

Fathead Minnow 32-d Survival and Growth Test

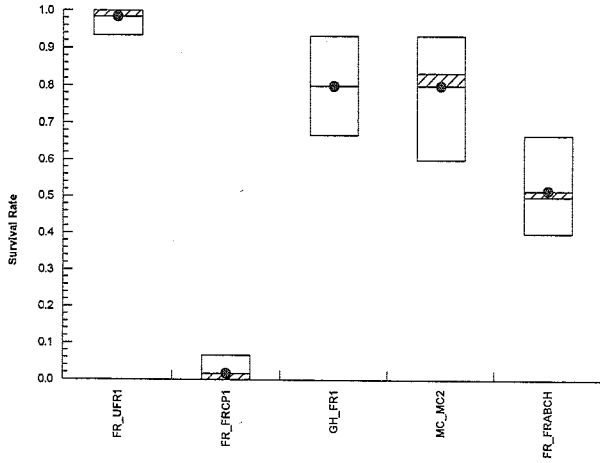
Nautilus Environmental

Analysis ID: 11-2764-5990
Analyzed: 25 Jan-19 16:57

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:58 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-3240-7450	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:57	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	5.76%
		GH_FR1 failed mean dry biomass-mg	5.76%
		MC_MC2 failed mean dry biomass-mg	5.76%
		FR_FRABCH failed mean dry biomass-mg	5.76%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	37.35	1.943	0.167	6	CDF	<1.0E-37	Significant Effect
FR_UFR1		GH_FR1*	6.152	1.943	0.186	6	CDF	4.2E-04	Significant Effect
		MC_MC2*	4.79	1.943	0.293	6	CDF	0.0015	Significant Effect
		FR_FRABCH*	14.09	1.943	0.186	6	CDF	4.0E-06	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	24.3404	6.0851	4	280.5	<1.0E-37	Significant Effect
Error	0.325393	0.0216929	15			
Total	24.6658		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.663	13.28	0.0465	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9664	0.866	0.6779	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	XC	4	3.223	2.955	3.491	3.22	3.074	3.377	0.08428	5.23%	0.00%
FR_FRCP1		4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	99.49%
GH_FR1		4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	18.25%
MC_MC2		4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	22.44%
FR_FRABCH		4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	41.75%

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

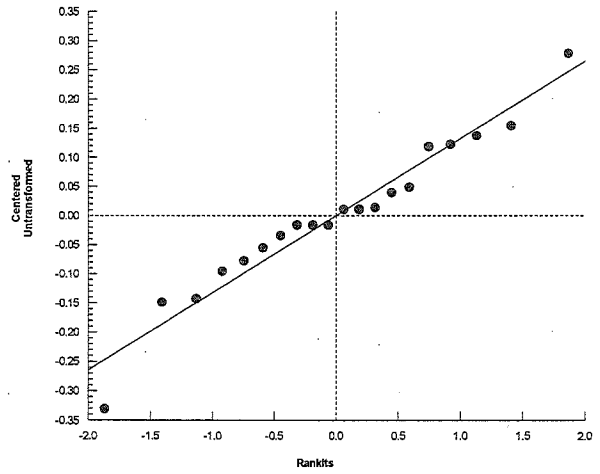
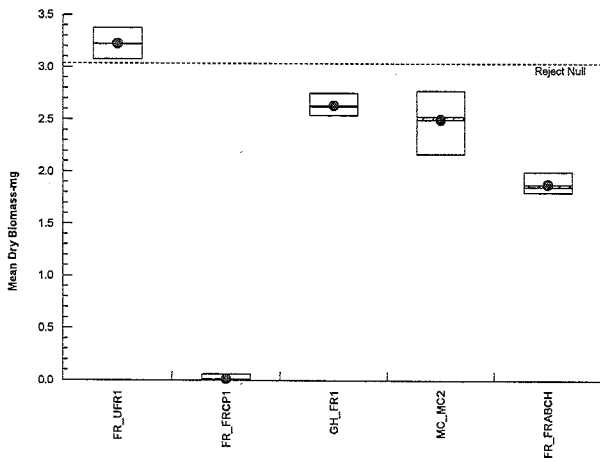
Analysis ID: 00-3240-7450 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 16:57 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	3.074	3.08	3.36	3.377
FR_FRCP1		0	0	0	0.06533
GH_FR1		2.601	2.753	2.539	2.645
MC_MC2		2.169	2.513	2.539	2.777
FR_FRABCH		1.999	1.888	1.822	1.799

Graphics



CETIS Analytical Report

Report Date: 05 Mar-19 12:13 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-9576-9969	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:13	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CMC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CMC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed length-mm	8.05%
		GH_FR1 passed length-mm	8.05%
		MC_MC2 passed length-mm	8.05%
		FR_FRABCH passed length-mm	8.05%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	18.86	2.353	0.583	3	CDF	1.6E-04	Significant Effect
FR_UFR1		GH_FR1	0.2998	1.943	0.551	6	CDF	0.3872	Non-Significant Effect
		CMC_MC2	1.032	1.943	0.701	6	CDF	0.1709	Non-Significant Effect
		FR_FRABCH	-0.2791	1.943	0.94	6	CDF	0.6052	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	20.4194	5.10486	4	12.15	3.5E-04	Significant Effect
Error	5.04037	0.420031	12			
Total	25.4598		16			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.35	5.412	0.1130	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9595	0.848	0.6221	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	XC	4	11.67	11.32	12.03	11.7	11.4	11.9	0.1109	1.90%	0.00%
FR_FRCP1		1	7			7	7	7	0	0.00%	40.04%
GH_FR1		4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	0.73%
CMC_MC2		4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	3.19%
FR_FRABCH		4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	-1.16%

CETIS Analytical Report

Report Date: 05 Mar-19 12:13 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

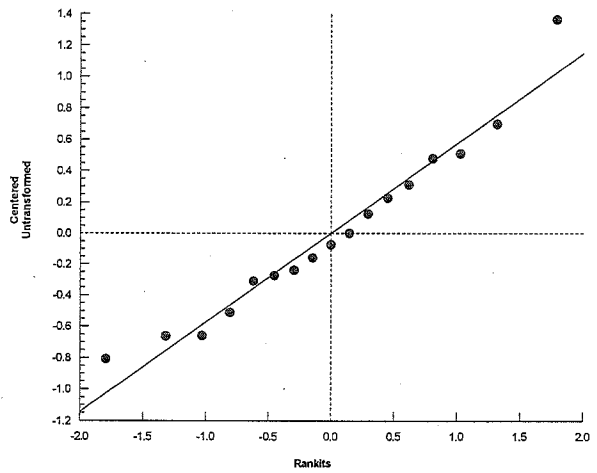
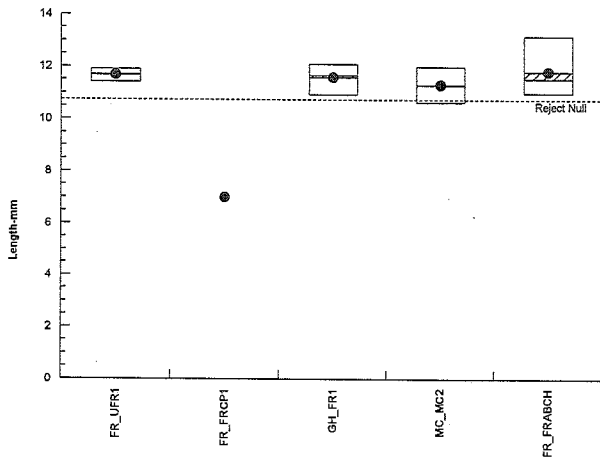
Analysis ID: 12-9576-9969 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:13 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	11.4	11.6	11.9	11.8
FR_FRCP1		7			
GH_FR1		10.93	12.1	11.43	11.9
MC_MC2		11.78	10.79	10.64	12
FR_FRABCH		13.17	11.57	11.5	11

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:58 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-8371-0392	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:58	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	16-0667-9317	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	0.1218	Exact	0.4874	Non-Significant Effect
FR_UFR1		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		MC_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	XC	60	0	60	1	0	-1.7%
FR_FRCP1		57	3	60	0.95	0.05	3.39%
GH_FR1		60	0	60	1	0	-1.7%
MC_MC2		59	1	60	0.9833	0.01667	0.0%
FR_FRABCH		59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.8667	1.0000	1.0000	0.9333
GH_FR1		1.0000	1.0000	1.0000	1.0000
MC_MC2		1.0000	1.0000	1.0000	0.9333
FR_FRABCH		1.0000	1.0000	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	XC	15/15	15/15	15/15	15/15
FR_FRCP1		13/15	15/15	15/15	14/15
GH_FR1		15/15	15/15	15/15	15/15
MC_MC2		15/15	15/15	15/15	14/15
FR_FRABCH		15/15	15/15	15/15	14/15

CETIS Analytical Report

Report Date: 25 Jan-19 16:58 (p 2 of 4)
Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

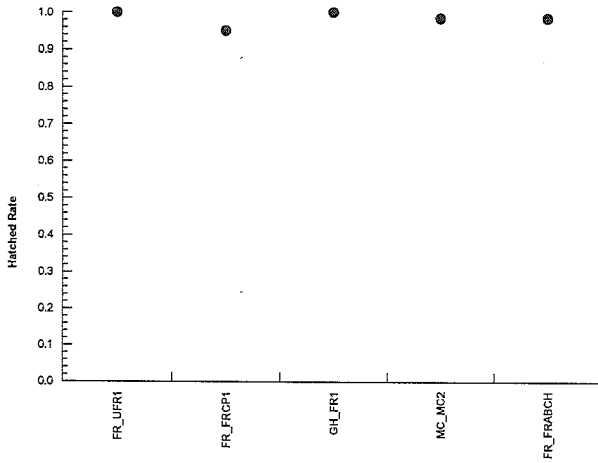
Nautilus Environmental

Analysis ID: 12-8371-0392
Analyzed: 25 Jan-19 16:58

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:01 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-8606-0236	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:00	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CMC _{MC2}	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CMC _{MC2}	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	1.4E-27	Significant Effect
GH_ER2		GH_FR1	0.0288	Exact	0.0575	Non-Significant Effect
		CMC _{MC2}	0.0288	Exact	0.0575	Non-Significant Effect
		FR_FRABCH*	0.0000	Exact	4.9E-07	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	XC	56	4	60	0.9333	0.06667	-16.67%
FR_FRCP1		1	59	60	0.01667	0.9833	97.92%
GH_FR1		48	12	60	0.8	0.2	0.0%
CMC _{MC2}		48	12	60	0.8	0.2	0.0%
FR_FRABCH		31	29	60	0.5167	0.4833	35.42%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	0.9333	0.8667	0.9333	1.0000
FR_FRCP1		0.0000	0.0000	0.0000	0.0667
GH_FR1		0.9333	0.6667	0.9333	0.6667
CMC _{MC2}		0.6000	0.9333	0.9333	0.7333
FR_FRABCH		0.4000	0.4667	0.5333	0.6667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	14/15	13/15	14/15	15/15
FR_FRCP1		0/15	0/15	0/15	1/15
GH_FR1		14/15	10/15	14/15	10/15
CMC _{MC2}		9/15	14/15	14/15	11/15
FR_FRABCH		6/15	7/15	8/15	10/15

Fathead Minnow 32-d Survival and Growth Test

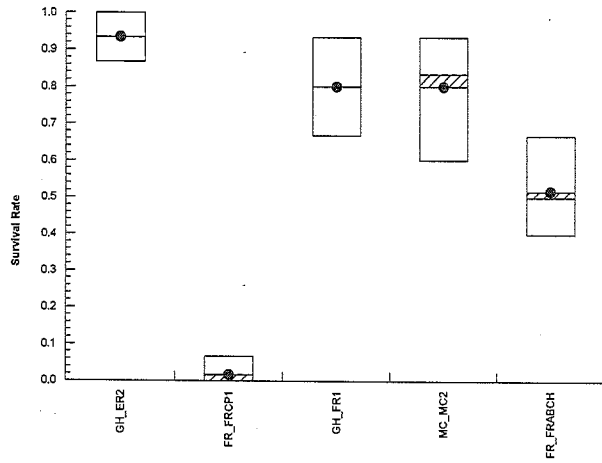
Nautilus Environmental

Analysis ID: 12-8606-0236
Analyzed: 25 Jan-19 17:00

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:01 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4812-6614	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:00	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CMC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CMC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	9.89%
		GH_FR1 failed mean dry biomass-mg	9.89%
		CMC_MC2 failed mean dry biomass-mg	9.89%
		FR_FRABCH failed mean dry biomass-mg	9.89%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	20.18	1.943	0.318	6	CDF	4.8E-07	Significant Effect
GH_ER2		GH_FR1*	4.027	1.943	0.328	6	CDF	0.0035	Significant Effect
		CMC_MC2*	3.968	1.943	0.399	6	CDF	0.0037	Significant Effect
		FR_FRABCH*	8.52	1.943	0.328	6	CDF	7.2E-05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	25.2223	6.30557	4	169.7	<1.0E-37	Significant Effect
Error	0.55729	0.0371527	15			
Total	25.7796		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	13.31	13.28	0.0099	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9244	0.866	0.1202	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	XC	4	3.314	2.797	3.831	3.231	3.035	3.76	0.1626	9.81%	0.00%
FR_FRCP1		4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	99.51%
GH_FR1		4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	20.50%
CMC_MC2		4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	24.58%
FR_FRABCH		4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	43.36%

CETIS Analytical Report

Report Date: 25 Jan-19 17:01 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

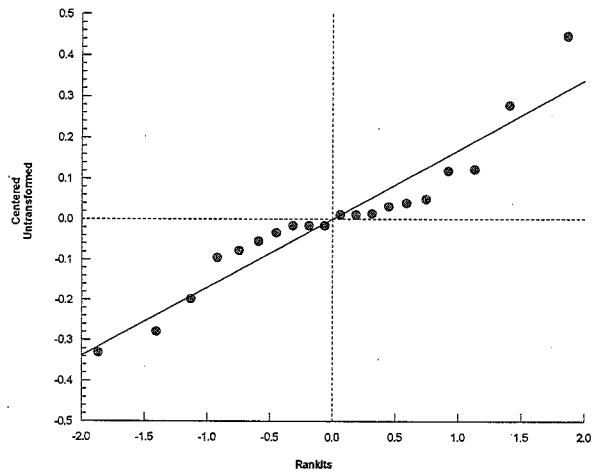
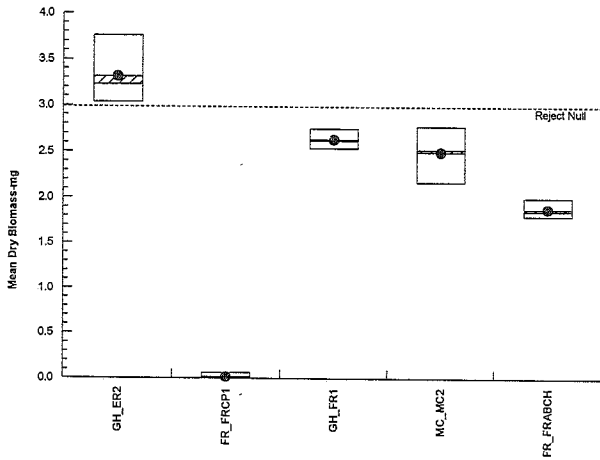
Analysis ID: 16-4812-6614 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 17:00 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	3.345	3.035	3.116	3.76
FR_FRCP1		0	0	0	0.06533
GH_FR1		2.601	2.753	2.539	2.645
MC_MC2		2.169	2.513	2.539	2.777
FR_FRABCH		1.999	1.888	1.822	1.799

Graphics



CETIS Analytical Report

Report Date: 05 Mar-19 12:12 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-3185-6643	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:11	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CM _{MC} MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM _{MC} MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed length-mm	7.68%
		GH_FR1 passed length-mm	7.68%
		CM _{MC} MC2 failed length-mm	7.68%
		FR_FRABCH passed length-mm	7.68%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	41.34	2.353	0.284	3	CDF	1.6E-05	Significant Effect
GH_ER2		GH_FR1	1.482	1.943	0.518	6	CDF	0.0944	Non-Significant Effect
		CM _{MC} MC2*	1.963	1.943	0.676	6	CDF	0.0487	Significant Effect
		FR_FRABCH	0.3693	1.943	0.921	6	CDF	0.3623	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	21.5836	5.39589	4	13.14	2.4E-04	Significant Effect
Error	4.92777	0.410648	12			
Total	26.5114		16			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	3.006	5.412	0.0622	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9563	0.848	0.5635	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	XC	4	11.98	11.81	12.16	12	11.86	12.08	0.05392	0.90%	0.00%
FR_FRCP1		1	7			7	7	7	0	0.00%	41.59%
GH_FR1		4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	3.30%
CM _{MC} MC2		4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	5.69%
FR_FRABCH		4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	1.46%

CETIS Analytical Report

Report Date: 05 Mar-19 12:12 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

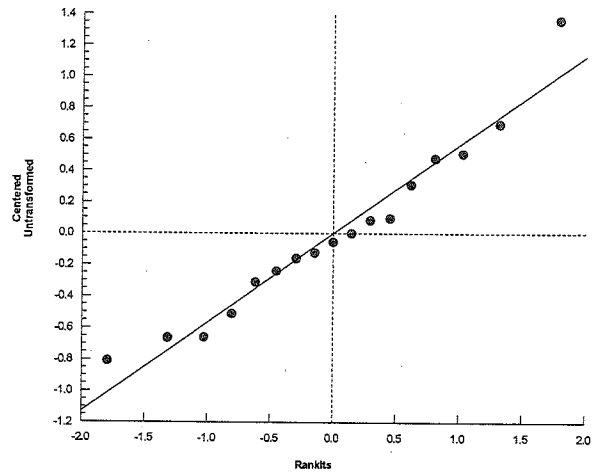
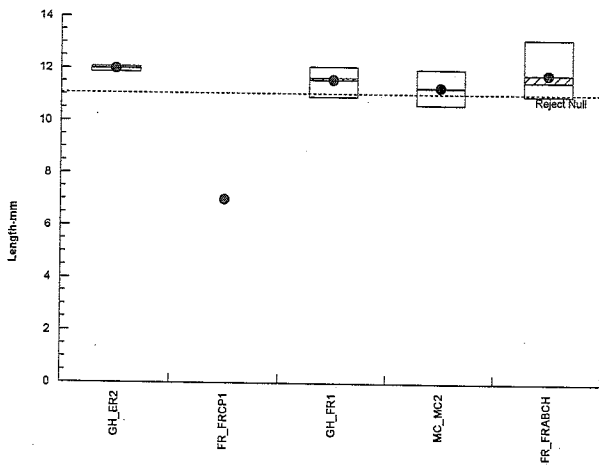
Analysis ID: 00-3185-6643 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:11 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	11.93	12.08	11.86	12.07
FR_FRCP1		7			
GH_FR1		10.93	12.1	11.43	11.9
MC_MC2		11.78	10.79	10.64	12
FR_FRABCH		13.17	11.57	11.5	11

Graphics



March 5/19

CETIS Analytical Report

Report Date: 25 Jan-19 17:01 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-9274-1362	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:00	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_ER2	19-1334-1734	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CMC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_ER2	Water Sample	Teck Coal	GH_ER2	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CMC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	0.1218	Exact	0.4874	Non-Significant Effect
GH_ER2		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		CMC_MC2	0.5000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.5000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2	XC	60	0	60	1	0	-1.7%
FR_FRCP1		57	3	60	0.95	0.05	3.39%
GH_FR1		60	0	60	1	0	-1.7%
CMC_MC2		59	1	60	0.9833	0.01667	0.0%
FR_FRABCH		59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	1.0000	1.0000	1.0000	1.0000
FR_FRCP1		0.8667	1.0000	1.0000	0.9333
GH_FR1		1.0000	1.0000	1.0000	1.0000
CMC_MC2		1.0000	1.0000	1.0000	0.9333
FR_FRABCH		1.0000	1.0000	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	XC	15/15	15/15	15/15	15/15
FR_FRCP1		13/15	15/15	15/15	14/15
GH_FR1		15/15	15/15	15/15	15/15
CMC_MC2		15/15	15/15	15/15	14/15
FR_FRABCH		15/15	15/15	15/15	14/15

CETIS Analytical Report

Report Date: 25 Jan-19 17:01 (p 2 of 4)
Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

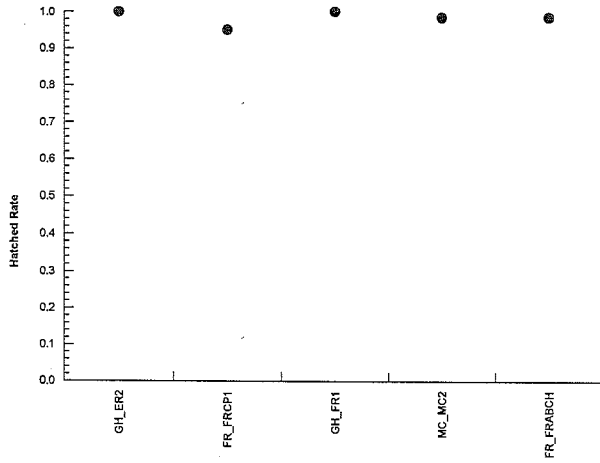
Nautilus Environmental

Analysis ID: 19-9274-1362
Analyzed: 25 Jan-19 17:00

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:05 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-8121-9884	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:03	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
CM_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	0.0000	Exact	7.2E-22	Significant Effect
<i>CM_MC1</i>		GH_FR1	0.4070	Exact	0.8140	Non-Significant Effect
		<i>CM_MC2</i>	0.4070	Exact	0.8140	Non-Significant Effect
		FR_FRABCH*	0.0002	Exact	5.7E-04	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	XC	50	10	60	0.8333	0.1667	0.0%
FR_FRCP1		1	59	60	0.01667	0.9833	98.0%
GH_FR1		48	12	60	0.8	0.2	4.0%
<i>CM_MC2</i>		48	12	60	0.8	0.2	4.0%
FR_FRABCH		31	29	60	0.5167	0.4833	38.0%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	0.8000	0.6667	0.8667	1.0000
FR_FRCP1		0.0000	0.0000	0.0000	0.0667
GH_FR1		0.9333	0.6667	0.9333	0.6667
<i>CM_MC2</i>		0.6000	0.9333	0.9333	0.7333
FR_FRABCH		0.4000	0.4667	0.5333	0.6667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	12/15	10/15	13/15	15/15
FR_FRCP1		0/15	0/15	0/15	1/15
GH_FR1		14/15	10/15	14/15	10/15
<i>CM_MC2</i>		9/15	14/15	14/15	11/15
FR_FRABCH		6/15	7/15	8/15	10/15

Fathead Minnow 32-d Survival and Growth Test

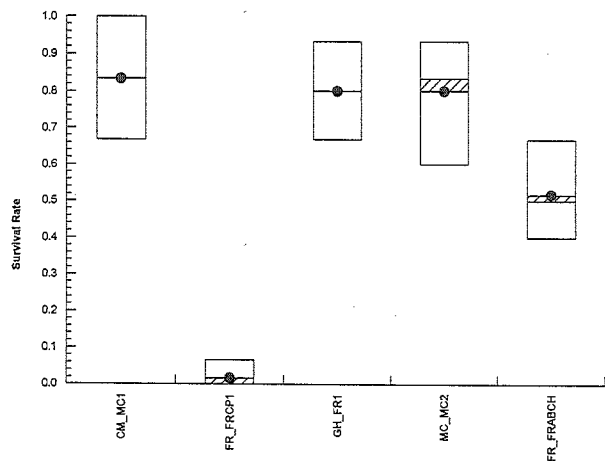
Nautilus Environmental

Analysis ID: 03-8121-9884
Analyzed: 25 Jan-19 17:03

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:04 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-9602-3171	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:03	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed mean dry biomass-mg	7.64%
		GH_FR1 passed mean dry biomass-mg	7.64%
		MC_MC2 passed mean dry biomass-mg	7.64%
		FR_FRABCH failed mean dry biomass-mg	7.64%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	27.76	1.943	0.179	6	CDF	<1.0E-37	Significant Effect
CM_MC1		GH_FR1	-0.609	1.943	0.197	6	CDF	0.7176	Non-Significant Effect
		MC_MC2	0.4753	1.943	0.301	6	CDF	0.3257	Non-Significant Effect
		FR_FRABCH*	6.881	1.943	0.197	6	CDF	2.3E-04	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	19.595	4.89876	4	216.9	<1.0E-37	Significant Effect
Error	0.338729	0.0225819	15			
Total	19.9338		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.809	13.28	0.0438	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9348	0.866	0.1907	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	XC	4	2.573	2.285	2.861	2.597	2.331	2.767	0.09063	7.04%	0.00%
FR_FRCP1		4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	99.37%
GH_FR1		4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	-2.40%
MC_MC2		4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	2.86%
FR_FRABCH		4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	27.04%

CETIS Analytical Report

Report Date: 25 Jan-19 17:04 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

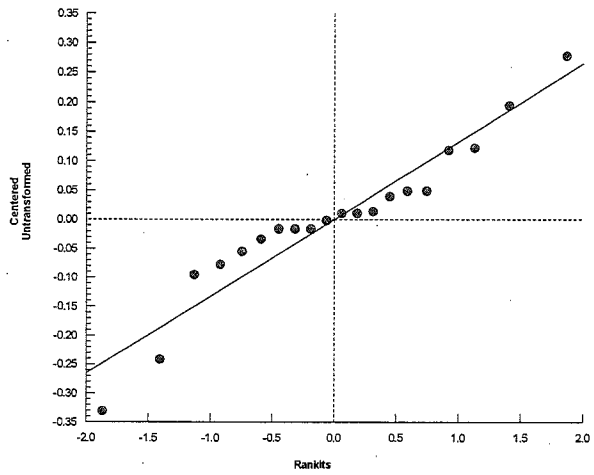
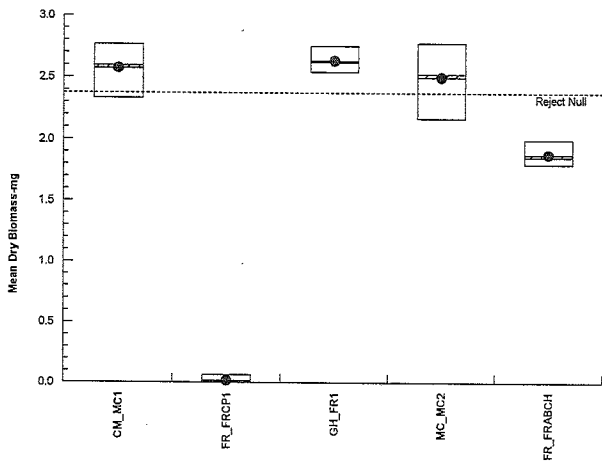
Analysis ID: 04-9602-3171 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 17:03 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	2.622	2.571	2.331	2.767
FR_FRCP1		0	0	0	0.06533
GH_FR1		2.601	2.753	2.539	2.645
MC_MC2		2.169	2.513	2.539	2.777
FR_FRABCH		1.999	1.888	1.822	1.799

Graphics



CETIS Analytical Report

Report Date: 05 Mar-19 12:18 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5504-6304	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:18	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
CM_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP1 failed length-mm	9.72%
		GH_FR1 passed length-mm	9.72%
		CM_MC2 passed length-mm	9.72%
		FR_FRABCH passed length-mm	9.72%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1*	6.199	2.353	1.581	3	CDF	0.0042	Significant Effect
		GH_FR1	-1.068	1.943	0.773	6	CDF	0.8367	Non-Significant Effect
		CM_MC2	-0.3013	1.943	0.887	6	CDF	0.6133	Non-Significant Effect
		FR_FRABCH	-1.155	1.943	1.085	6	CDF	0.8540	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	19.7834	4.94586	4	9.931	8.7E-04	Significant Effect
Error	5.97617	0.498015	12			
Total	25.7596		16			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	1.329	5.412	0.3149	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9264	0.848	0.1893	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	XC	4	11.16	10.21	12.12	11.17	10.62	11.7	0.3005	5.38%	0.00%
FR_FRCP1		1	7			7	7	7	0	0.00%	37.30%
GH_FR1		4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	-3.81%
CM_MC2		4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	-1.23%
FR_FRABCH		4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	-5.78%

CETIS Analytical Report

Report Date: 05 Mar-19 12:18 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

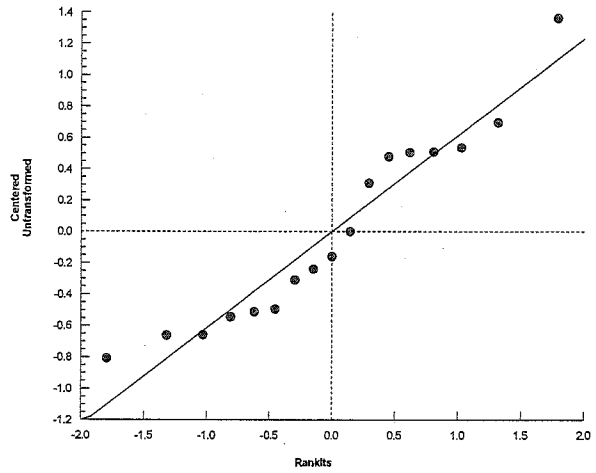
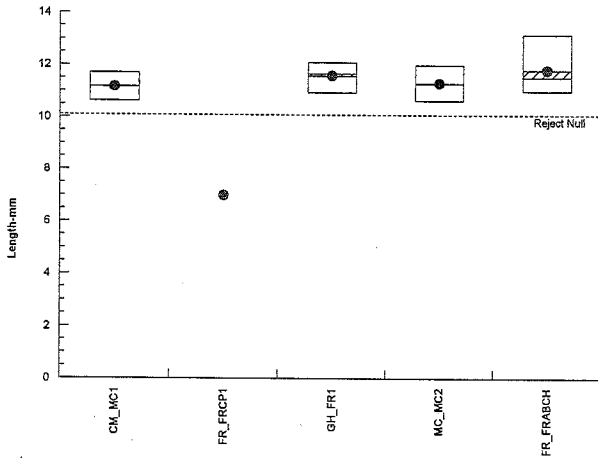
Analysis ID: 11-5504-6304 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:18 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	11.67	11.7	10.62	10.67
FR_FRCP1		7			
GH_FR1		10.93	12.1	11.43	11.9
MC_MC2		11.78	10.79	10.64	12
FR_FRABCH		13.17	11.57	11.5	11

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:05 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-3555-4927	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:03	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC1	01-4171-4910	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h		
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h		
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h		
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC1	Water Sample	Teck Coal	CM_MC1	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
GH_FR1	Water Sample	Teck Coal	GH_FR1	
MC_MC2	Water Sample	Teck Coal	CM_MC2	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_FRCP1	0.3093	Exact	1.0000	Non-Significant Effect
<i>CM_MC1</i>		GH_FR1	1.0000	Exact	1.0000	Non-Significant Effect
		<i>CM_MC2</i>	0.7521	Exact	1.0000	Non-Significant Effect
		FR_FRABCH	0.7521	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	XC	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1		57	3	60	0.95	0.05	3.39%
GH_FR1		60	0	60	1	0	-1.7%
<i>CM_MC2</i>		59	1	60	0.9833	0.01667	0.0%
FR_FRABCH		59	1	60	0.9833	0.01667	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	0.9333	1.0000	1.0000	1.0000
FR_FRCP1		0.8667	1.0000	1.0000	0.9333
GH_FR1		1.0000	1.0000	1.0000	1.0000
<i>CM_MC2</i>		1.0000	1.0000	1.0000	0.9333
FR_FRABCH		1.0000	1.0000	1.0000	0.9333

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	XC	14/15	15/15	15/15	15/15
FR_FRCP1		13/15	15/15	15/15	14/15
GH_FR1		15/15	15/15	15/15	15/15
<i>CM_MC2</i>		15/15	15/15	15/15	14/15
FR_FRABCH		15/15	15/15	15/15	14/15

Fathead Minnow 32-d Survival and Growth Test

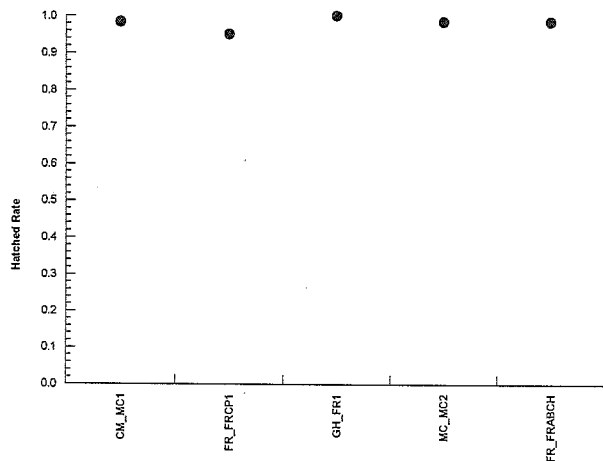
Nautilus Environmental

Analysis ID: 04-3555-4927
Analyzed: 25 Jan-19 17:03

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 04-7716-1974 **Endpoint:** Survival Rate **CETIS Version:** CETISv1.9.4
 Analyzed: 25 Jan-19 17:06 **Analysis:** STP 2xK Contingency Tables **Status Level:** 1

Batch ID: 05-2401-4870 **Test Type:** Survival-Development-Growth **Analyst:** Emma Marus
 Start Date: 09 Nov-18 14:00 **Protocol:** ASTM E1241-05 (2013) **Diluent:** Mod-Hard Synthetic Water
 Ending Date: 11 Dec-18 11:20 **Species:** Pimephales promelas **Brine:**
 Test Length: 31d 21h **Taxon:** Actinopterygii **Source:** Aquatic Biosystems, CO **Age:**

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L*	0.0000	Exact	4.5E-30	Significant Effect
<i>Cu Ctrl 20µg/L</i>		CM_MC2 20 µg/L	0.0815	Exact	0.1629	Non-Significant Effect
		GH_FR1 20µg/L	0.3397	Exact	0.3397	Non-Significant Effect
		FR_FRABCH 20*	0.0000	Exact	1.3E-06	Significant Effect

CYT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	MC	58	2	60	0.9667	0.03333	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	98.28%
CM_MC2 20 µg/L		53	7	60	0.8833	0.1167	8.62%
GH_FR1 20µg/L		56	4	60	0.9333	0.06667	3.45%
FR_FRABCH 20		36	24	60	0.6	0.4	37.93%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	1.0000	0.9333	1.0000	0.9333
FR_FRCP120µg/L		0.0000	0.0667	0.0000	0.0000
CM_MC2 20 µg/L		0.9333	0.8667	0.8667	0.8667
GH_FR1 20µg/L		0.8667	0.8667	1.0000	1.0000
FR_FRABCH 20		0.4667	0.3333	0.8000	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	15/15	14/15	15/15	14/15
FR_FRCP120µg/L		0/15	1/15	0/15	0/15
CM_MC2 20 µg/L		14/15	13/15	13/15	13/15
GH_FR1 20µg/L		13/15	13/15	15/15	15/15
FR_FRABCH 20		7/15	5/15	12/15	12/15

Fathead Minnow 32-d Survival and Growth Test

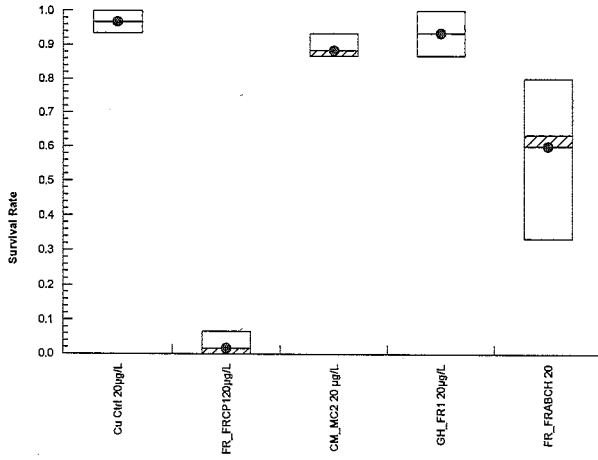
Nautilus Environmental

Analysis ID: 04-7716-1974
Analyzed: 25 Jan-19 17:06

Endpoint: Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-7345-8265 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 25 Jan-19 17:07 Analysis: STP 2xK Contingency Tables Status Level: 1

Batch ID: 05-2401-4870 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 09 Nov-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 11 Dec-18 11:20 Species: Pimephales promelas Brine:
 Test Length: 31d 21h Taxon: Actinopterygii Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L	0.9839	Exact	1.0000	Non-Significant Effect
<i>20µg/L</i>		GH_FR1 20µg/L	0.8966	Exact	1.0000	Non-Significant Effect
		FR_FRABCH 20	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	MC	58	2	60	0.9667	0.03333	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	98.28%
CM_MC2 20 µg/L		53	7	60	0.8833	0.1167	8.62%
GH_FR1 20µg/L		56	4	60	0.9333	0.06667	3.45%
FR_FRABCH 20		36	24	60	0.6	0.4	37.93%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	1.0000	0.9333	1.0000	0.9333
FR_FRCP120µg/L		0.0000	0.0667	0.0000	0.0000
CM_MC2 20 µg/L		0.9333	0.8667	0.8667	0.8667
GH_FR1 20µg/L		0.8667	0.8667	1.0000	1.0000
FR_FRABCH 20		0.4667	0.3333	0.8000	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	15/15	14/15	15/15	14/15
FR_FRCP120µg/L		0/15	1/15	0/15	0/15
CM_MC2 20 µg/L		14/15	13/15	13/15	13/15
GH_FR1 20µg/L		13/15	13/15	15/15	15/15
FR_FRABCH 20		7/15	5/15	12/15	12/15

CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 8 of 8)
Test Code/ID: 181877 / 20-4999-8688

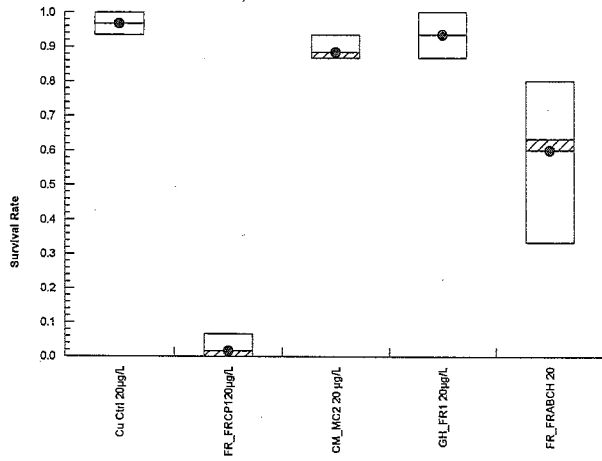
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-7345-8265 Endpoint: Survival Rate
Analyzed: 25 Jan-19 17:07 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-4012-6214	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:06	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L failed mean dry biomass-m	3.92%
		CM_MC2 20 µg/L failed mean dry biomass-m	3.92%
		GH_FR1 20µg/L failed mean dry biomass-mg	3.92%
		FR_FRABCH 20 failed mean dry biomass-mg	3.92%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L*	20.23	1.943	0.297	6	CDF	4.7E-07	Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L*	3.146	1.943	0.223	6	CDF	0.0100	Significant Effect
<i>20µg/L</i>		GH_FR1 20µg/L*	13.2	1.943	0.098	6	CDF	5.8E-06	Significant Effect
		FR_FRABCH 20*	20.25	1.943	0.127	6	CDF	4.7E-07	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	23.7943	5.94859	4	200.4	<1.0E-37	Significant Effect
Error	0.445167	0.0296778	15			
Total	24.2395		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.983	13.28	0.0407	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8829	0.866	0.0200	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	MC	4	3.234	3.091	3.378	3.251	3.121	3.315	0.04524	2.80%	0.00%
FR_FRCP120µg/L		4	0.1458	-0.3183	0.6099	0	0	0.5833	0.1458	200.00%	95.49%
CM_MC2 20 µg/L		4	2.874	2.539	3.209	2.834	2.663	3.165	0.1053	7.33%	11.15%
GH_FR1 20µg/L		4	2.57	2.5	2.64	2.579	2.511	2.611	0.02205	1.72%	20.54%
FR_FRABCH 20		4	1.915	1.765	2.064	1.919	1.807	2.013	0.04695	4.90%	40.81%

CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 6 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

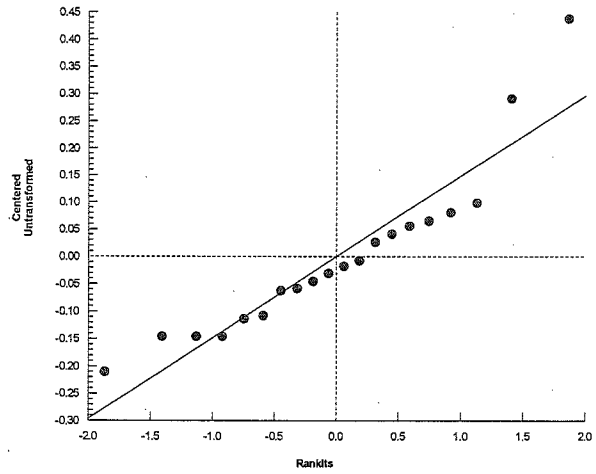
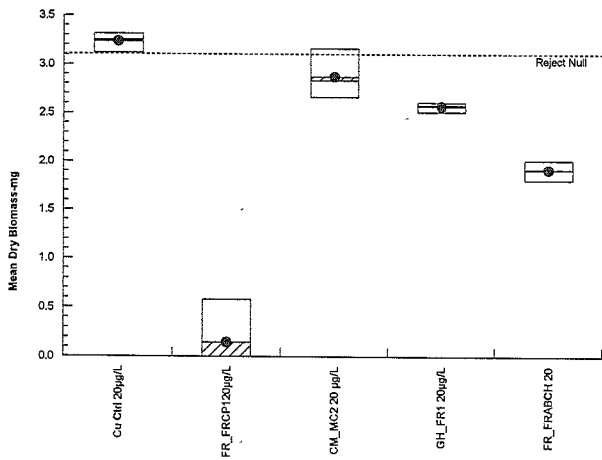
Analysis ID: 01-4012-6214 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 17:06 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	3.121	3.315	3.299	3.203
FR_FRCP120µg/L	0	0	0.5833	0	0
CM_MC2 20 µg/L		2.811	2.663	2.856	3.165
GH_FR1 20µg/L		2.562	2.596	2.611	2.511
FR_FRABCH 20		1.97	1.869	1.807	2.013

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-6793-4938	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:07	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L passed mean dry biomass- 3.92% CM_MC2 20 µg/L passed mean dry biomass- 3.92% GH_FR1 20µg/L passed mean dry biomass-m 3.92% FR_FRABCH 20 passed mean dry biomass-m 3.92%	

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L	-20.23	1.943	0.297	6	CDF	1.0000	Non-Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L	-3.146	1.943	0.223	6	CDF	0.9900	Non-Significant Effect
<i>20µg/L</i>		GH_FR1 20µg/L	-13.2	1.943	0.098	6	CDF	1.0000	Non-Significant Effect
		FR_FRABCH 20	-20.25	1.943	0.127	6	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	23.7943	5.94859	4	200.4	<1.0E-37	Significant Effect
Error	0.445167	0.0296778	15			
Total	24.2395		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.983	13.28	0.0407	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8829	0.866	0.0200	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	MC	4	3.234	3.091	3.378	3.251	3.121	3.315	0.04524	2.80%	0.00%
FR_FRCP120µg/L		4	0.1458	-0.3183	0.6099	0	0	0.5833	0.1458	200.00%	95.49%
CM_MC2 20 µg/L		4	2.874	2.539	3.209	2.834	2.663	3.165	0.1053	7.33%	11.15%
GH_FR1 20µg/L		4	2.57	2.5	2.64	2.579	2.511	2.611	0.02205	1.72%	20.54%
FR_FRABCH 20		4	1.915	1.765	2.064	1.919	1.807	2.013	0.04695	4.90%	40.81%

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

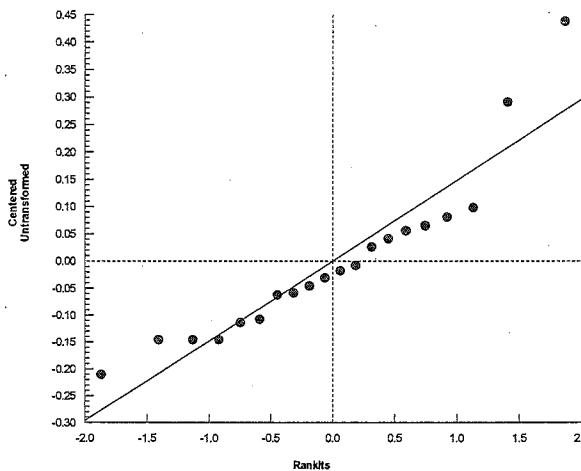
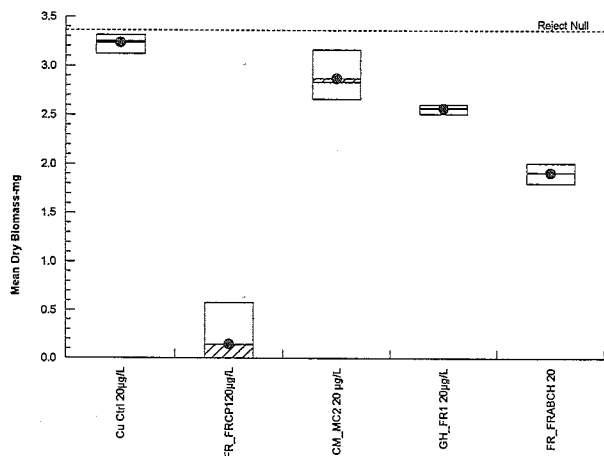
Analysis ID: 11-6793-4938 Endpoint: Mean Dry Biomass-mg
 Analyzed: 25 Jan-19 17:07 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	3.121	3.315	3.299	3.203
FR_FRCP120µg/L		0	0.5833	0	0
CM_MC2 20 µg/L		2.811	2.663	2.856	3.165
GH_FR1 20µg/L		2.562	2.596	2.611	2.511
FR_FRABCH 20		1.97	1.869	1.807	2.013

Graphics



CETIS Analytical Report

Report Date: 05 Mar-19 12:20 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-4393-2892	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:20	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L passed length-mm	10.56%
		CM_MC2 20 µg/L passed length-mm	10.56%
		GH_FR1 20µg/L failed length-mm	10.56%
		FR_FRABCH 20 passed length-mm	10.56%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L	-8.89	2.353	0.729	3	CDF	0.9985	Non-Significant Effect
<i>(Cu Ctrl 20µg/L)</i>		CM_MC2 20 µg/L	1.919	1.943	0.453	6	CDF	0.0517	Non-Significant Effect
		GH_FR1 20µg/L*	4.362	1.943	0.296	6	CDF	0.0024	Significant Effect
		FR_FRABCH 20	0.1923	1.943	1.187	6	CDF	0.4269	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9.93946	2.48486	4	6.023	0.0068	Significant Effect
Error	4.95065	0.412554	12			
Total	14.8901		16			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	19.83	5.412	3.2E-05	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9583	0.848	0.6002	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	MC	4	11.25	10.8	11.69	11.17	11	11.64	0.1386	2.46%	0.00%
FR_FRCP120µg/L		1	14			14	14	14	0	0.00%	-24.50%
CM_MC2 20 µg/L		4	10.8	10.2	11.39	10.82	10.39	11.15	0.1875	3.47%	3.98%
GH_FR1 20µg/L		4	10.58	10.38	10.78	10.58	10.47	10.69	0.06351	1.20%	5.91%
FR_FRABCH 20		4	11.13	9.234	13.02	11.09	9.92	12.4	0.5951	10.70%	1.04%

March 5/19

CETIS Analytical Report

Report Date: 05 Mar-19 12:20 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

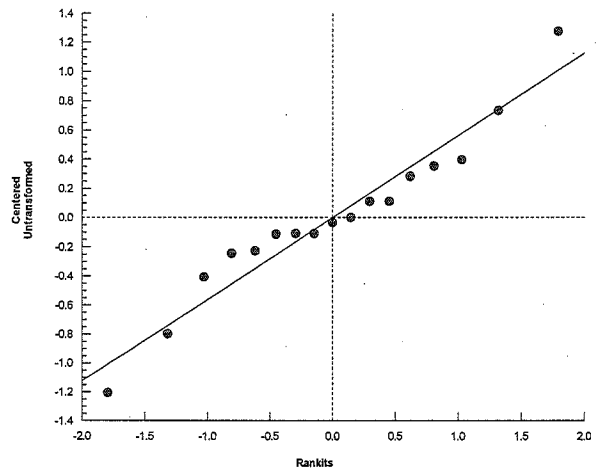
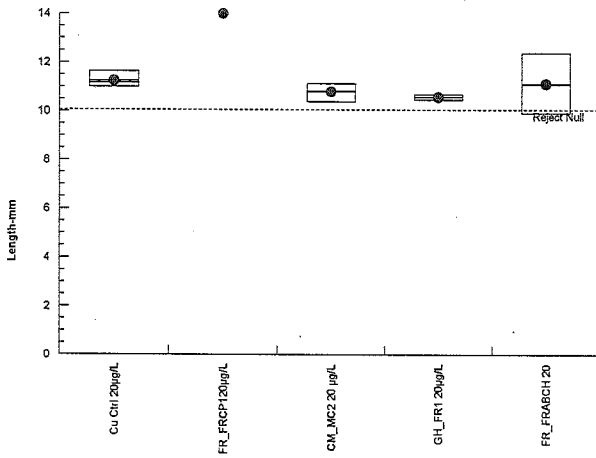
Analysis ID: 01-4393-2892 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:20 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	11	11.64	11.13	11.21
FR_FRCP120µg/L		14			
CM_MC2 20 µg/L		10.57	10.39	11.08	11.15
GH_FR1 20µg/L		10.69	10.69	10.47	10.47
FR_FRABCH 20		11.86	12.4	9.92	10.33

Graphics



Handwritten signature and date:
 Mark 5/19

CETIS Analytical Report

Report Date: 05 Mar-19 12:21 (p 1 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-5121-7041	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 05 Mar-19 12:21	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L failed length-mm	10.56%
		CM_MC2 20 µg/L passed length-mm	10.56%
		GH_FR1 20µg/L passed length-mm	10.56%
		FR_FRABCH 20 passed length-mm	10.56%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
<i>(Cu Ctrl 20µg/L)</i>		FR_FRCP120µg/L*	8.89	2.353	0.729	3	CDF	0.0015	Significant Effect
		CM_MC2 20 µg/L	-1.919	1.943	0.453	6	CDF	0.9483	Non-Significant Effect
		GH_FR1 20µg/L	-4.362	1.943	0.296	6	CDF	0.9976	Non-Significant Effect
		FR_FRABCH 20	-0.1923	1.943	1.187	6	CDF	0.5731	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9.93946	2.48486	4	6.023	0.0068	Significant Effect
Error	4.95065	0.412554	12			
Total	14.8901		16			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	19.83	5.412	3.2E-05	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9583	0.848	0.6002	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20µg/L	MC	4	11.25	10.8	11.69	11.17	11	11.64	0.1386	2.46%	0.00%
FR_FRCP120µg/L		1	14			14	14	14	0	0.00%	-24.50%
CM_MC2 20 µg/L		4	10.8	10.2	11.39	10.82	10.39	11.15	0.1875	3.47%	3.98%
GH_FR1 20µg/L		4	10.58	10.38	10.78	10.58	10.47	10.69	0.06351	1.20%	5.91%
FR_FRABCH 20		4	11.13	9.234	13.02	11.09	9.92	12.4	0.5951	10.70%	1.04%

CETIS Analytical Report

Report Date: 05 Mar-19 12:21 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

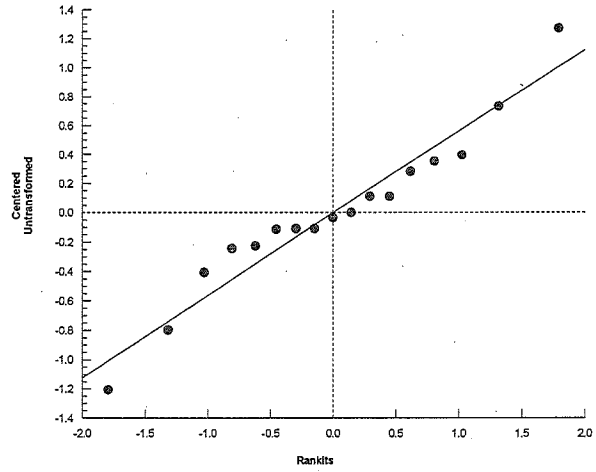
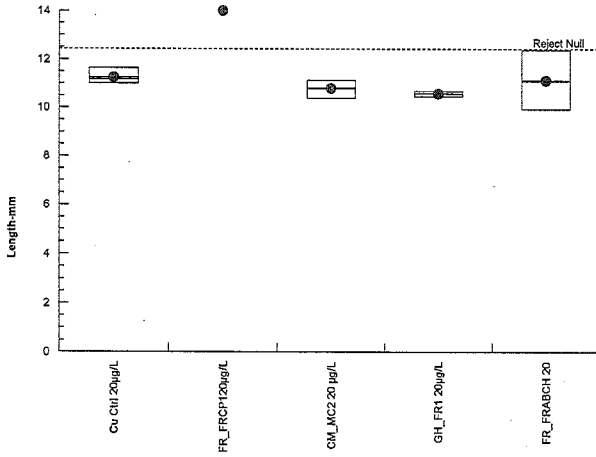
Analysis ID: 10-5121-7041 Endpoint: Length-mm
 Analyzed: 05 Mar-19 12:21 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	11	11.64	11.13	11.21
FR_FRCP120µg/L		14			
CM_MC2 20 µg/L		10.57	10.39	11.08	11.15
GH_FR1 20µg/L		10.69	10.69	10.47	10.47
FR_FRABCH 20		11.86	12.4	9.92	10.33

Graphics



SW
 March 5/19

CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 1 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-1501-6097	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:06	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L	0.5000	Exact	1.0000	Non-Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
<i>20µg/L</i>		GH_FR1 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH 20	1.0000	Exact	1.0000	Non-Significant Effect

CJT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	MC	60	0	60	1	0	0.0%
FR_FRCP120µg/L		59	1	60	0.9833	0.01667	1.67%
CM_MC2 20 µg/L		60	0	60	1	0	0.0%
GH_FR1 20µg/L		60	0	60	1	0	0.0%
FR_FRABCH 20		60	0	60	1	0	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	1.0000	1.0000	1.0000	1.0000
FR_FRCP120µg/L		1.0000	1.0000	0.9333	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	15/15	15/15	15/15	15/15
FR_FRCP120µg/L		15/15	15/15	14/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20µg/L		15/15	15/15	15/15	15/15
FR_FRABCH 20		15/15	15/15	15/15	15/15

CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 2 of 8)
Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

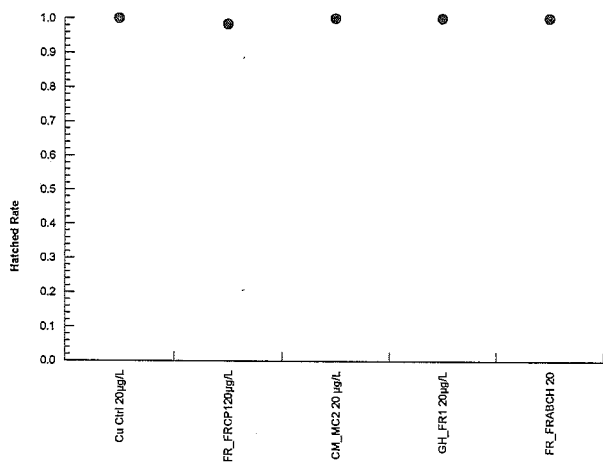
Nautilus Environmental

Analysis ID: 05-1501-6097
Analyzed: 25 Jan-19 17:06

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:08 (p 3 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-5256-6396	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:07	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Method Control		FR_FRCP120µg/L	1.0000	Exact	1.0000	Non-Significant Effect
<i>Cu Ctrl</i>		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect
<i>20µg/L</i>		GH_FR1 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect
		FR_FRABCH 20	1.0000	Exact	1.0000	Non-Significant Effect

CST

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20µg/L	MC	60	0	60	1	0	0.0%
FR_FRCP120µg/L		59	1	60	0.9833	0.01667	1.67%
CM_MC2 20 µg/L		60	0	60	1	0	0.0%
GH_FR1 20µg/L		60	0	60	1	0	0.0%
FR_FRABCH 20		60	0	60	1	0	0.0%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	1.0000	1.0000	1.0000	1.0000
FR_FRCP120µg/L		1.0000	1.0000	0.9333	1.0000
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20µg/L	MC	15/15	15/15	15/15	15/15
FR_FRCP120µg/L		15/15	15/15	14/15	15/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15
GH_FR1 20µg/L		15/15	15/15	15/15	15/15
FR_FRABCH 20		15/15	15/15	15/15	15/15

EW
Feb. 6/19

Fathead Minnow 32-d Survival and Growth Test

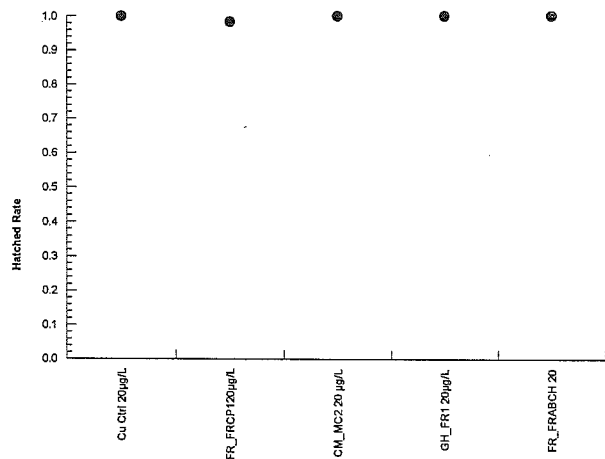
Nautilus Environmental

Analysis ID: 17-5256-6396
Analyzed: 25 Jan-19 17:07

Endpoint: Hatched Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-5664-3443	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:10	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample FR_FRCP1		FR_FRCP120µg/L	0.7521	Exact	0.7521	Non-Significant Effect

CJT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	SS	1	59	60	0.01667	0.98333	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.98333	0.0%

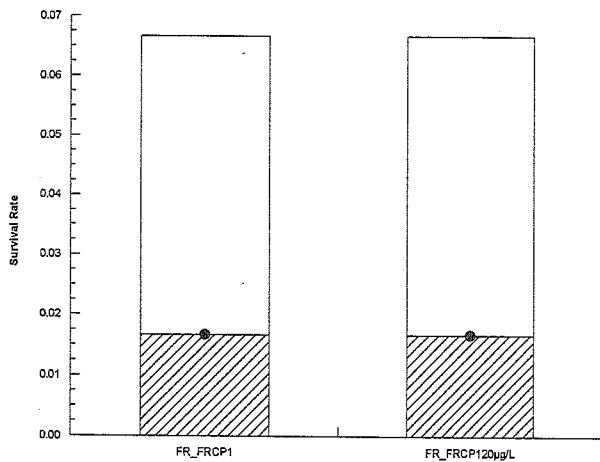
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0.0000	0.0000	0.0000	0.0667
FR_FRCP120µg/L		0.0000	0.0667	0.0000	0.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0/15	0/15	0/15	1/15
FR_FRCP120µg/L		0/15	1/15	0/15	0/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-1398-9580	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:11	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
FR_FRCP1		FR_FRCP120µg/L	0.7521	Exact	0.7521	Non-Significant Effect CLT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	SS	1	59	60	0.01667	0.9833	0.0%
FR_FRCP120µg/L		1	59	60	0.01667	0.9833	0.0%

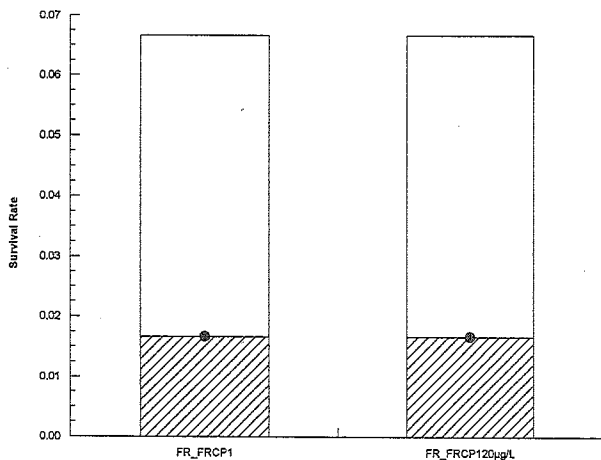
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0.0000	0.0000	0.0000	0.0667
FR_FRCP120µg/L		0.0000	0.0667	0.0000	0.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0/15	0/15	0/15	1/15
FR_FRCP120µg/L		0/15	1/15	0/15	0/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-8820-8776	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:09	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_FRCP120µg/L passed mean dry biomass-	1745.86%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample		FR_FRCP120µg/L	-0.8825	1.943	0.285	6	CDF	0.7943	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0335407	0.0335407	1	0.7788	0.4115	Non-Significant Effect
Error	0.25841	0.0430683	6			
Total	0.29195		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	79.72	47.47	0.0047	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.7399	0.6451	0.0063	Non-Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	SS	4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	0.00%
FR_FRCP120µg/L		4	0.1458	-0.3183	0.6099	0	0	0.5833	0.1458	200.00%	-792.87%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0	0	0	0.06533
FR_FRCP120µg/L		0	0.5833	0	0

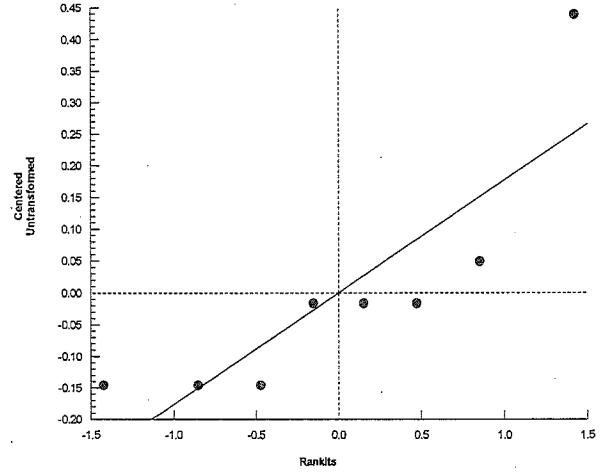
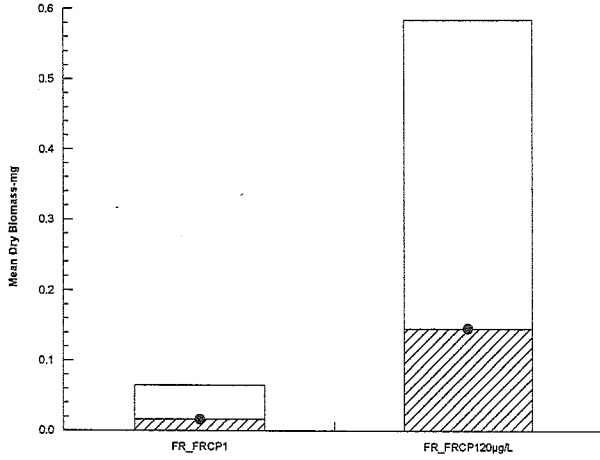
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-8820-8776 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:09 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-4394-4788	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:10	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRCP120µg/L passed mean dry biomass-	1745.86%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample FR_FRCP1		FR_FRCP120µg/L	0.8825	1.943	0.285	6	CDF	0.2057	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0335407	0.0335407	1	0.7788	0.4115	Non-Significant Effect
Error	0.25841	0.0430683	6			
Total	0.29195		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	79.72	47.47	0.0047	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.7399	0.6451	0.0063	Non-Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	SS	4	0.01633	-0.03565	0.06831	0	0	0.06533	0.01633	200.00%	0.00%
FR_FRCP120µg/L		4	0.1458	-0.3183	0.6099	0	0	0.5833	0.1458	200.00%	-792.87%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0	0	0	0.06533
FR_FRCP120µg/L		0	0.5833	0	0

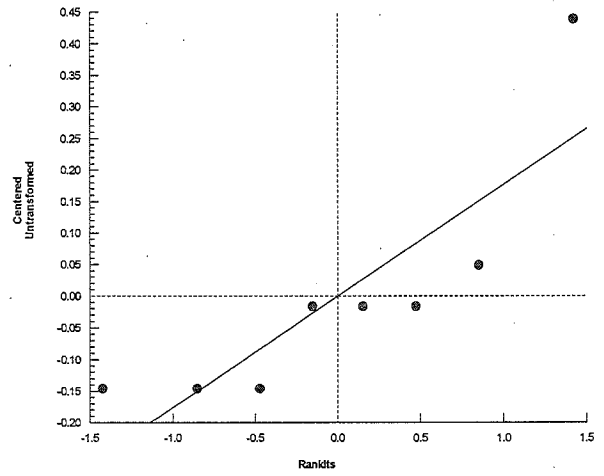
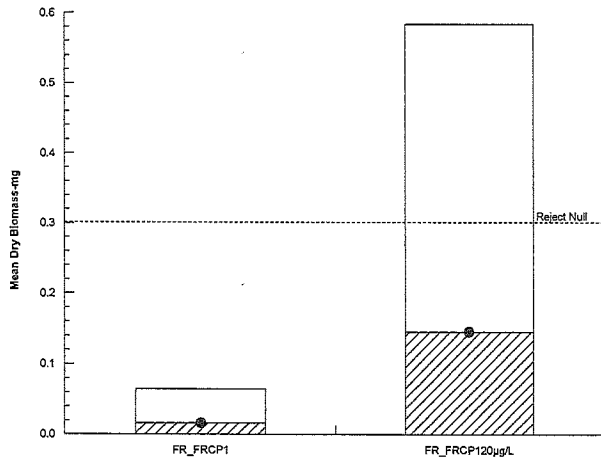
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-4394-4788 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:10 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-0593-6161 Endpoint: Hatched Rate CETIS Version: CETISv1.9.4
 Analyzed: 25 Jan-19 17:10 Analysis: Single 2x2 Contingency Table Status Level: 1

Batch ID: 05-2401-4870 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 09 Nov-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 11 Dec-18 11:20 Species: Pimephales promelas Brine:
 Test Length: 31d 21h Taxon: Actinopterygii Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
FR_FRCP1		FR_FRCP120µg/L	0.9406	Exact	0.9406	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	SS	57	3	60	0.95	0.05	3.39%
FR_FRCP120µg/L		59	1	60	0.9833	0.01667	0.0%

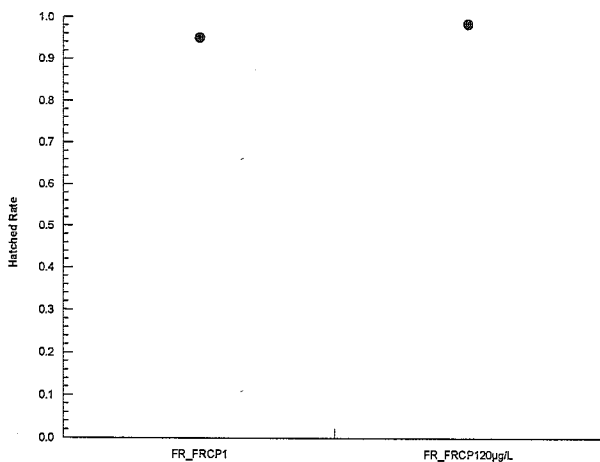
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0.8667	1.0000	1.0000	0.9333
FR_FRCP120µg/L		1.0000	1.0000	0.9333	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	13/15	15/15	15/15	14/15
FR_FRCP120µg/L		15/15	15/15	14/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:12 (p 2 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-8201-7558	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:11	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRCP1	17-5236-5947	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRCP120µg/L	09-0092-6318	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1	
FR_FRCP120µg/L	Water Sample	Teck Coal	FR_FRCP1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
FR_FRCP1		FR_FRCP120µg/L	0.3093	Exact	0.3093	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	SS	57	3	60	0.95	0.05	3.39%
FR_FRCP120µg/L		59	1	60	0.9833	0.01667	0.0%

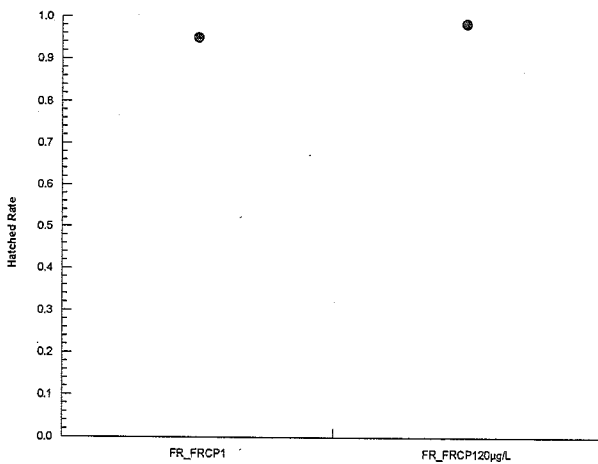
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	0.8667	1.0000	1.0000	0.9333
FR_FRCP120µg/L		1.0000	1.0000	0.9333	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	SS	13/15	15/15	15/15	14/15
FR_FRCP120µg/L		15/15	15/15	14/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-0633-6716	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
MC_MC2		CM_MC2 20 µg/L	0.9340	Exact	0.9340	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
MC_MC2	SS	48	12	60	0.8	0.2	0.0%
CM_MC2 20 µg/L		53	7	60	0.8833	0.1167	-10.42%

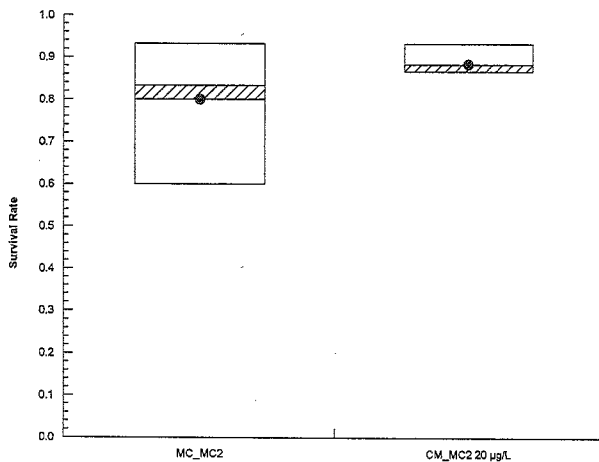
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	0.6000	0.9333	0.9333	0.7333
CM_MC2 20 µg/L		0.9333	0.8667	0.8667	0.8667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	9/15	14/15	14/15	11/15
CM_MC2 20 µg/L		14/15	13/15	13/15	13/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-5071-8676	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample <i>EMM</i>		CM_MC2 20 µg/L	0.1587	Exact	0.1587	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
MC_MC2	SS	48	12	60	0.8	0.2	0.0%
CM_MC2 20 µg/L		53	7	60	0.8833	0.1167	-10.42%

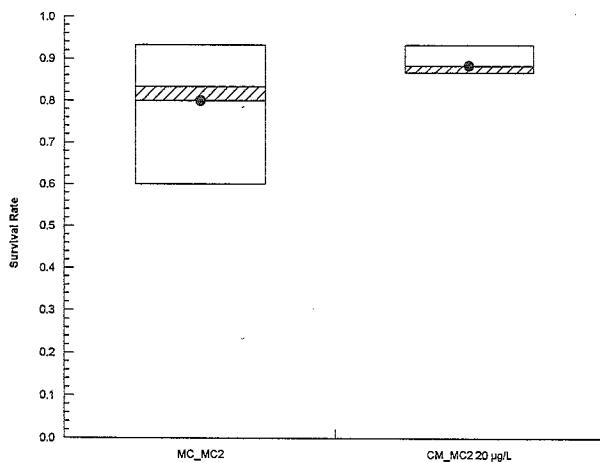
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	0.6000	0.9333	0.9333	0.7333
CM_MC2 20 µg/L		0.9333	0.8667	0.8667	0.8667

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	9/15	14/15	14/15	11/15
CM_MC2 20 µg/L		14/15	13/15	13/15	13/15

Graphics



EMM
 Feb-6/19

CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-9436-4626	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	CM_MC2 20 µg/L passed mean dry biomass-	12.72%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample <i>CM_MC2</i>		CM_MC2 20 µg/L	-2.287	1.943	0.318	6	CDF	0.9689	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.280247	0.280247	1	5.23	0.0622	Non-Significant Effect
Error	0.321487	0.0535811	6			
Total	0.601733		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.415	47.47	0.7822	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9416	0.6451	0.6271	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
MC_MC2	SS	4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	0.00%
CM_MC2 20 µg/L		4	2.874	2.539	3.209	2.834	2.663	3.165	0.1053	7.33%	-14.98%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	2.169	2.513	2.539	2.777
CM_MC2 20 µg/L		2.811	2.663	2.856	3.165

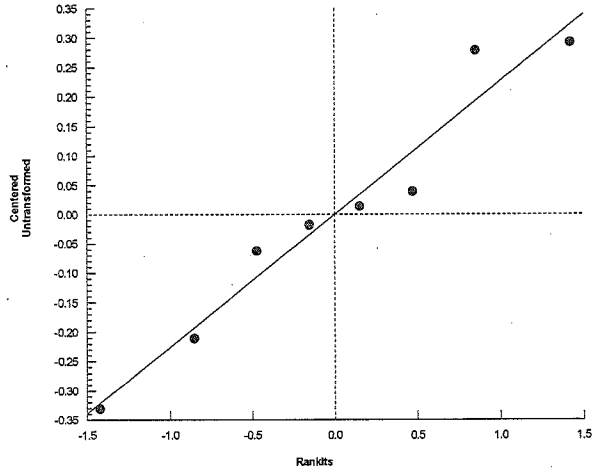
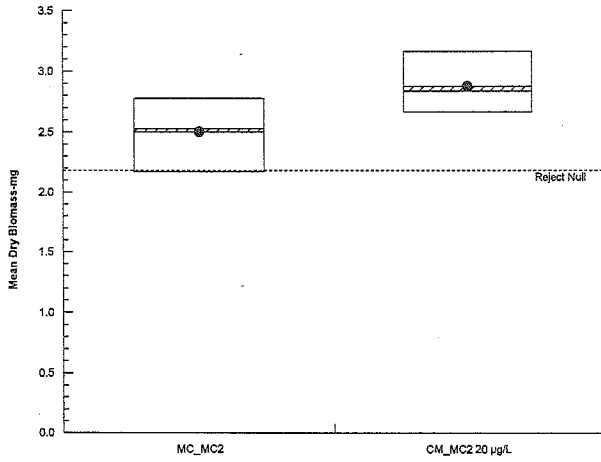
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-9436-4626 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-6710-5960	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	CM_MC2 20 µg/L failed mean dry biomass-m	12.72%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample		CM_MC2 20 µg/L*	2.287	1.943	0.318	6	CDF	0.0311	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.280247	0.280247	1	5.23	0.0622	Non-Significant Effect
Error	0.321487	0.0535811	6			
Total	0.601733		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.415	47.47	0.7822	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9416	0.6451	0.6271	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
MC_MC2	SS	4	2.5	2.101	2.898	2.526	2.169	2.777	0.1253	10.03%	0.00%
CM_MC2 20 µg/L		4	2.874	2.539	3.209	2.834	2.663	3.165	0.1053	7.33%	-14.98%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	2.169	2.513	2.539	2.777
CM_MC2 20 µg/L		2.811	2.663	2.856	3.165

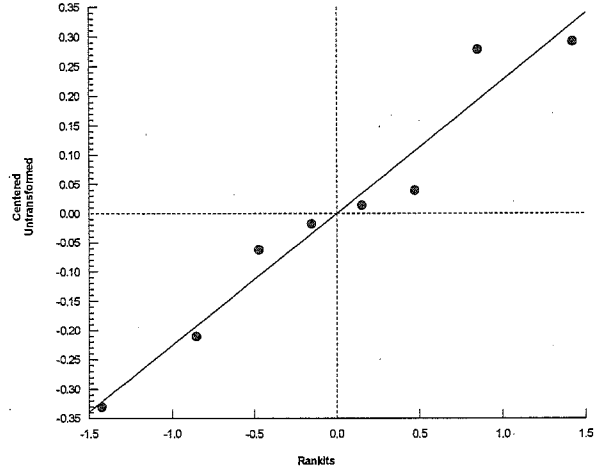
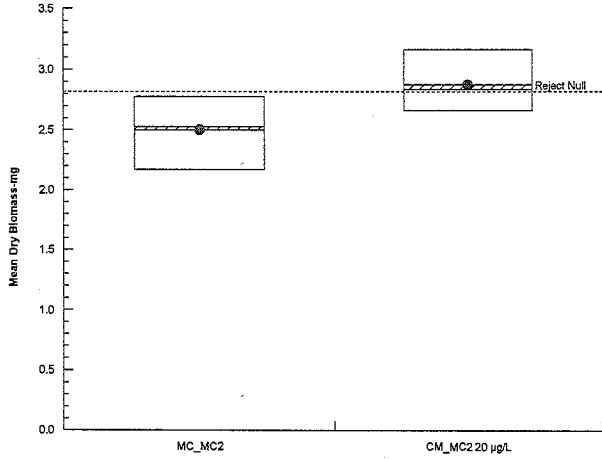
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-6710-5960 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 1 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-2519-1789 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 25 Jan-19 17:14 Analysis: Parametric-Two Sample Status Level: 1

Batch ID: 05-2401-4870 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 09 Nov-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 11 Dec-18 11:20 Species: Pimephales promelas Brine:
 Test Length: 31d 21h Taxon: Actinopterygii Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	CM_MC2 20 µg/L passed length-mm	6.73%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample <i>MM</i>		CM_MC2 20 µg/L	1.29	1.943	0.761	6	CDF	0.1222	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.51005	0.51005	1	1.665	0.2444	Non-Significant Effect
Error	1.83795	0.306325	6			
Total	2.348		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	3.357	47.47	0.3465	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9166	0.6451	0.4025	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
MC_MC2	SS	4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	0.00%
CM_MC2 20 µg/L		4	10.8	10.2	11.39	10.82	10.39	11.15	0.1875	3.47%	4.47%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	11.78	10.79	10.64	12
CM_MC2 20 µg/L		10.57	10.39	11.08	11.15

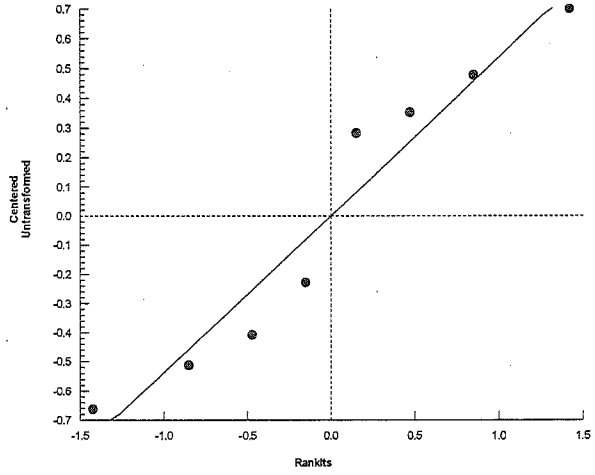
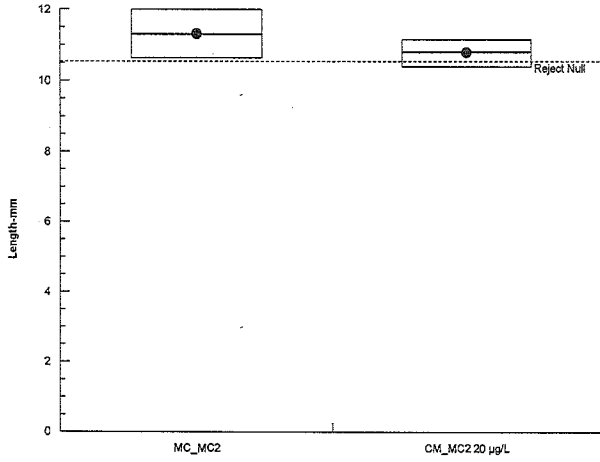
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-2519-1789 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 3 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-8680-3460	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
CM_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
CM_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	CM_MC2 20 µg/L passed length-mm	6.73%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample <i>CM_MC2</i>		CM_MC2 20 µg/L	-1.29	1.943	0.761	6	CDF	0.8778	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.51005	0.51005	1	1.665	0.2444	Non-Significant Effect
Error	1.83795	0.306325	6			
Total	2.348		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	3.357	47.47	0.3465	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9166	0.6451	0.4025	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	SS	4	11.3	10.21	12.4	11.28	10.64	12	0.3435	6.08%	0.00%
CM_MC2 20 µg/L		4	10.8	10.2	11.39	10.82	10.39	11.15	0.1875	3.47%	4.47%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	SS	11.78	10.79	10.64	12
CM_MC2 20 µg/L		10.57	10.39	11.08	11.15

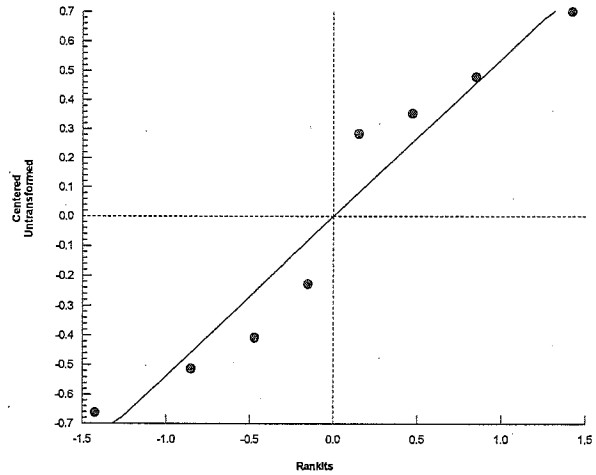
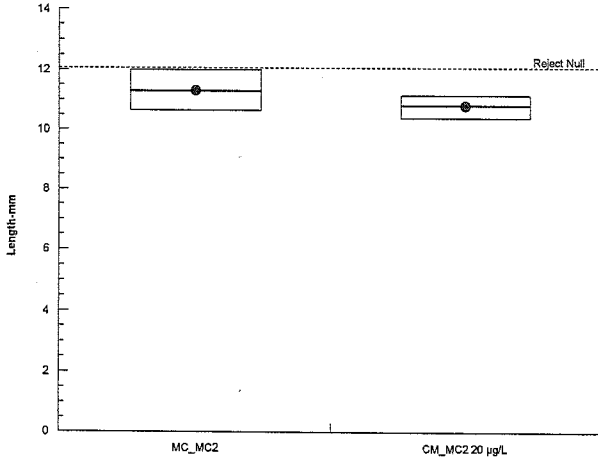
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-8680-3460 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:14 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-3593-1634	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:14	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample <i>CM_MC2</i>		CM_MC2 20 µg/L	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
MC_MC2	SS	59	1	60	0.9833	0.01667	0.0%
CM_MC2 20 µg/L		60	0	60	1	0	-1.7%

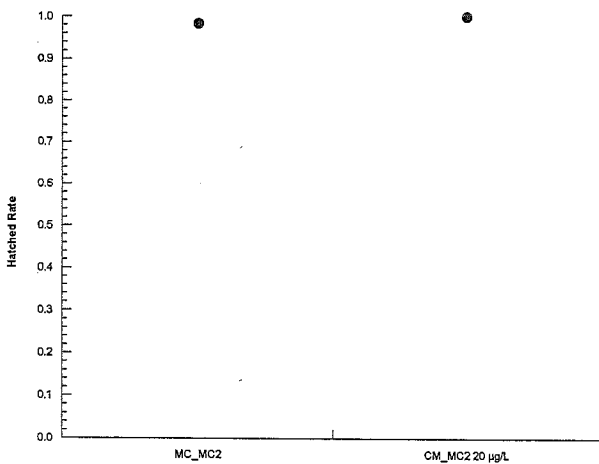
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	1.0000	1.0000	1.0000	0.9333
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	15/15	15/15	15/15	14/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:15 (p 2 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-2553-1987 Endpoint: Hatched Rate CETIS Version: CETISv1.9.4
 Analyzed: 25 Jan-19 17:14 Analysis: Single 2x2 Contingency Table Status Level: 1

Batch ID: 05-2401-4870 Test Type: Survival-Development-Growth Analyst: Emma Marus
 Start Date: 09 Nov-18 14:00 Protocol: ASTM E1241-05 (2013) Diluent: Mod-Hard Synthetic Water
 Ending Date: 11 Dec-18 11:20 Species: Pimephales promelas Brine:
 Test Length: 31d 21h Taxon: Actinopterygii Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
MC_MC2	03-0294-8597	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
CM_MC2 20 µg/L	17-0902-2790	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
MC_MC2	Water Sample	Teck Coal	CM_MC2	
CM_MC2 20 µg/L	Water Sample	Teck Coal	CM_MC2 20 µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample <i>EMMC2</i>		CM_MC2 20 µg/L	0.5000	Exact	0.5000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
MC_MC2	SS	59	1	60	0.9833	0.01667	0.0%
CM_MC2 20 µg/L		60	0	60	1	0	-1.7%

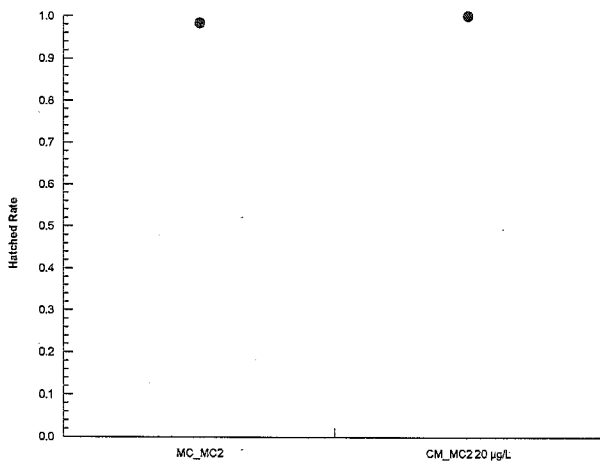
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	1.0000	1.0000	1.0000	0.9333
CM_MC2 20 µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
MC_MC2	SS	15/15	15/15	15/15	14/15
CM_MC2 20 µg/L		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:18 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-0113-6910	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:17	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample <i>GH_FR1</i>		GH_FR1 20µg/L	0.9932	Exact	0.9932	Non-Significant Effect <i>C>T</i>

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	SS	48	12	60	0.8	0.2	0.0%
GH_FR1 20µg/L		56	4	60	0.9333	0.0667	-16.67%

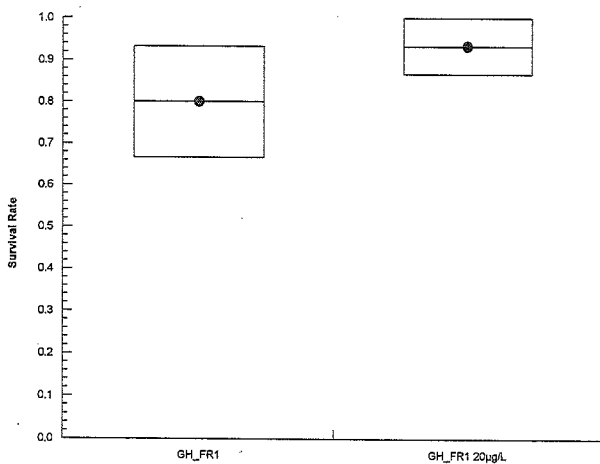
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	0.9333	0.6667	0.9333	0.6667
GH_FR1 20µg/L		0.8667	0.8667	1.0000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	14/15	10/15	14/15	10/15
GH_FR1 20µg/L		13/15	13/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:18 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-6736-4500	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample ①		GH_FR1 20µg/L*	0.0288	Exact	0.0288	Significant Effect

er er
EST EST
CKT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	SS	48	12	60	0.8	0.2	0.0%
GH_FR1 20µg/L		56	4	60	0.9333	0.06667	-16.67%

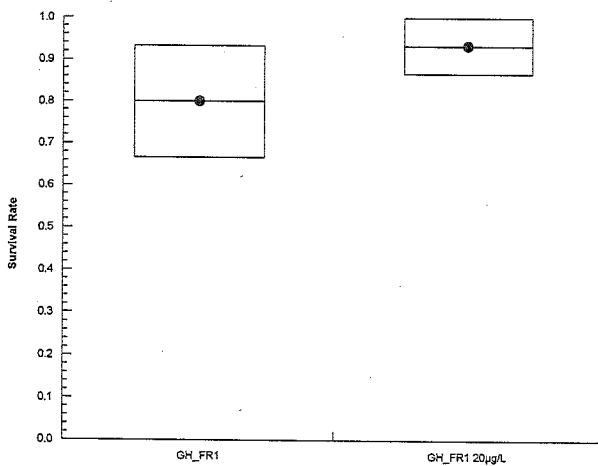
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	0.9333	0.6667	0.9333	0.6667
GH_FR1 20µg/L		0.8667	0.8667	1.0000	1.0000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	14/15	10/15	14/15	10/15
GH_FR1 20µg/L		13/15	13/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:17 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-5057-4827	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_FR1 20µg/L passed mean dry biomass-m	3.70%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample GH_FR1		GH_FR1 20µg/L	1.287	1.943	0.098	6	CDF	0.1227	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0083623	0.0083623	1	1.657	0.2454	Non-Significant Effect
Error	0.0302749	0.0050458	6			
Total	0.0386371		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	4.188	47.47	0.2701	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9824	0.6451	0.9739	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	SS	4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	0.00%
GH_FR1 20µg/L		4	2.57	2.5	2.64	2.579	2.511	2.611	0.02205	1.72%	2.45%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	2.601	2.753	2.539	2.645
GH_FR1 20µg/L		2.562	2.596	2.611	2.511

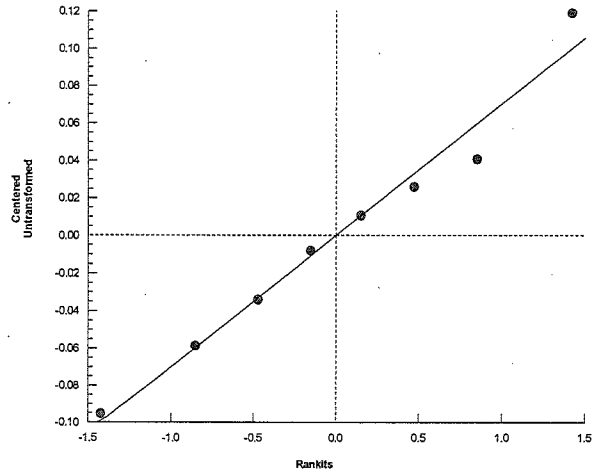
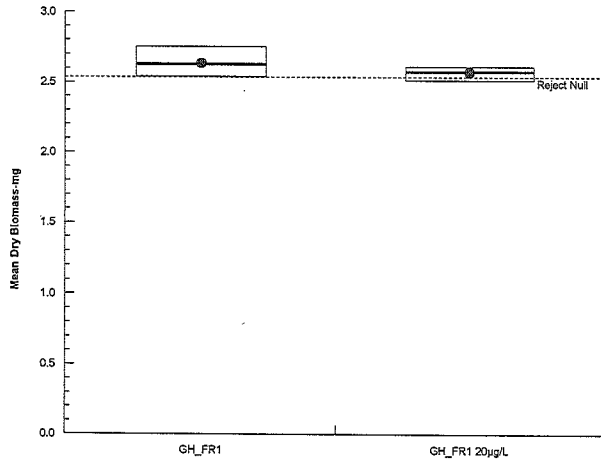
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-5057-4827 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:16 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:17 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 09-4362-7173	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_FR1 20µg/L passed mean dry biomass-m	3.70%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample GH_FR1		GH_FR1 20µg/L	-1.287	1.943	0.098	6	CDF	0.8773	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0083623	0.0083623	1	1.657	0.2454	Non-Significant Effect
Error	0.0302749	0.0050458	6			
Total	0.0386371		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	4.188	47.47	0.2701	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9824	0.6451	0.9739	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	SS	4	2.635	2.491	2.778	2.623	2.539	2.753	0.04513	3.43%	0.00%
GH_FR1 20µg/L		4	2.57	2.5	2.64	2.579	2.511	2.611	0.02205	1.72%	2.45%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	2.601	2.753	2.539	2.645
GH_FR1 20µg/L		2.562	2.596	2.611	2.511

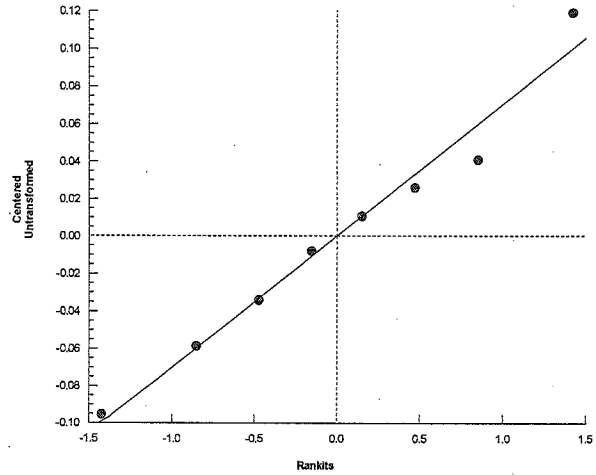
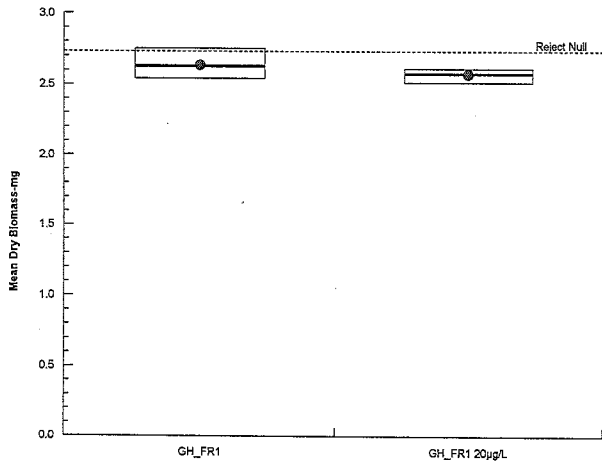
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-4362-7173 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:16 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:17 (p 1 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-0677-9217	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_FR1 20µg/L failed length-mm	4.50%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample ①		GH_FR1 20µg/L*	3.76	1.943	0.522	6	CDF	0.0047	Significant Effect

ANOVA Table

GH-FR1 10µg/L

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.0402	2.0402	1	14.14	0.0094	Significant Effect
Error	0.865799	0.1443	6			
Total	2.906		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	16.89	47.47	0.0441	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9513	0.6451	0.7241	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	SS	4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	0.00%
GH_FR1 20µg/L		4	10.58	10.38	10.78	10.58	10.47	10.69	0.06351	1.20%	8.71%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	10.93	12.1	11.43	11.9
GH_FR1 20µg/L		10.69	10.69	10.47	10.47

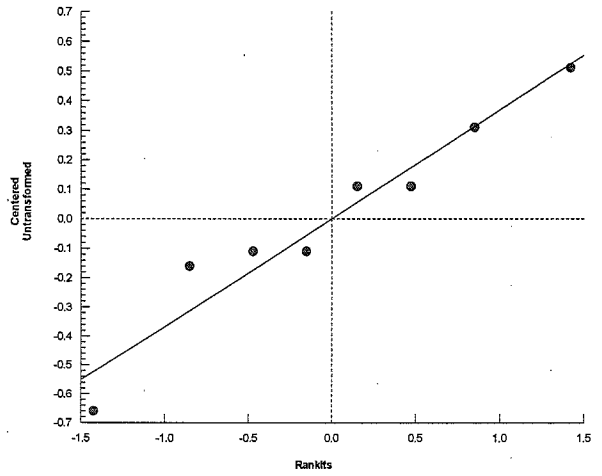
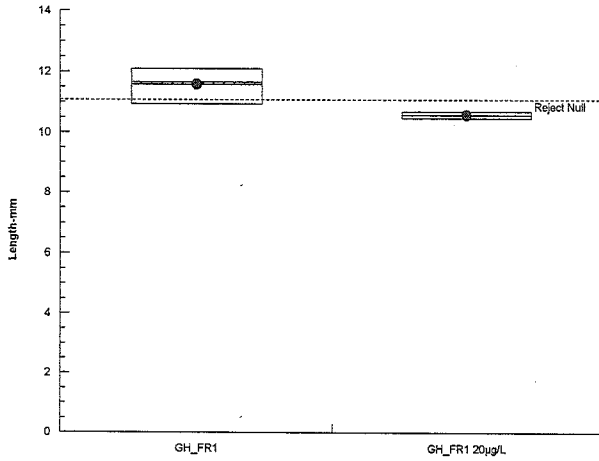
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 10-0677-9217 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:16 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:17 (p 3 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5546-4669	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	GH_FR1 20µg/L passed length-mm	4.50%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample GH_FR1		GH_FR1 20µg/L	-3.76	1.943	0.522	6	CDF	0.9953	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.0402	2.0402	1	14.14	0.0094	Significant Effect
Error	0.865799	0.1443	6			
Total	2.906		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	16.89	47.47	0.0441	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9513	0.6451	0.7241	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	SS	4	11.59	10.76	12.42	11.66	10.93	12.1	0.261	4.50%	0.00%
GH_FR1 20µg/L		4	10.58	10.38	10.78	10.58	10.47	10.69	0.06351	1.20%	8.71%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	10.93	12.1	11.43	11.9
GH_FR1 20µg/L		10.69	10.69	10.47	10.47

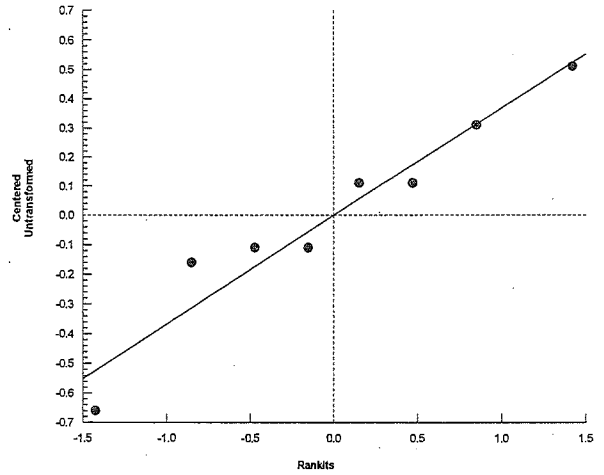
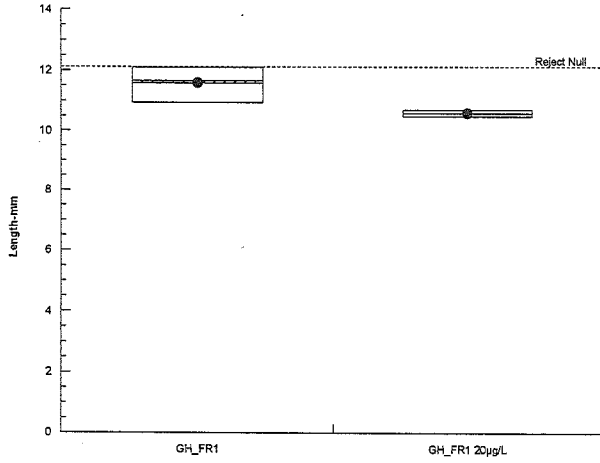
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5546-4669 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:16 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:17 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-7724-1226	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:16	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample GH_FR1		GH_FR1 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect

CJT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	SS	60	0	60	1	0	0.0%
GH_FR1 20µg/L		60	0	60	1	0	0.0%

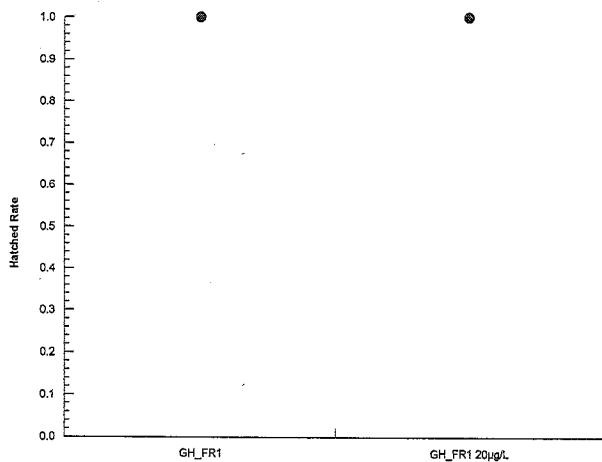
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	15/15	15/15	15/15	15/15
GH_FR1 20µg/L		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:18 (p 2 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 08-3859-3619	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:17	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
GH_FR1	05-7924-2029	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
GH_FR1 20µg/L	10-9409-4366	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
GH_FR1	Water Sample	Teck Coal	GH_FR1	
GH_FR1 20µg/L	Water Sample	Teck Coal	GH_FR1 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample		GH_FR1 20µg/L	1.0000	Exact	1.0000	Non-Significant Effect

CCT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	SS	60	0	60	1	0	0.0%
GH_FR1 20µg/L		60	0	60	1	0	0.0%

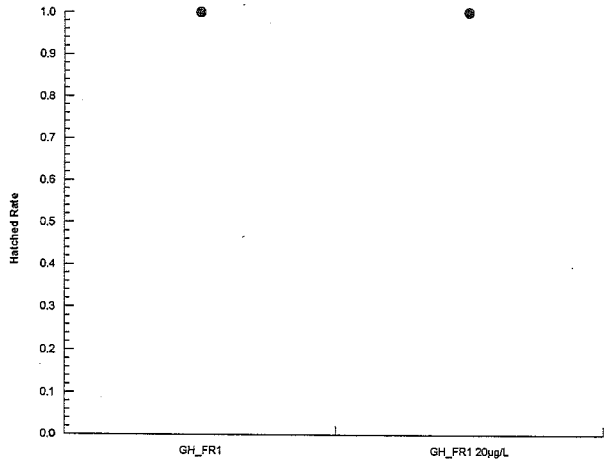
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	1.0000	1.0000	1.0000	1.0000
GH_FR1 20µg/L		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	SS	15/15	15/15	15/15	15/15
GH_FR1 20µg/L		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 3 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-6250-7242	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample 1		FR_FRABCH 20	0.2312	Exact	0.2312	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRABCH	SS	31	29	60	0.5167	0.4833	13.89%
FR_FRABCH 20		36	24	60	0.6	0.4	0.0%

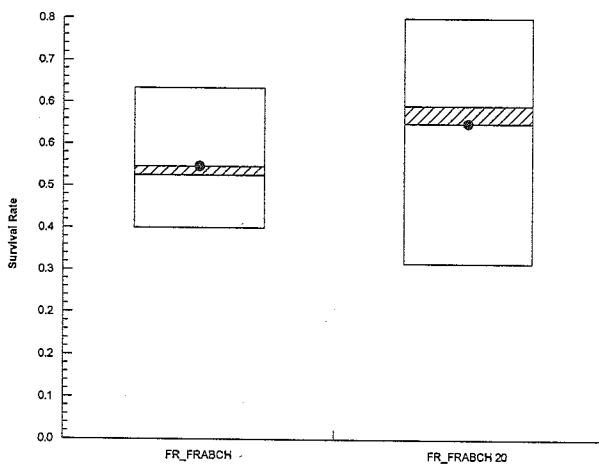
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	0.4000	0.4667	0.5333	0.6667
FR_FRABCH 20		0.4667	0.3333	0.8000	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	6/15	7/15	8/15	10/15
FR_FRABCH 20		7/15	5/15	12/15	12/15

Graphics



Feb-6/19

CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 4 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 15-9366-6412	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Sample FR_FRABCH		FR_FRABCH 20	0.8650	Exact	0.8650	Non-Significant Effect CCT

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRABCH	SS	31	29	60	0.5167	0.4833	13.89%
FR_FRABCH 20		36	24	60	0.6	0.4	0.0%

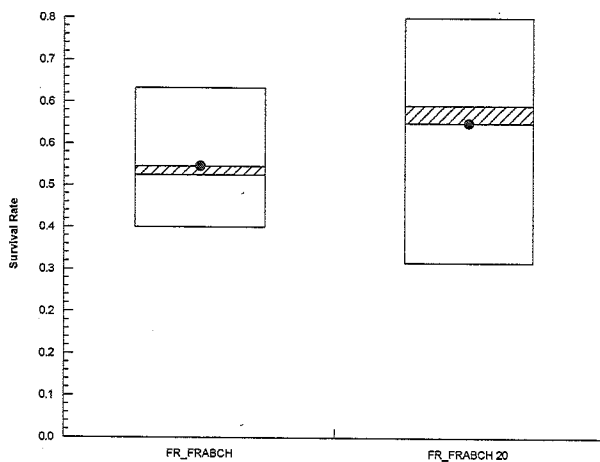
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	0.4000	0.4667	0.5333	0.6667
FR_FRABCH 20		0.4667	0.3333	0.8000	0.8000

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	6/15	7/15	8/15	10/15
FR_FRABCH 20		7/15	5/15	12/15	12/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5154-2769	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed <i>FR_FRABCH</i>	C > T	FR_FRABCH 20 passed mean dry biomass-m 6.72%	

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample		FR_FRABCH 20	-0.575	1.943	0.126	6	CDF	0.7069	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0027878	0.0027878	1	0.3306	0.5862	Non-Significant Effect
Error	0.0505917	0.008432	6			
Total	0.0533796		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.095	47.47	0.9421	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9344	0.6451	0.5566	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRABCH	SS	4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	0.00%
FR_FRABCH 20		4	1.915	1.765	2.064	1.919	1.807	2.013	0.04695	4.90%	-1.99%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	1.999	1.888	1.822	1.799
FR_FRABCH 20		1.97	1.869	1.807	2.013

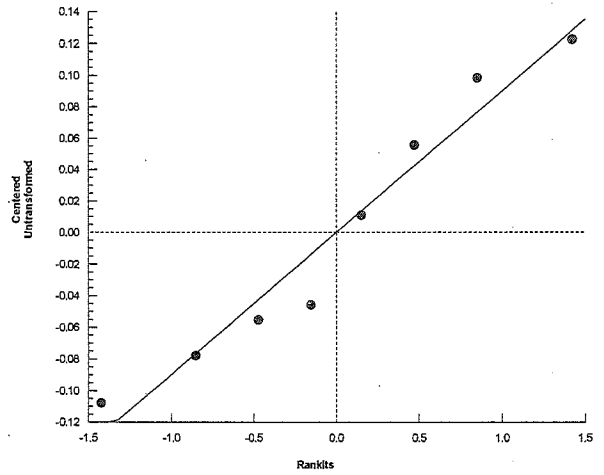
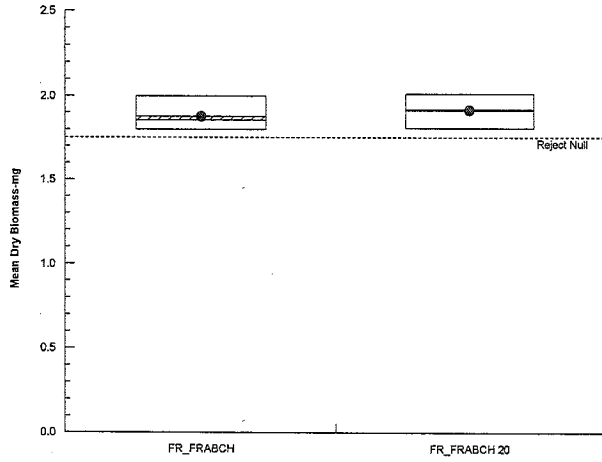
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5154-2769 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



EW
Feb 6/19

CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 7 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 16-3866-0444	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C < T	FR_FRABCH 20 passed mean dry biomass-m	6.72%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
FR_FRABCH		FR_FRABCH 20	0.575	1.943	0.126	6	CDF	0.2931	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0027878	0.0027878	1	0.3306	0.5862	Non-Significant Effect
Error	0.0505917	0.008432	6			
Total	0.0533796		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.095	47.47	0.9421	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9344	0.6451	0.5566	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRABCH	SS	4	1.877	1.734	2.02	1.855	1.799	1.999	0.04486	4.78%	0.00%
FR_FRABCH 20		4	1.915	1.765	2.064	1.919	1.807	2.013	0.04695	4.90%	-1.99%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	1.999	1.888	1.822	1.799
FR_FRABCH 20		1.97	1.869	1.807	2.013

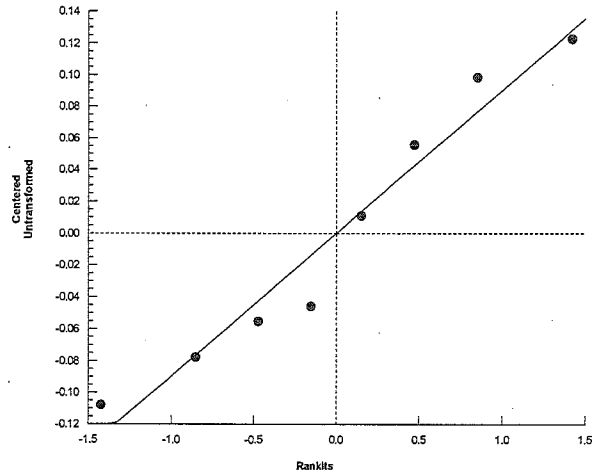
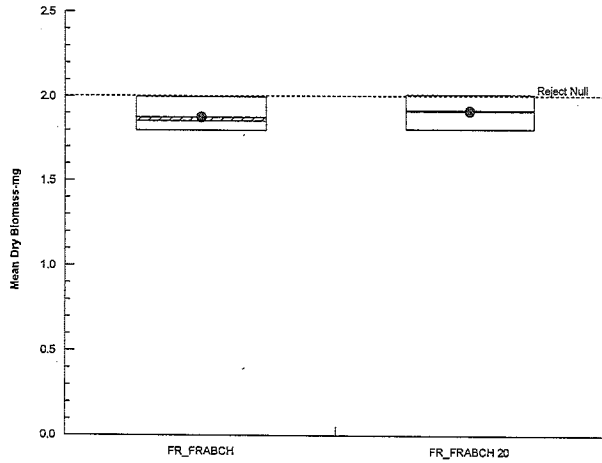
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-3866-0444 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 17:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 1 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 15-6041-7180	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed <i>FR_FRABCH</i>	C > T	FR_FRABCH 20 passed length-mm	12.49%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample		FR_FRABCH 20	0.8995	1.943	1.474	6	CDF	0.2015	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.931613	0.931613	1	0.809	0.4031	Non-Significant Effect
Error	6.90927	1.15155	6			
Total	7.84089		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.598	47.47	0.7095	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8931	0.6451	0.2500	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRABCH	SS	4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	0.00%
FR_FRABCH 20		4	11.13	9.234	13.02	11.09	9.92	12.4	0.5951	10.70%	5.78%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	13.17	11.57	11.5	11
FR_FRABCH 20		11.86	12.4	9.92	10.33

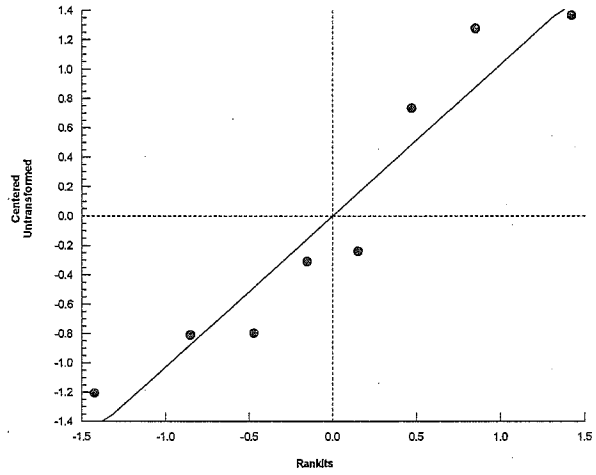
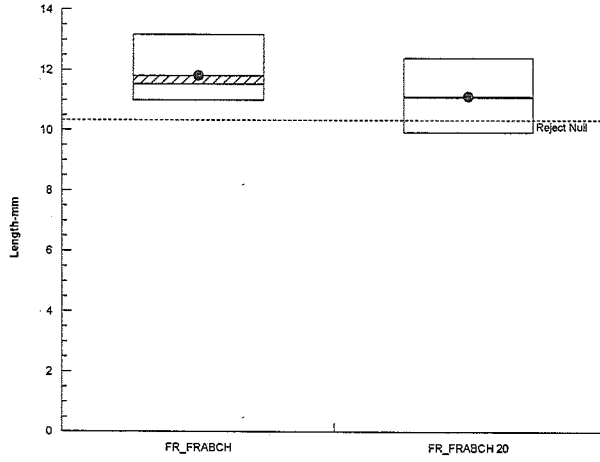
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 15-6041-7180 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 3 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test **Nautilus Environmental**

Analysis ID: 11-5215-2956	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed <i>FR_FRABCH</i>	C < T	FR_FRABCH 20 passed length-mm	12.49%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Sample		FR_FRABCH 20	-0.8995	1.943	1.474	6	CDF	0.7985	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.931613	0.931613	1	0.809	0.4031	Non-Significant Effect
Error	6.90927	1.15155	6			
Total	7.84089		7			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.598	47.47	0.7095	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8931	0.6451	0.2500	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRABCH	SS	4	11.81	10.31	13.31	11.53	11	13.17	0.4708	7.97%	0.00%
FR_FRABCH 20		4	11.13	9.234	13.02	11.09	9.92	12.4	0.5951	10.70%	5.78%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	13.17	11.57	11.5	11
FR_FRABCH 20		11.86	12.4	9.92	10.33

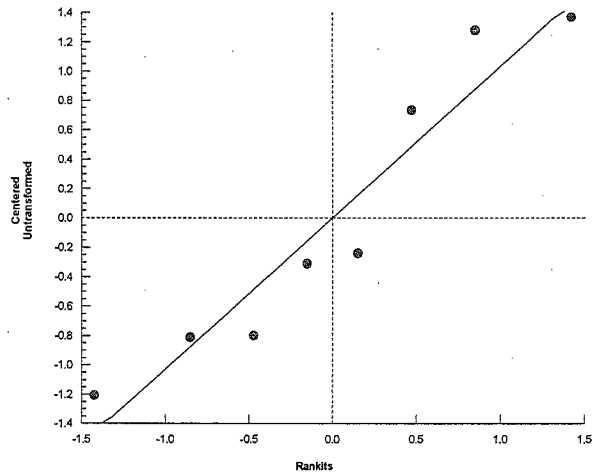
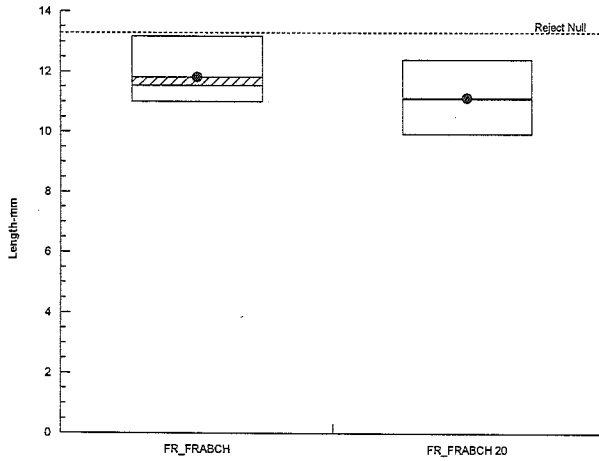
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-5215-2956 Endpoint: Length-mm
Analyzed: 25 Jan-19 17:19 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 1 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-0262-2110	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
FR_FRABCH		FR_FRABCH 20	0.5000	Exact	0.5000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRABCH	SS	59	1	60	0.9833	0.01667	1.67%
FR_FRABCH 20		60	0	60	1	0	0.0%

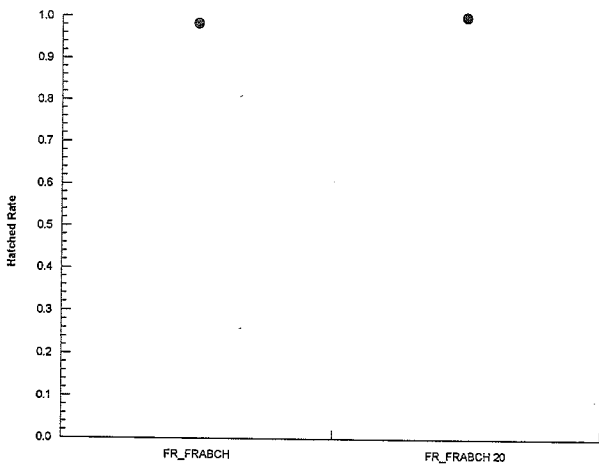
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	1.0000	1.0000	1.0000	0.9333
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	15/15	15/15	15/15	14/15
FR_FRABCH 20		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 17:20 (p 2 of 4)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-6328-8600	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 17:19	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_FRABCH	07-8898-7824	06 Nov-18	07 Nov-18	86h	Teck Coal	Teck Coal Q4 2018
FR_FRABCH 20	05-8546-6379	06 Nov-18	07 Nov-18	86h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH	
FR_FRABCH 20	Water Sample	Teck Coal	FR_FRABCH 20	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
FR_FRABCH		FR_FRABCH 20	1.0000	Exact	1.0000	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRABCH	SS	59	1	60	0.9833	0.01667	1.67%
FR_FRABCH 20		60	0	60	1	0	0.0%

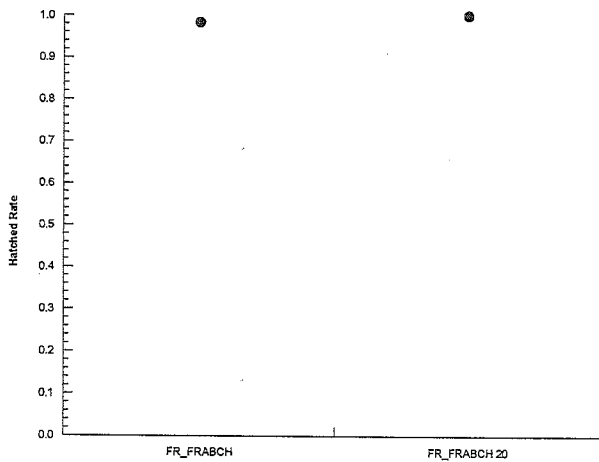
Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	1.0000	1.0000	1.0000	0.9333
FR_FRABCH 20		1.0000	1.0000	1.0000	1.0000

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRABCH	SS	15/15	15/15	15/15	14/15
FR_FRABCH 20		15/15	15/15	15/15	15/15

Graphics



CETIS Analytical Report

Report Date: 07 Feb-19 10:57 (p 2 of 2)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-6568-1888	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 07 Feb-19 10:55	Analysis: Single 2x2 Contingency Table	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-5223-4443	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h		
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control (no Cu)		Negative Control ①	0.8653	Exact	0.8653	Non-Significant Effect
		Method Control ②	0.9958	Exact	0.9958	Non-Significant Effect

Data Summary ① 10µg/L Cu ② 20µg/L Cu

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control	LC	51	9	60	0.85	0.15	12.07%
Cu Ctrl 10µg/L	N	54	6	60	0.9	0.1	6.9%
Cu Ctrl 20µg/L	MC	58	2	60	0.9667	0.03333	0.0%

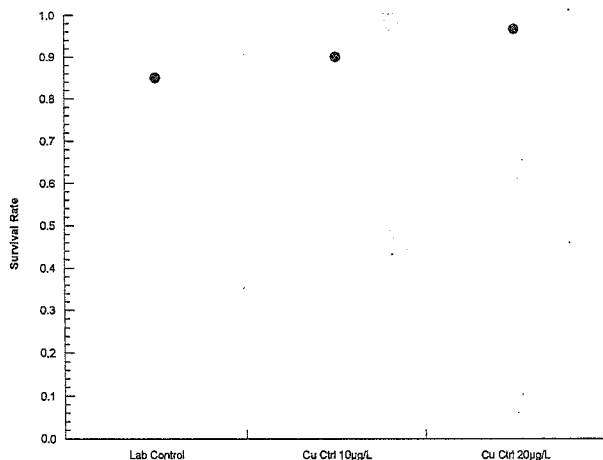
Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	0.8667	1.0000	0.6667	0.8667
Cu Ctrl 10µg/L	N	0.7333	1.0000	0.9333	0.9333
Cu Ctrl 20µg/L	MC	1.0000	0.9333	1.0000	0.9333

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	13/15	15/15	10/15	13/15
Cu Ctrl 10µg/L	N	11/15	15/15	14/15	14/15
Cu Ctrl 20µg/L	MC	15/15	14/15	15/15	14/15

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:53 (p 5 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-0362-7541	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:51	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-5223-4443	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h		
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed mean dry biomass-mg	6.67%
		Cu Ctrl 20µg/L passed mean dry biomass-mg	6.67%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Control		Negative Control	-0.3302	1.943	0.236	6	CDF	0.6238	Non-Significant Effect
		Method Control	-0.07519	1.943	0.215	6	CDF	0.5287	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0035956	0.0017978	2	0.08004	0.9237	Non-Significant Effect
Error	0.202138	0.0224598	9			
Total	0.205734		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.608	9.21	0.4475	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9534	0.8025	0.6868	Normal Distribution

Mean Dry Biomass-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	LC	4	3.226	2.904	3.548	3.249	2.968	3.439	0.1011	6.27%	0.00%
Cu Ctrl 10µg/L	N	4	3.266	3.051	3.481	3.303	3.083	3.375	0.0676	4.14%	-1.25%
Cu Ctrl 20µg/L	MC	4	3.234	3.091	3.378	3.251	3.121	3.315	0.04524	2.80%	-0.26%

Mean Dry Biomass-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	3.319	3.179	2.968	3.439
Cu Ctrl 10µg/L	N	3.361	3.083	3.245	3.375
Cu Ctrl 20µg/L	MC	3.121	3.315	3.299	3.203

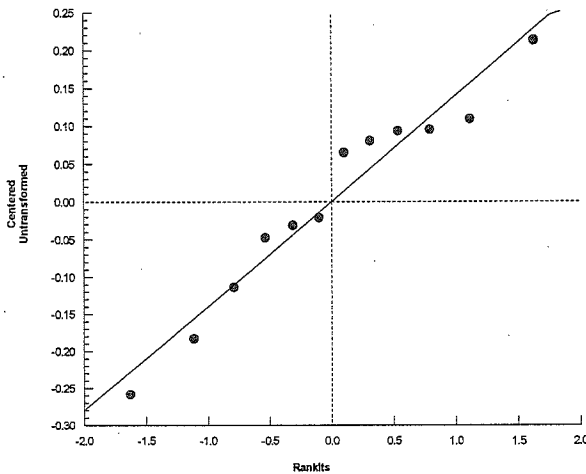
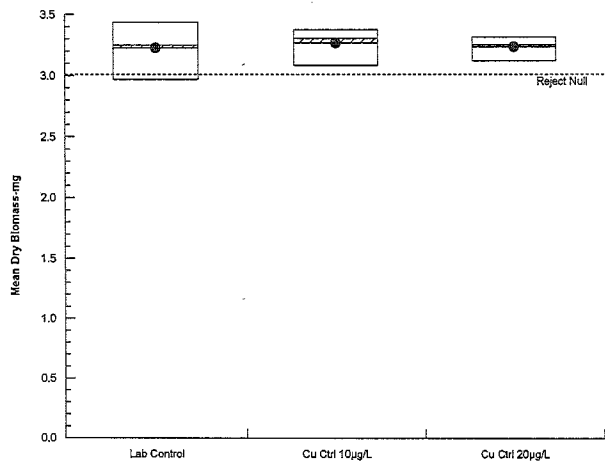
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-0362-7541 Endpoint: Mean Dry Biomass-mg
Analyzed: 25 Jan-19 16:51 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:52 (p 3 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-6680-5095	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:51	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-5223-4443	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h		
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Cu Ctrl 10µg/L passed length-mm	4.20%
		Cu Ctrl 20µg/L passed length-mm	4.20%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Control		Negative Control	0.2625	1.943	0.703	6	CDF	0.4009	Non-Significant Effect
		Method Control	0.7695	1.943	0.48	6	CDF	0.2354	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0721999	0.0360999	2	0.1803	0.8380	Non-Significant Effect
Error	1.8022	0.200245	9			
Total	1.8744		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.467	9.21	0.4802	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9576	0.8025	0.7486	Normal Distribution

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	LC	4	11.43	10.78	12.09	11.33	11.08	12	0.2043	3.57%	0.00%
Cu Ctrl 10µg/L	N	4	11.34	10.39	12.29	11.28	10.7	12.09	0.2987	5.27%	0.83%
Cu Ctrl 20µg/L	MC	4	11.25	10.8	11.69	11.17	11	11.64	0.1386	2.46%	1.66%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	11.08	11.2	12	11.46
Cu Ctrl 10µg/L	N	12.09	10.7	11.5	11.07
Cu Ctrl 20µg/L	MC	11	11.64	11.13	11.21

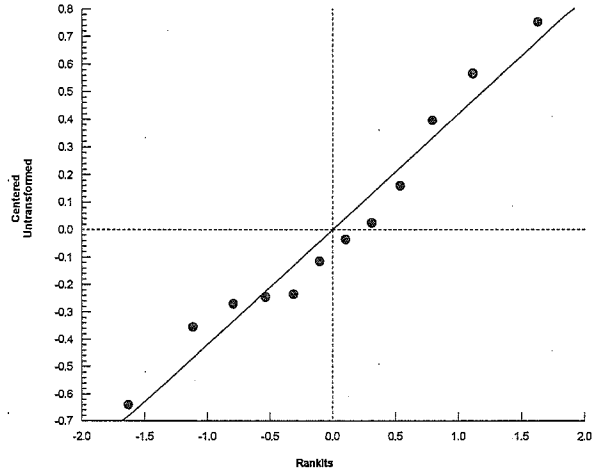
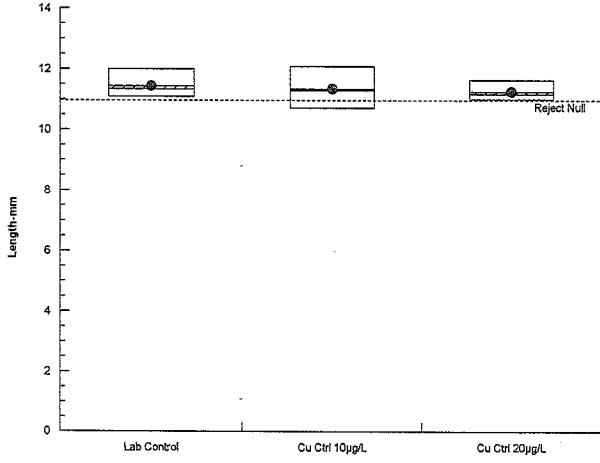
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-6680-5095 Endpoint: Length-mm
Analyzed: 25 Jan-19 16:51 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 25 Jan-19 16:52 (p 1 of 8)
 Test Code/ID: 181877 / 20-4999-8688

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0889-4935	Endpoint: Hatched Rate	CETIS Version: CETISv1.9.4
Analyzed: 25 Jan-19 16:52	Analysis: Parametric-Two Sample	Status Level: 1
Batch ID: 05-2401-4870	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 09 Nov-18 14:00	Protocol: ASTM E1241-05 (2013)	Diluent: Mod-Hard Synthetic Water
Ending Date: 11 Dec-18 11:20	Species: Pimephales promelas	Brine:
Test Length: 31d 21h	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Lab Control	05-5223-4443	09 Nov-18	09 Nov-18	14h	Teck Coal	Teck Coal Q4 2018
Cu Ctrl 10µg/L	18-3863-5145	09 Nov-18	09 Nov-18	14h		
Cu Ctrl 20µg/L	01-5215-5235	09 Nov-18	09 Nov-18	14h		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Lab Control	Water Sample	Teck Coal	Lab Control	
Cu Ctrl 10µg/L	Copper	Teck Coal	Cu Ctrl 10 µg/L	
Cu Ctrl 20µg/L	Copper	Teck Coal	Cu Ctrl 20µg/L	

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	DF	P-Type	P-Value	Decision(α:5%)
Lab Control		Negative Control ①	0	1.943	6	CDF	1.0000	Non-Significant Effect
(no Cu)		Method Control ②	0	1.943	6	CDF	1.0000	Non-Significant Effect

ANOVA Table

① Cu Ctrl 10µg/L ② Cu Ctrl 20µg/L

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0	0	2	65540	<1.0E-37	Significant Effect
Error	0	0	9			
Total	0		11			

Hatched Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	LC	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
Cu Ctrl 10µg/L	N	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
Cu Ctrl 20µg/L	MC	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%

Angular (Corrected) Transformed Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	LC	4	1.441	1.441	1.442	1.441	1.441	1.441	0	0.00%	0.00%
Cu Ctrl 10µg/L	N	4	1.441	1.441	1.442	1.441	1.441	1.441	0	0.00%	0.00%
Cu Ctrl 20µg/L	MC	4	1.441	1.441	1.442	1.441	1.441	1.441	0	0.00%	0.00%

Hatched Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 10µg/L	N	1.0000	1.0000	1.0000	1.0000
Cu Ctrl 20µg/L	MC	1.0000	1.0000	1.0000	1.0000

Angular (Corrected) Transformed Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	1.441	1.441	1.441	1.441
Cu Ctrl 10µg/L	N	1.441	1.441	1.441	1.441
Cu Ctrl 20µg/L	MC	1.441	1.441	1.441	1.441

Hatched Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	LC	15/15	15/15	15/15	15/15
Cu Ctrl 10µg/L	N	15/15	15/15	15/15	15/15
Cu Ctrl 20µg/L	MC	15/15	15/15	15/15	15/15

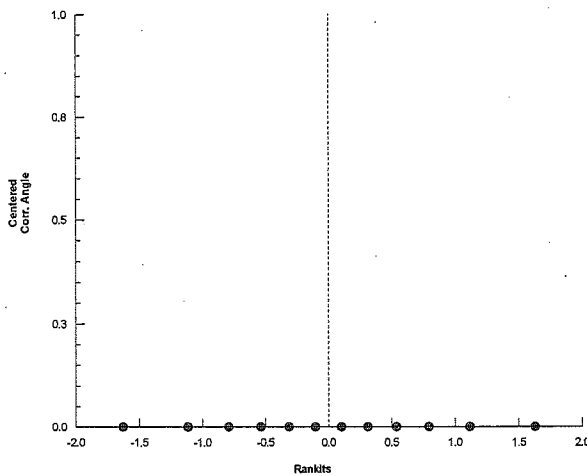
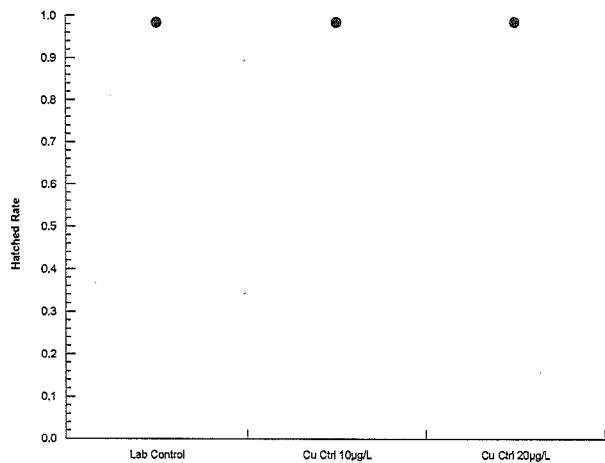
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0889-4935 Endpoint: Hatched Rate
Analyzed: 25 Jan-19 16:52 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



APPENDIX E – *Oncorhynchus mykiss* Toxicity Test Data

Embryo-Alevin Test Summary Sheet

Client: Teck Test Date: October 31 - November 30, 2018
 Work Order No.: 181873 Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Various - see table below
 Sample Date: October 30, November 6, 13, 20 and 27, 2018
 Date Received: October 31, November 7, 14, 21 and 28, 2018
 Sample Volume: (3-9) x 20 L to (1-3) x 200L per refresh

Dilution Water:

Type: Dechlorinated Tap Water
 Hardness (mg/L CaCO₃): 10 - 13
 Alkalinity (mg/L CaCO₃): 10 - 13

Test Organism Information:

Batch No: 103118
 Source: Lyndon Fish Hatcheries, New Dundee, ON Number male broodstock used: 3
 Loading Density: 1.10 g/L Number female broodstock used: 4
 Sperm motility check: Verification of sperm motility using a compound microscope

SDS Reference Toxicant Results:

Reference Toxicant ID: RTE112
 Stock Solution ID: 18S02
 Date Initiated: October 31, 2018
 7-d EC50 (95% CL): 3.0 (2.8 - 3.1) mg/L SDS

Reference Toxicant Mean and Range: 4.1 (2.1 - 7.9) mg/L SDS
 Reference Toxicant CV (%): 34

Test Results:

Sample ID	Survival (%) (Mean ± SD)	Normal (%) (Mean ± SD)	Length (mm) (Mean ± SD)	Wet weight (mg) (Mean ± SD)
Control	92.4 ± 8.1	88.0 ± 10.5	20.6 ± 0.3	102.2 ± 4.3
FR_UFR1	86.7 ± 3.3	83.3 ± 3.3	21.0 ± 0.2	103.8 ± 2.6
GH_ER2	87.8 ± 9.7	87.8 ± 9.7	21.1 ± 0.0	104.7 ± 2.1
CM_MC1	80.0 ± 0.0	80.0 ± 0.0	21.4 ± 0.4	105.6 ± 2.4
LC_SLC	89.7 ± 6.0	88.6 ± 8.0	21.3 ± 0.2	104.7 ± 3.3
FR_FRCP1	21.1 ± 21.7 ^{*1,2,3,4}	16.7 ± 15.3 ^{*1,2,3,4}	17.1 ± 0.1 ^{*1,2,3,4}	88.8 ± 0.6 ^{*1,2,3,4}
FR_FRABCH	70.4 ± 20.0 ^{*2,4}	69.3 ± 21.2 ^{*2,4}	20.3 ± 0.8 ^{3,4}	100.9 ± 4.7
GH_FR1	61.1 ± 19.5 ^{*1,2,4}	60.0 ± 17.6 ^{*1,2,3,4}	19.8 ± 0.1 ^{1,2,3,4}	99.6 ± 3.8
GH_ERC	90.0 ± 0.0	86.7 ± 3.3	20.7 ± 0.4	98.6 ± 2.6
EV_HC1	77.5 ± 14.0	77.5 ± 14.0	21.2 ± 0.8	105.2 ± 6.2
EV_MC2	84.2 ± 14.1	84.2 ± 14.1	21.6 ± 0.1	107.9 ± 2.6
CM_MC2	77.8 ± 13.9	76.7 ± 14.5	21.3 ± 0.2	111.0 ± 3.8
LC_LCDSSLCC	92.0 ± 8.0	90.9 ± 10.0	21.7 ± 0.2	112.1 ± 4.2
LC_LC3	87.8 ± 11.7	84.4 ± 13.5	21.3 ± 0.2	110.9 ± 4.9
LC_LC5	86.7 ± 8.8	85.6 ± 10.2	21.6 ± 0.2	107.8 ± 2.0
LC_DCDS	95.6 ± 5.1	92.2 ± 5.1	21.8 ± 0.1	112.3 ± 1.2

* Indicates results that were significantly lower relative to the laboratory control
¹ Indicates results that were significantly lower relative to reference site FR_UFR1
² Indicates results that were significantly lower relative to reference site GH_ER2
³ Indicates results that were significantly lower relative to reference site CM_MC1
⁴ Indicates results that were significantly lower relative to reference site LC_SLC

Reviewed by: JOU Date reviewed: Feb 13 / 19

Embryo-Alevin Toxicity Test Daily Mortality

131/6

Client: Tech
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		1	2	3	4	5	6	7	8	9	10	11	12	
Control	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2													0
	3													0
	4						6	2						8
FR-UFR1 100	1						0	0						0
	2						0	0						0
	3						1	0						2
	4						1	2						12
GH-ER2 100	1					0	1	0					0	1
	2					0	0	0						0
	3					0	0	0						0
	4					1	5	1						6
CM-MCI 100	1					0	0	1						1
	2						0	0						2
	3						0	0						0
	4						9	2						12
LC-SLC 100	1						0	0					0	0
	2						0	1						1
	3						0	0						0
	4						2	9	1					12
FR-FR(P) 100	1					0	0	0						0
	2													0
	3													0
	4													1
FR-FRACH ^B 100	1												0	3
	2												0	1
	3												2	4
	4						2	9	2	1			0	9
GH-FRI 100	1					0	0	0					0	1
	2						0	0					0	0
	3						0	0					2	3
	4						7	2	1				2	13
Tech Initials		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm

Comments:

Reviewed by:

Jen

Date reviewed:

Jan. 30/19

Embryo-Alevin Toxicity Test Daily Mortality

A246

Client: Teck
 Sample ID: (Various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 2, 2018 @ 0930
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		1	2	3	4	5	6	7	8	9	10	11	12	
GH-ERC 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2					0	0	0					1	1
	3					0	0	0					0	0
	4					1	0	2					0	11
EV-HCl 100	1				0	1	0					2	4	
	2					0	0			0		1	1	
	3					0	1			0		0	1	
	4					3	2			1		0	6	
EV-MCZ 100	1					0	0			0			0	
	2					0	0			0			0	
	3			↓		↓	0	0		↓			0	
	4			1		1	6	4	↓	↓			12	
CM-MCZ 100	1			0		0	0	0	2		1		3	
	2						↓		0		1	↓	1	
	3						↓			0		1	1	
	4						10			1		3	14	
LC-LC5SLC 100	1						0				0		0	
	2						↓				0		1	
	3						↓				1		1	
	4						5				1		7	
LC-LC3 100	1						0				0		0	
	2						↓						0	
	3						↓		↓				0	
	4						1	8	1				10	
LC-LC5 100	1					0	0	0					0	
	2						↓						0	
	3						↓		↓				0	
	4						6		1		↓		7	
LC-DCOS 100	1						0		0		3		3	
	2						↓				0		0	
	3						↓				0		0	
	4	↓	↓	↓	↓	↓	11	↓	↓	↓	0	↓	11	
Tech Initials		UN	UN	UN	2	UN	UN	UN	UN	2	UN	UN	UN	UN

Comments: _____

Reviewed by: JOB Date reviewed: Jan 30/19
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

Embryo-Alevin Toxicity Test Daily Mortality

P3.4/6

Client: Teck
 Sample ID: (Various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities											Total Dead Eggs/Embryos/ Alevins	
		13 ^①	14	15	16	17	18	19	20	21	22	23		24
GH-ERC 100	1	0	0	0	0	0	1	0	0	0	0	0	0	1
	2	↓	↓	↓	1	↓	0	0	1	②	↓	↓	↓	2
	3	↓	↓	↓	0	↓	↓	0	0	②	②	↓	↓	0
	4	↓	↓	↓	0	3	↓	1	1	↓	②	②	↓	3
EV-HCI 100	1	↓	↓	↓	0	0	↓	0	0	↓	②	↓	②	0
	2	↓	↓	↓	0	↓	↓	0	↓	↓	②	↓	②	1
	3	↓	0	↓	2	↓	↓	1	②	1	↓	②	↓	5
	4	↓	0	↓	0	↓	↓	0	↓	0	②	②	↓	0
EV-MC2 100	1	↓	0	↓	0	↓	↓	0	1	0	↓	②	↓	1
	2	↓	1	↓	1	↓	↓	0	0	2	↓	↓	②	4
	3	↓	0	↓	0	↓	1	2	1	0	②	1	②	6
	4	↓	0	↓	1	0	0	2	2	1	②	②	↓	6
CM-MC2 100	1	↓	↓	↓	0	↓	↓	1	1	1	↓	②	②	3
	2	↓	↓	↓	1	↓	↓	0	0	0	②	②	②	1
	3	↓	↓	↓	0	↓	↓	1	2	②	↓	②	↓	3
	4	↓	↓	↓	0	↓	↓	0	0	↓	②	②	↓	1
LL-DCSS-LCC 100	1	↓	0	↓	0	↓	↓	0	1	②	②	↓	↓	0
	2	↓	↓	↓	0	↓	↓	0	↓	↓	②	②	↓	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	②	↓	②	↓	3
	4	↓	↓	↓	↓	↓	↓	0	↓	↓	②	②	↓	3
LC-LC3 100	1	↓	↓	↓	0	0	↓	0	2	↓	②	②	1	②
	2	↓	↓	↓	0	↓	↓	0	0	②	②	②	0	0
	3	↓	↓	↓	1	↓	↓	1	0	②	②	②	0	4
	4	↓	1	↓	0	↓	↓	2	1	②	②	②	↓	4
LC-LC5 100	1	↓	0	↓	↓	↓	↓	0	0	↓	②	②	②	0
	2	↓	↓	↓	↓	↓	↓	0	1	↓	②	②	↓	1
	3	↓	↓	↓	↓	↓	↓	1	0	↓	②	②	↓	3
	4	↓	↓	↓	↓	↓	↓	0	0	1	②	②	↓	3
LC-DCDS 100	1	↓	↓	↓	↓	0	↓	↓	↓	0	②	②	②	0
	2	↓	↓	↓	↓	0	↓	↓	↓	↓	②	②	↓	1
	3	↓	↓	↓	↓	0	↓	↓	↓	↓	②	②	↓	0
	4	↓	↓	↓	↓	↓	↓	↓	↓	1	②	②	↓	5
Tech Initials		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm

Comments: ① at eyed stage ② starting to hatch ③ some fungus ④ ≥ 50% hatched

Reviewed by: JOH Date reviewed: Jan. 30/19

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities						Total Dead Embryos/ Alevins	Total Alevins Undeveloped/ Unhatched	Total No. Alevins Normal	Total Exposed Eggs
		25	26	27	28	29	30				
Control	1	2	0	0	0	0	3	4	1	25	31
	2	2	0	0	0	0	0	0	0	30	30
	3	2	0	0	0	0	2	2	3	25	30
	4	2	0	0	0	0	0	1	0	19	30
FR_VFR1 100	1	0	1	1	2	0	0	3	1	25	30
	2	0	0	0	0	0	0	1	1	24	30
	3	0	0	0	1	0	0	1	1	26	30
	4	0	0	0	0	0	0	1	0	12	30
GH_GR2 100	1	0	0	0	2	0	0	2	0	23	30
	2	0	0	0	0	1	0	0	0	29	31
	3	0	0	0	0	1	0	1	0	28	30
	4	0	0	0	0	0	0	0	0	19	29
CM_MCI 100	1	0	1	2	1	0	0	3	0	24	30
	2	0	1	0	0	0	0	1	0	24	30
	3	0	0	2	0	0	0	4	0	24	30
	4	0	0	0	0	1	0	1	0	13	30
LC_SLC 100	1	0	0	1	1	0	0	2	0	27	29
	2	0	0	0	0	0	0	0	0	28	30
	3	0	0	2	0	0	0	4	1	23	29
	4	0	0	0	0	0	0	0	0	15	30
FR_FRCP1 100	1	0	0	1	0	0	0	3	0	6	30
	2	0	1	1	0	0	1	13	4	9	30
	3	0	0	0	0	0	0	17	0	0	30
	4	0	2	0	0	0	0	5	2	1	29
FR_FRABCH 100	1	0	3	0	0	0	0	3	1	16	30
	2	0	0	0	0	0	0	0	0	28	30
	3	0	1	0	0	0	1	2	0	19	30
	4	0	0	0	0	0	0	0	0	15	29
GH_FR1 100	1	0	2	0	0	0	0	2	0	16	30
	2	0	1	0	0	0	0	1	1	24	30
	3	0	0	1	0	0	0	1	0	14	30
	4	0	0	0	0	0	0	0	1	4	30
Tech Initials		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm

Comments: ① dead eggs covered in ppt. ② some fungus

See "Rainbow Trout Embryo-Alevin Toxicity Test - Overall Results" for detailed normality assessments.

Reviewed by: JCh

Date reviewed: Jan. 30/19

Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck
 Sample ID: (Vancouver)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities							Total Dead Embryos/ Alevins	Total Undeveloped/ Unhatched ^{Abnormal Alevins}	Total No. Alevins _{normal}	Total Exposed Eggs
		25	26	27	28	29	30					
GH-ERC 100	1	0	0	0	20	0	0		2	1	~276	30
	2		0	0	0				0	0	27	30
	3		1	1	1				3	2	~275	30
	4		0	0	0				0	1	~273	30
EV-LC1 100	1		10	1		30	1		6	0	20	30
	2		0	0		0	0		0	0	28	30
	3						2		2	0	21	29
	4						0		0	0	23	29
EV-LC2 100	1								0	0	29	30
	2								0	0	27	31
	3			1	1	1			3	0	20	29
	4			0	0	0			0	0	12	30
CM-LC2 100	1	1		2	1				4	0	20	30
	2	0		0	0				0	0	28	30
	3		1	40					4	1	~221	30
	4		1	0			3		4	1	~110	30
LC-LC0SSLC	1		0	1					1	0	29	30
	2		0	0					0	0	29	30
	3		1						1	1	~273	29
	4		0	1					0	0	20	30
LC-LC3 100	1		0	10					1	0	26	30
	2		0	0					0	1	~3029	30
	3	1	1	1					3	2	~281	30
	4	0	1	0					1	0	15	30
LC-LC5 100	1	0	30	30					6	1	~273	30
	2		0	0					0	0	29	30
	3		1	1	1				2	0	25	30
	4		0	0	1				1	0	18	29
LC-LC5S 100	1				0				0	1	~276	30
	2								0	0	29	30
	3								0	2	~3028	30
	4								0	0	14	30
Tech Initials		U	U	U	U	U	U	U	U	U	U	U

Comments: ^{4th} @ some fungus
 See "Rainbow Trout Embryo-Alevin Toxicity Test - overall results" for detailed normality assessments

Reviewed by: JCA Date reviewed: Jan. 30/19

81120

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.1	10.1	10.1	10.1	10.0	10.2	10.1	10.2	9.8	10.1	10.1	10.1	10.0
pH	7.0	6.8	7.0	7.0	7.1	7.0	7.1	7.0	6.8	7.1	7.2	7.1	7.1
Cond. (µS/cm)	37	38		36		37		37		37		37	
Initials	A	A		mm		A		A		mm		mm	

FR-VFRI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.1	10.2	10.0	10.1	10.0	10.1	9.9	10.0	10.1	10.0	10.1
pH	8.0	8.0	8.0	8.0	8.1	8.1	8.2	8.0	8.1	8.0	8.2	8.0	8.1
Cond. (µS/cm)	354	345		363		349		348		365		350	
Initials	A	mm		mm		A		A		mm		mm	

GH-ER2 Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.7	10.2	10.0	10.1	10.0	10.2	10.0	10.0	9.8	10.0	10.1	10.0	10.1
pH	8.0	8.1	8.0	8.0	8.1	8.0	8.1	8.1	8.2	8.1	8.2	8.0	8.2
Cond. (µS/cm)	311	304		306		305		305		316		315	
Initials	A	mm		mm		A		A		mm		mm	

CM-MCI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.0	10.1	10.1	10.2	9.9	10.2	9.8	9.9	10.0	10.0	9.9
pH	8.0	8.0	8.0	8.0	8.1	8.1	8.1	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	370	268		269		271		269		271		272	
Initials	A	mm		mm		A		A		mm		mm	

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	FR-VFRI	GH-ER2	CM-MCI
Hardness*	12	mm 564/470	240	256
Alkalinity*	12	134	132	126

Analysts: AWD, mm
 Reviewed by: Jete
 Date reviewed: Jan. 29/19

* mg/L as CaCO3
 FR-VFRI - clear, no colour, no odour, no particulates
 GH-ER2 - clear, no colour, no odour, some particulates
 CM-MCI - clear, no colour, no odour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

132/20

Client: Teck
 Sample ID: (various)
 Work Order #: 181873
 (96 vial)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-SLC Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.2	10.1	9.9	10.1	10.1	10.0	10.1	9.9	10.0	10.1	10.1	10.2
pH	8.0	7.7	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.0	8.1
Cond. (µS/cm)	388	371		372		369		371		370		372	
Initials	A	UM		UM		A		A		UM		UM	

FR-FRCP1 Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.1	10.0	10.0	10.1	10.0	10.0	9.9	9.9	10.0	9.9	10.2
pH	8.0	7.7	8.1	7.7	8.1	7.8	8.0	7.7	8.0	7.8	8.0	7.8	8.0
Cond. (µS/cm)	3520	3410		3450		3450		3440		3410		3400	
Initials	A	UM		UM		A		A		UM		UM	

FR-FRABCH Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.2	10.0	10.2	10.1	9.9	10.1	9.8	9.9	10.0	9.9	10.1
pH	8.0	8.0	8.1	8.1	8.3	8.1	8.2	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	1108	1090		1087		1094		1091		1082		1074	
Initials	UM	UM		UM		A		A		UM		UM	

GH-FR1 Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.4	10.3	10.1	10.1	10.2	10.0	9.9	10.1	9.9	9.8	10.1	9.9	10.1
pH	8.1	8.2	8.2	8.2	8.3	8.1	8.3	8.2	8.1	8.1	8.2	8.1	8.2
Cond. (µS/cm)	889	876		881		874		871		880		881	
Initials	UM	UM		UM		A		A		UM		UM	

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 GH-FR1 probe

	Control	LC-SLC	FR-FRCP1	FR-FRABCH
Hardness*	690	240	2640	1100
Alkalinity*	180	134	150	196

Analysts: AWD, JAL

Reviewed by: JLH

Date reviewed: Jan 29/19

* mg/L as CaCO₃ LC-SLC, FR-FRABCH, GH-FR1 - clear, no colour, no odour, some particulates.

Sample Description: FR-FRCP1 - turbid, colourless, hydrocarbon odour, no particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

12/31/20

Client: Teck
 Sample ID: (various)
 Work Order #: 181873
 (p/w)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

GH-ERC Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.0	10.0	10.1	10.1	10.0	10.1	9.8	10.1	10.0	10.0	10.1
pH	8.0	8.1	8.1	8.1	8.2	8.0	8.2	8.0	8.1	8.0	8.2	8.1	8.2
Cond. (µS/cm)	339	330		329		330		329		333		330	
Initials	A	MM		MM		A		A		MM		MM	

EV-HCI Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.1	9.9	10.1	10.2	9.9	10.1	9.9	10.0	10.0	10.0	10.1
pH	8.0	8.2	8.1	8.1	8.2	8.1	8.1	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	738	730		730		731		730		735		732	
Initials	A	MM		MM		A		A		MM		MM	

EV-MC2 Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.0	10.2	10.1	10.1	10.0	10.0	9.8	10.0	10.0	9.9	10.1
pH	7.9	8.1	8.0	8.1	8.2	8.0	8.1	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	715	695		694		705		701		702		706	
Initials	A	MM		MM		A		A		MM		MM	

CM-MC2 Concentration 100	Days												
	0	1		2		3		4		5		6	
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.1	10.0	10.0	10.1	10.0	10.0	9.9	9.9	10.0	10.0	10.0
pH	8.0	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.1	8.1	8.2	8.1	8.3
Cond. (µS/cm)	1007	996		999		997		999		998		1000	
Initials	A	MM		MM		A		A		MM		MM	

Thermometer: CEP #3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 GH-ERC 10000 EV-HCI 10000 EV-MC2 10000 CM-MC2 10000

	GH-ERC	EV-HCI	EV-MC2	CM-MC2
Hardness*	238	450	410	~780 SiO
Alkalinity*	140	186	174	128

Analysts: AWD, MM

Reviewed by: JOU

Date reviewed: Jan 29/19

* mg/L as CaCO3

Sample Description:

GH-ERC, EV-HCI, EV-MC2, CM-MC2 -
 clear, no colour, no odour, some particulates.

Comments:

1034/20

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TACK
 Sample ID: (VANCOUS)
 Work Order #: 181873
 (% v/v)

Start Date & Time: October 31, 2018 @ 15:30h
 Stop Date & Time: November 30, 2018 @ 09:30h
 Test Species: Oncorhynchus mykiss

LC-LCDS-LCC Concentration 100	Days													
	0	1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.0	10.2	10.0	10.1	10.0	10.1	9.9	9.9	10.2	9.8	10.1	
pH	7.9	8.1	8.0	8.1	8.2	8.1	8.2	8.0	8.1	8.1	8.2	8.1	8.2	
Cond. (µS/cm)	843	836		829		831		834		836		840		
Initials	A	UM		UM		A		A		UM		UM		

LC-LC3 Concentration 100	Days													
	0	1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.1	10.1	10.0	10.0	10.1	10.1	9.8	9.9	10.2	10.0	10.0	
pH	8.0	7.9	8.1	7.9	8.2	8.0	8.2	8.0	8.2	8.0	8.3	8.1	8.3	
Cond. (µS/cm)	1017	942		937		937		932		932		930		
Initials	A	UM		UM		A		A		UM		UM		

LC-LC5 Concentration 100	Days													
	0	1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.0	10.1	10.0	10.0	10.0	10.0	9.8	10.0	10.1	10.1	10.0	
pH	8.0	8.3	8.1	8.2	8.2	8.1	8.2	8.2	8.2	8.1	8.2	8.1	8.3	
Cond. (µS/cm)	747	743		740		745		741		747		746		
Initials	A	UM		UM		A		A		UM		UM		

LC-DCDS Concentration 100	Days													
	0	1		2		3		4		5		6		
	init.	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	
DO (mg/L)	10.3	10.2	10.1	10.0	10.1	10.1	10.0	10.0	9.8	10.0	10.1	10.0	9.9	
pH	8.1	8.5	8.2	8.4	8.2	8.5	8.2	8.4	8.3	8.1	8.2	8.1	8.3	
Cond. (µS/cm)	602	599		600		603		605		604		607		
Initials	A	UM		UM		A		A		UM		UM		

Thermometer: ORP#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-LCDS-LCC probe LC-LC3 probe LC-LC5 probe LC-DCDS probe

	Control	LC-LC3	LC-LC5	LC-DCDS
Hardness*	620	830	840	330
Alkalinity*	154	202	174	140

Analysts: AWJ/YML
 Reviewed by: JLH
 Date reviewed: Jan. 29/19

* mg/L as CaCO3

LC-LCDS-LCC, LC-LC3, LC-LC5, LC-DCDS -

Sample Description: clear, no colour, no odour, some particulates.

Comments:

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck (Various)
 Sample ID: 181873
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 20, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (1/2 v10)	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.1	10.1	10.0	10.2	10.1	10.2	10.1	10.2	9.9	10.1	10.2	10.1	10.0
pH	7.1	7.1	6.9	7.1	6.9	6.8	7.2	7.0	7.2	6.8	7.1	7.1	7.1	7.1
Cond. (µS/cm)	36		36		36		37		38		37		37	
Initials	UM		UM		UM		UM		P		UM		UM	

FR-VFRI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	9.9	10.1	10.1	10.1	10.1	9.8	9.8	10.2	10.0	10.0
pH	8.0	8.1	8.0	8.1	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.2
Cond. (µS/cm)	352		342		343		345		344		341		348	
Initials	UM		UM		UM		UM		P		UM		UM	

GH-ER2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	9.9	9.8	10.1	10.0	10.1	10.1	10.1	10.1	9.9	9.9	10.1	9.8	10.0
pH	8.0	8.2	8.0	8.2	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.2	8.1	8.2
Cond. (µS/cm)	305		304		307		310		311		309		306	
Initials	UM		UM		UM		UM		P		UM		UM	

CM-MCI Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	10.0	10.1	10.1	10.2	10.1	9.9	9.9	10.1	10.0	10.1
pH	8.1	8.3	7.9	8.1	8.0	8.2	8.1	8.0	8.1	8.1	8.1	8.1	8.0	8.2
Cond. (µS/cm)	269		254		255		262		265		256		255	
Initials	UM		UM		UM		UM		P		UM		UM	

Thermometer: CER-#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 Analysts: AND, UM
 Reviewed by: JG
 Date reviewed: Feb 6/19

	Control	FR-VFRI	GH-ER2	CM-MCI
Hardness*	13	198	156	126
Alkalinity*	11	138	138	113

* mg/L as CaCO3
 FR-VFRI, GH-ER2, CM-MCI:

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck
 Sample ID: (initials)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-SLC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.1	9.8	10.1	9.8	10.1	10.1	10.0	10.2	10.1	9.8	10.1	10.0	10.1
pH	7.9	8.1	8.0	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.0	8.1	8.1	8.2
Cond. (µS/cm)	370		371		374		383		380		374		376	
Initials	mm		mm		mm		mm		mm		mm		mm	

FR-FRCP1 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.5	14.0
DO (mg/L)	10.1	10.1	9.9	10.0	9.8	10.1	10.1	10.0	10.1	10.0	9.9	10.1	10.1	10.0
pH	7.8	8.0	7.9	8.1	7.7	8.1	7.9	8.0	7.8	8.1	7.7	8.3	7.6	8.3
Cond. (µS/cm)	3430		3480		3430		3550		3500		3440		3420	
Initials	mm		mm		mm		mm		mm		mm		mm	

FR-FRABCH Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.5	14.0
DO (mg/L)	10.1	10.0	10.0	10.1	9.9	10.2	10.0	10.1	10.1	10.0	10.0	10.2	10.0	10.2
pH	8.1	8.2	7.9	8.2	8.1	8.2	8.1	8.3	8.1	8.2	8.0	8.2	7.9	8.2
Cond. (µS/cm)	1085		1088		1091		1112		1113		1069		1072	
Initials	mm		mm		mm		mm		mm		mm		mm	

GH-FR1 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	9.9	10.1	10.0	10.1	10.1	10.1	10.1	9.9	10.0	10.1	10.0	10.1
pH	8.1	8.2	8.1	8.1	8.1	8.2	8.1	8.3	8.0	8.2	8.0	8.2	8.1	8.3
Cond. (µS/cm)	877		901		900		922		925		900		901	
Initials	mm		mm		mm		mm		mm		mm		mm	

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-SLC probe FR-FRCP1 probe FR-FRABCH probe GH-FR1 probe
 Control | FR-FRCP1 | FR-FRABCH | GH-FR1
 Hardness* | 188 | 2390 | w/ 620 1150 | 480
 Alkalinity* | 132 | 270 | 200 | 186
 * mg/L as CaCO3
 Analysts: AWD/mm
 Reviewed by: 1/9/19
 Date reviewed: Feb. 6/19

Sample Description: LC-SLC, FR-FRCP1, FR-FRABCH, GH-FR1 - clear, no colour, no odour, some particulates
FR-FRCP1 - slightly turbid, light grey, no odour, some particulates.
 Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

B37120

Client: Teck
 Sample ID: (VANU1)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0830h
 Test Species: Oncorhynchus mykiss

GH-ERC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.5	14.0
DO (mg/L)	10.2	10.0	10.0	10.0	10.0	10.2	10.1	10.0	10.1	10.0	10.0	10.2	9.8	10.1
pH	8.1	8.2	7.9	8.1	8.1	8.3	8.0	8.3	8.1	8.2	8.0	8.2	8.0	8.3
Cond. (µS/cm)	329		327		330		341		390		328		339	
Initials	MM		MM		MM		MM		P		MM		MM	

EV-HCl Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.1	10.2	9.9	10.1	10.1	10.1	10.0	10.1	9.8	10.2	10.0	10.0
pH	8.0	8.2	8.1	8.1	8.1	8.2	8.1	8.2	8.0	8.1	8.1	8.1	8.1	8.3
Cond. (µS/cm)	730		741		750		764		765		742		742	
Initials	MM		MM		MM		MM		P		MM		MM	

EV-MC2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.1	10.1	10.1	9.9	10.1	10.1	10.0	10.1	9.9	9.9	10.1	10.1	10.0
pH	8.0	8.2	7.8	8.1	8.1	8.2	8.1	8.2	8.0	8.2	8.1	8.2	7.9	8.2
Cond. (µS/cm)	693		612		612		616		616		610		602	
Initials	MM		MM		MM		MM		P		MM		MM	

CM-MC2 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.0	10.2	10.0	10.1	10.0	10.1	10.1	10.0	9.9	10.1	10.0	10.0
pH	8.0	8.2	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.3
Cond. (µS/cm)	996		934		931		921		930		932		930	
Initials	MM		MM		MM		MM		P		MM		MM	

Thermometer: CERT#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 GH-ERC probe EV-HCl probe EV-MC2 probe CM-MC2 probe

	Control	EV-HCl	EV-MC2	CM-MC2
Hardness*	172	392	310	480
Alkalinity*	144	152	152	170

Analysts: AND, MM

Reviewed by: JOH

Date reviewed: Feb. 6/19

* mg/L as CaCO3
 Sample Description: GH-ERC, EV-HCl, EV-MC2, CM-MC2 - clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

13/8/20

Client: Teck
 Sample ID: (Various)
 Work Order #: 181873
 (% v/v)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 20, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LL-LCDS-LCC Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.1	10.0	10.0	10.0	10.1	10.0	10.2	10.1	10.0	10.1	10.2	10.0	10.1
pH	8.1	8.2	8.1	8.2	8.2	8.3	8.2	8.2	8.2	8.3	8.2	8.3	8.2	8.3
Cond. (µS/cm)	891		850		850		850		852		851		849	
Initials	um		um		um		um		a		um		um	

LC-LC3 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.1	10.0	9.8	10.1	10.0	10.2	10.1	10.1	9.9	10.2	10.0	10.1
pH	8.0	8.2	7.9	8.2	8.0	8.2	8.0	8.3	8.0	8.2	8.2	8.3	8.1	8.3
Cond. (µS/cm)	932		1057		1056		1060		1062		1055		1056	
Initials	um		um		um		um		a		um		um	

LC-LC5 Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.1	10.1	10.1	10.0	10.0	10.1	10.2	10.0	10.1	9.9	10.2	9.9	10.1
pH	8.0	8.2	8.1	8.3	8.1	8.2	8.1	8.3	8.1	8.2	8.2	8.3	8.1	8.2
Cond. (µS/cm)	745		753		753		762		755		755		754	
Initials	um		um		um		um		a		um		um	

LC-DCDS Concentration 100	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	10.0	10.1	10.0	10.0	10.1	10.0	10.0	10.1	9.9	10.0
pH	8.1	8.2	8.2	8.2	8.1	8.2	8.1	8.2	8.2	8.3	8.2	8.3	8.2	8.2
Cond. (µS/cm)	um	39604	609		596		608		600		603		600	
Initials	um		um		um		um		a		um		um	

Thermometer: CEP#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-LCDS-LCC probe DCDS probe

	Control	LC-LC3	LC-LC5	LC-DCDS
Hardness*	540	560	500	298
Alkalinity*	184	206	164	136

Analysts: AWD/um
 Reviewed by: JOB
 Date reviewed: Feb 6/19

* mg/L as CaCO₃

Sample Description: clear, no colour, no odour, some particulates.

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

P3 9/20

Client: Truck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.0	10.1	10.1	10.0	10.1	10.2	10.1	9.8	10.0	10.1	10.0	10.1
pH	6.9	7.0	7.1	7.0	7.1	7.0	6.8	7.0	6.8	7.2	7.0	7.1	7.1	7.2
Cond. (µS/cm)	37		36		37		36		37		37		36	
Initials	um		um		um		um		m		um		um	

FR_UFRI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	9.9	10.1	10.1	10.1	10.2	9.8	10.0	10.0	9.9	10.1
pH	8.2	8.3	8.1	8.2	8.1	8.3	8.0	8.2	8.1	8.1	8.1	8.3	8.2	8.3
Cond. (µS/cm)	342		343		350		348		351		350		351	
Initials	um		um		um		um		m		um		um	

GH-ER2 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.1	10.1	10.0	10.0	10.1	10.2	10.0	10.1	9.8	9.9	10.0	9.9	10.1
pH	8.2	8.3	8.1	8.3	8.1	8.2	8.1	8.2	8.2	8.3	8.1	8.3	8.1	8.3
Cond. (µS/cm)	301		300		316		320		317		310		310	
Initials	um		um		um		um		m		um		um	

CM_MCI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.3	10.1	10.1	10.0	10.0	10.2	10.1	10.1	9.8	9.9	10.0	10.0	10.0	10.1
pH	8.0	8.3	8.0	8.3	8.0	8.3	8.1	8.2	8.1	8.3	8.1	8.3	8.1	8.3
Cond. (µS/cm)	261		273		277		276		278		275		276	
Initials	um		um		um		um		m		um		um	

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	FR_UFRI	GH-ER2	CM_MCI
Hardness*	12	196	174	122
Alkalinity*	12	130	128	118

Analysts: AWD/um

Reviewed by: JGU

Date reviewed: Feb. 6/19

* mg/L as CaCO₃

FR_UFRI, GH-ER2, CM_MCI -

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

B3 10/20

Client: Teck
 Sample ID: (VARIOUS)
 Work Order #: 181873
 (% v/v)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-SLC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.0	10.0	10.2	10.1	10.1	10.1	9.9	9.8	10.1	9.9	9.9
pH	8.1	8.3	8.1	8.3	8.1	8.3	8.1	8.2	8.0	8.2	8.1	8.2	8.1	8.3
Cond. (µS/cm)	372		379		382		383		381		388		387	
Initials	um		um		um		um		A		um		um	

FR-FRCPI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	9.9	9.9	10.0	9.9	10.1	10.1	10.0	10.1	9.8	9.9	10.1	10.0	10.0
pH	7.7	8.2	7.8	8.1	7.8	8.2	7.8	8.3	7.7	8.3	7.9	8.3	7.8	8.2
Cond. (µS/cm)	3430		3420		3490		3490		3460		3460		3460	
Initials	um		um		um		um		A		um		um	

FR-FRABCH Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	9.9	10.0	10.0	10.1	10.1	10.0	10.0	9.9	9.9	10.1	10.1	9.9
pH	8.1	8.3	8.0	8.2	8.1	8.2	8.0	8.2	8.1	8.3	8.1	8.3	8.1	8.3
Cond. (µS/cm)	1074		1067		1095		1097		1081		1085		1092	
Initials	um		um		um		um		A		um		um	

GH-FRI Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	9.9	10.1	10.1	10.0	12.0	10.0	10.0	10.0	9.9	9.9	10.0	10.0	9.9
pH	8.2	8.3	8.1	8.2	8.2	8.3	8.2	8.3	8.1	8.2	8.1	8.3	8.2	8.3
Cond. (µS/cm)	891		892		898		892		871		890		896	
Initials	um		um		um		um		A		um		um	

Thermometer: CP#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	FR-FRCPI	FR-FRABCH	GH-FRI
Hardness*	202 ± 0.04	2620	1150	640
Alkalinity*	126	270	168	186

Analysts: AWD, um

Reviewed by: JLH
 Date reviewed: Feb. 6/19

* mg/L as CaCO₃
 Sample Description: clear, no colour, no odour, some particulates.
FR-FRCPI - slightly turbid, light grey, no odour, some particulates
 Comments:

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

Pg 11/20

Client: Teck
 Sample ID: (Vander)
 Work Order #: 181873
 (% v/v)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

GH-ERC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.1	10.1	9.9	10.0	10.1	10.2	10.1	9.8	10.0	10.0	10.0	10.1
pH	8.1	8.3	8.0	8.3	8.1	8.3	8.1	8.3	8.7	8.3	8.1	8.3	8.2	8.3
Cond. (µS/cm)	329		321		331		335		329		333		335	
Initials	um		um		um		um		A		um		um	

EV-HCl Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	9.9	9.8	10.1	10.0	10.1	10.1	10.2	10.2	9.9	9.8	10.0	9.9	10.0
pH	8.2	8.3	8.1	8.3	8.2	8.3	8.1	8.3	8.1	8.4	8.2	8.4	8.2	8.3
Cond. (µS/cm)	739		758		766		765		757		766		766	
Initials	um		um		um		um		r		um		um	

EV-MC2 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.1	10.0	10.1	9.9	10.0	10.1	10.1	10.0	9.8	9.9	10.0	9.9	10.0
pH	8.0	8.3	8.0	8.2	8.0	8.3	8.0	8.3	8.1	8.3	8.1	8.4	8.2	8.4
Cond. (µS/cm)	596		653		687		686		676		687		678	
Initials	um		um		um		um		r		um		um	

CM-MC2 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.1	10.0	10.1	9.9	10.1	10.1	10.1	10.0	9.9	9.9	10.0	10.0	10.0
pH	8.1	8.3	8.2	8.3	8.2	8.3	8.0	8.3	8.1	8.4	8.2	8.3	8.2	8.4
Cond. (µS/cm)	925		1086		1122		1124		1119		1126		1127	
Initials	um		um		um		um		r		um		um	

Thermometer: CE#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	GH-ERC probe	EV-HCl probe	EV-MC2 probe	CM-MC2 probe
Hardness*	174	382	340	520 800
Alkalinity*	130	156	146	168

Analysts: AWJ/MC

Reviewed by: Jble
 Date reviewed: Feb. 6/19

* mg/L as CaCO₃

GH-ERC, EV-HCl, EV-MC2, CM-MC2 -

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

13/2/20

Client: Teck
 Sample ID: (VANDU)
 Work Order #: 181873
 (90 v12)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-LC5SLCC Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.3	10.0	10.0	10.1	10.0	10.1	10.1	10.1	10.0	9.9	9.9	10.0	10.0	10.0
pH	8.2	8.3	8.2	8.3	8.2	8.3	8.1	8.3	8.2	8.3	8.2	8.3	8.2	8.3
Cond. (µS/cm)	840		867		873		868		874		874		877	
Initials	mm		mm		mm		mm		a		mm		mm	

LC-LC3 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.8	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	10.1	10.2	10.1	10.1	10.0	9.8	9.8	10.0	10.0	9.9
pH	8.1	8.3	8.1	8.3	8.2	8.3	8.2	8.3	8.2	8.4	8.2	8.4	8.2	8.4
Cond. (µS/cm)	1033		1021		1026		1028		1030		1026		1026	
Initials	mm		mm		mm		mm		a		mm		mm	

LC-LC5 Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	10.0	10.0	10.1	10.0	10.1	10.1	10.1	10.0	9.9	9.9	10.0	10.1	9.9
pH	8.2	8.3	8.2	8.3	8.3	8.3	8.1	8.4	8.1	8.4	8.2	8.4	8.3	8.4
Cond. (µS/cm)	750		766		775		776		769		775		777	
Initials	mm		mm		mm		mm		a		mm		mm	

LC-DCDS Concentration 100	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.1	10.0	10.1	10.1	10.1	10.0	10.1	10.0	9.8	9.8	10.1	10.0	9.9
pH	8.2	8.3	8.2	8.3	8.2	8.4	8.1	8.3	8.1	8.4	8.2	8.3	8.2	8.4
Cond. (µS/cm)	591		613		620		620		631		622		623	
Initials	mm		mm		mm		mm		a		mm		mm	

Thermometer: ORP#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC5SLCC probe pH probe
 Analysts: AWD, MM
 Reviewed by: JOU
 Date reviewed: Feb. 6/19

	Control	LC-LC3	LC-LC5	LC-DCDS
Hardness*	540	mm 204 780	mm 200 630	270
Alkalinity*	148	178	144	98

* mg/L as CaCO3
 LC5SLCC, LC-LC3, LC-LC5, LC-DCDS -

Sample Description: clear, no colour, no odour, some particulates.

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

R3/13/20

Client: Teck
 Sample ID: (NANOW)
 Work Order #: 181873

Start Date & Time: October 21, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.2	10.0	10.1	10.1	10.0	10.1	9.9	10.1	9.8	10.1	9.9	10.0	9.9
pH	7.1	7.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.2	7.0	7.1	7.2	7.2
Cond. (µS/cm)	37		36		36		36		36		37		37	
Initials	um		um		um		um		A		um		um	

FR UFR1 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.1	10.3	10.0	10.1	9.9	10.1	10.0	10.0	9.8	10.0	9.9	10.1	9.9
pH	8.1	8.2	8.1	8.3	8.1	8.2	8.1	8.3	8.1	8.2	8.2	8.3	8.2	8.2
Cond. (µS/cm)	346		343		358		360		361		362		362	
Initials	um		um		um		um		A		um		um	

GH-ER2 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.1	10.1	10.0	10.2	9.9	10.1	10.1	10.1	9.9	10.0	9.9	10.0	10.0
pH	8.1	8.2	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.3	8.2	8.3
Cond. (µS/cm)	306		309		319		320		320		321		322	
Initials	um		um		um		A		A		um		um	

CaMCl Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.9	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.2	10.0	10.0	10.2	10.1	10.4	10.1	10.1	9.8	9.9	9.8	10.0	10.0
pH	8.1	8.2	8.0	8.1	8.1	8.2	8.1	8.2	8.1	8.3	8.0	8.2	8.1	8.2
Cond. (µS/cm)	276		282		286		285		286		291		291	
Initials	um		um		um		A		A		um		um	

Thermometer: CR#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	FR-UFR1	GH-ER2	CaMCl
Hardness*	10	174	164	144
Alkalinity*	10	120	126	120

Analysts: AWD, YNL
 Reviewed by: Jou
 Date reviewed: Feb. 6/19

* mg/L as CaCO3
 Sample Description: FR-UFR1, GH-ER2, CaMCl - clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

B14/20

Client: Teck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 21, 2018 @ 1530h
 Stop Date & Time: November 20, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-SLC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	10.0	9.9	10.1	10.0	10.1	10.0	10.1	9.8	9.9	10.0	10.0	10.1
pH	8.0	8.2	8.1	8.1	8.1	8.2	8.1	8.3	8.1	8.1	8.1	8.3	8.2	8.3
Cond. (µS/cm)	386		391		395		396		392		402		411	
Initials	um		um		~		A		B		um		um	

FR-FRCPI Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.1	10.0	10.0	9.8	10.1	9.8	10.2	10.0	10.2	9.8	9.8	9.8	9.8	10.0
pH	7.8	8.1	7.8	8.1	8.0	8.2	7.9	8.3	8.0	8.2	7.7	8.3	7.7	8.3
Cond. (µS/cm)	3450		3630		3570		3560		3560		3580		3560	
Initials	um		um		um		~		~		um		um	

FR-FRABCH Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.8	10.1	10.0	10.0	10.1	9.8	10.2	10.0	10.2	9.8	10.0	9.8	9.8	10.0
pH	8.1	8.3	8.0	8.1	8.1	8.2	8.1	8.4	8.1	8.2	8.0	8.3	8.0	8.3
Cond. (µS/cm)	1070		1114		1098		1100		1100		1112		1111	
Initials	um		um		um		~		~		um		um	

GH-FRI Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	9.9	10.3	9.9	10.0	9.9	10.0	9.9	10.0	9.8	9.9	10.0	9.9	10.0
pH	8.2	8.3	8.2	8.4	8.2	8.4	8.2	8.4	8.2	8.3	8.2	8.3	8.2	8.4
Cond. (µS/cm)	887		905		917		918		918		891		905	
Initials	um		um		um		~		~		um		um	

Thermometer: CP#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-SLC phke FR-FRCPI phke FR-FRABCH phke GH-FRI phke
 Analysts: AWD, um
 Reviewed by: Joe
 Date reviewed: Feb. 6/19

	Control	FR-FRCPI	FR-FRABCH	GH-FRI
Hardness*	202	2200	~ 600-1100	540
Alkalinity*	126	270	174	182

* mg/L as CaCO3

LC-SLC, FR-FRABCH, GH-FRI -

Sample Description: clear, no colour, no odour, some particulates
FR-FRCPI - slightly turbid, light grey, no odour, some particulates.

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

E3 15/20

Client: Teck
 Sample ID: (various)
 Work Order #: 181873
 (16 vials)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 20 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

GH-ERC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	10.0	9.9	10.1	10.0	10.0	10.0	10.1	9.8	9.9	10.0	9.9	10.0
pH	8.0	8.2	8.0	8.2	8.1	8.3	8.1	8.3	8.1	8.2	8.1	8.3	8.2	8.3
Cond. (µS/cm)	336		343		344		344		346		346		349	
Initials	um		um		um		A		A		um		um	

EV-HCl Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.8	9.9	10.0	9.9	10.1	10.0	10.1	10.0	10.0	9.8	10.0	10.0	9.7	10.0
pH	8.1	8.3	8.1	8.1	8.1	8.3	8.1	8.3	8.1	8.3	8.2	8.4	8.2	8.3
Cond. (µS/cm)	761		766		777		776		776		774		786	
Initials	um		um		um		A		A		um		um	

EV-MC2 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.8	10.0	10.0	10.0	10.0	10.1	10.1	10.0	10.1	9.8	10.0	10.1	9.9	10.0
pH	8.1	8.3	8.2	8.2	8.2	8.3	8.1	8.3	8.1	8.2	8.1	8.3	8.2	8.3
Cond. (µS/cm)	674		692		690		692		691		697		696	
Initials	um		um		um		A		A		um		um	

CM-MC2 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.0	10.0	9.8	10.0	9.9	10.0	10.1	10.0	9.8	10.0	10.1	9.9	10.0
pH	8.1	8.3	8.1	8.3	8.1	10.3	8.1	8.3	8.1	8.3	8.1	8.3	8.1	8.3
Cond. (µS/cm)	1118		1079		1085		1090		1091		1078		1051	
Initials	um		um		um		A		A		um		um	

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	GH-ERC Control	EV-HCl	EV-MC2	CM-MC2
Hardness*	186	398	352	490
Alkalinity*	134	154	160	162

Analysts: AWD/ML

Reviewed by: JGA

Date reviewed: Feb. 6/19

* mg/L as CaCO₃ GH-ERC, EV-HCl, EV-MC2, CM-MC2 -

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

B.16/20

Client: Teck
 Sample ID: (Various)
 Work Order #: 181873
 (% v/v)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-LCDSLCC Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.1	10.0	10.0	10.1	10.0	10.1	10.0	10.0	9.8	10.0	9.8	10.0	10.1
pH	8.2	8.3	8.1	8.4	8.1	8.3	8.1	8.3	8.1	8.2	8.1	8.3	8.2	8.3
Cond. (µS/cm)	867		931		917		920		921		929		930	
Initials	um		um		um		a		a		um		um	

LC-LC3 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	10.0	9.8	10.1	10.0	10.1	10.0	10.0	9.8	9.9	10.0	9.9	10.0
pH	8.2	8.3	8.2	8.4	8.2	8.4	8.2	8.3	8.2	8.3	8.2	8.3	8.2	8.4
Cond. (µS/cm)	1019		1132		1138		1140		1140		1147		1143	
Initials	um		um		um		um		a		um		um	

LC-LC5 Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	9.9	10.0	10.1	9.9	10.0	10.0	10.1	10.0	10.1	9.9	9.8	9.9	9.9	10.0
pH	8.2	8.3	8.2	8.4	8.2	8.3	8.2	8.3	8.2	8.3	8.2	8.3	8.2	8.4
Cond. (µS/cm)	771		804		799		861		800		805		809	
Initials	um		um		um		a		a		um		um	

LC-DCDS Concentration 100	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.0	10.0	10.0	9.9	10.1	10.0	10.0	10.1	10.0	9.8	9.9	10.0	9.9	10.0
pH	8.2	8.2	8.2	8.3	8.2	8.3	8.2	8.3	8.2	8.3	8.2	8.4	8.2	8.4
Cond. (µS/cm)	617		649		644		645		645		654		653	
Initials	um		um		um		a		a		um		um	

Thermometer: CEK#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-LCDSLCC um LC-LC3 um LC-LC5 um LC-DCDS um

	Control	LC-LC3	LC-LC5	LC-DCDS
Hardness*	470	3570	370-630	310
Alkalinity*	160	176	146	134

Analysts: AND, um

Reviewed by: JOE

Date reviewed: Feb. 6/19

* mg/L as CaCO₃

LC-LCDSLCC, LC-LC3, LC-LC5, LC-DCDS -

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

B317120

Client: Teck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

Control Concentration (% v/v)	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	10.0	9.9	10.1	10.0	9.9	9.9								
pH	7.0	7.1	7.1	7.1	7.1	7.1								
Cond. (µS/cm)	37		36		40									
Initials	uw		uw		uw									

FR_UFR1 Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	9.9	9.9	10.0	10.0	10.0								
pH	8.1	8.3	8.0	8.3	8.1	8.1								
Cond. (µS/cm)	361		356		362									
Initials	uw		uw		uw									

GH-ER2 Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.8	9.8	9.9	10.0	9.9	9.9								
pH	8.1	8.3	8.1	8.3	8.2	8.2								
Cond. (µS/cm)	315		317		322									
Initials	uw		uw		uw									

CM-MCI Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.8	9.9	9.9	10.1	10.0	10.0								
pH	8.0	8.3	8.0	8.3	8.0	8.0								
Cond. (µS/cm)	289		289		293									
Initials	uw		uw		uw									

Thermometer: CER#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	FR_UFR1	GH-ER2	CM-MCI
Hardness*	11	138	168	146
Alkalinity*	13	130	126	122

Analysts: uw

Reviewed by: JCH

Date reviewed: Feb. 6/19

* mg/L as CaCO₃

FR_UFR1, GH-ER2, CM-MCI -

Sample Description: clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

R318/20

Client: Teck
 Sample ID: (various)
 Work Order #: 181873
 (P. V. V.)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-SLC Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.8	9.9	10.0	10.0	10.0	10.0								
pH	8.1	8.2	8.1	8.3	8.1	8.1								
Cond. (µS/cm)	392		400		405									
Initials	uml		uml		uml									

FR-FRCPI Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	9.9	9.9	10.0	10.0	10.1								
pH	7.6	8.3	7.8	8.3	8.2	8.2								
Cond. (µS/cm)	3600		3560		3410									
Initials	uml		uml		uml									

FR-FRABCH Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	10.0	10.0	10.1	10.0	9.9								
pH	8.0	8.3	8.0	8.2	8.2	8.2								
Cond. (µS/cm)	1113		1109		1049									
Initials	uml		uml		uml									

GH-FRI Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	9.9	10.0	10.1	10.0	9.9								
pH	8.2	8.4	8.2	8.4	8.3	8.3								
Cond. (µS/cm)	924		915		910									
Initials	uml		uml		uml									

Thermometer: #3 DO meter: 813/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-SLC probe pH probe

	Control	FR-FRCPI	FR-FRABCH	GH-FRI
Hardness*	196	160	136	128
Alkalinity*	126	160	136	128

Analysts: uml
 Reviewed by: Julie
 Date reviewed: Feb. 6/19

* mg/L as CaCO₃

LC-SLC, FR-FRABCH, GH-FRI -

Sample Description: clear, no colour, no odour, some particulates
FR-FRCPI - slightly turbid, light grey, no odour, some particulates.

Comments:

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

B319120

Client: Teck
 Sample ID: (various)
 Work Order #: 181873

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

GH-ERC Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	10.0	9.9	10.0	10.1	10.0	10.0								
pH	8.1	8.3	8.1	8.3	8.2	8.2								
Cond. (µS/cm)	340		341		350									
Initials	uml		uml		uml									

EV-HCI Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	10.0	10.0	10.1	10.0	10.0								
pH	8.2	8.3	8.1	8.3	8.2	8.2								
Cond. (µS/cm)	737		769		779									
Initials	uml		uml		uml									

EV-MC2 Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.8	9.9	9.9	10.0	9.9	9.9								
pH	8.1	8.3	8.0	8.3	8.2	8.2								
Cond. (µS/cm)	686		694		692									
Initials	uml		uml		uml									

CM-MC2 Concentration 100	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0	14.0	14.0								
DO (mg/L)	9.9	10.0	9.8	10.0	10.0	10.0								
pH	8.1	8.3	8.1	8.3	8.3	8.3								
Cond. (µS/cm)	1053		1009		1005									
Initials	uml		uml		uml									

Thermometer: CR#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213

	Control	EV-HCI	EV-MC2	CM-MC2
Hardness*	172	390	334	470
Alkalinity*	138	158	148	126

Analysts: pshe
uml

Reviewed by: pshe
 Date reviewed: Feb. 6/19

Sample Description: GH-ERC, EV-HCI, EV-MC2, CM-MC2 - clear, no colour, no odour, some particulates

Comments: _____

Embryo-Alevin Freshwater Toxicity Test

Initial and Final Water Quality Measurements

09/20/20

Client: Teck
 Sample ID: (Various)
 Work Order #: 181873
 (1% v/v)

Start Date & Time: October 31, 2018 @ 1530h
 Stop Date & Time: November 30, 2018 @ 0930h
 Test Species: Oncorhynchus mykiss

LC-DCDSSLC Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0		14.0								
DO (mg/L)	10.0	9.9	10.0	10.1		10.1								
pH	8.1	8.4	8.2	8.3		8.2								
Cond. (µS/cm)	656	929	917			927								
Initials	uul		uul		uul									

LC-LC3 Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0		14.0								
DO (mg/L)	9.9	9.9	10.0	10.1		10.1								
pH	8.1	8.3	8.1	8.3		8.3								
Cond. (µS/cm)	1146		1124			1137								
Initials	uul		uul		uul									

LC-LC5 Concentration 100	Days													
	28		29		30									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0		14.0								
DO (mg/L)	9.9	10.0	9.9	10.1		10.0								
pH	8.1	8.3	8.1	8.4		8.3								
Cond. (µS/cm)	806		801			790								
Initials	uul		uul		uul									

LC-DCD5 Concentration 100	Days													
	28		29		30 final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	14.0		14.0								
DO (mg/L)	9.9	10.0	9.9	10.1		9.9								
pH	8.1	8.3	8.1	8.4		8.3								
Cond. (µS/cm)	650		653			658								
Initials	uul		uul		uul									

Thermometer: CE#3 DO meter: 213/213 pH meter: 213/213 Conductivity meter: 213/213
 LC-DCDSSLC probe probe probe probe

	Control	LC-LC3	LC-LC5	LC-DCD5
Hardness*	520	520	510	322
Alkalinity*	124	146	124	144

Analysts: uul

Reviewed by: JOL

Date reviewed: Feb. 6/19

* mg/L as CaCO₃

Sample Description: clear, no colour, no odour, some particulates

Comments:

18-1163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: Control
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
Control A	1	19.5	/		
	2	20.5	/		
	3	20.5	/		
	4	20.0	/		
	5	22.0	/		
	6	21.0	/		
	7	20.5	/		
	8	20.5	/		
	9	20.0	/		
	10	21.0	/		
	11	21.0	/		
	12	19.5	/		
	13	21.0	/		
	14	20.0	/		
	15	20.5	/		
	16	21.0	/		
	17	21.0	/		
	18	21.0	/		
	19	20.5	/		
	20	21.0	/		
	21	21.0	/		
	22	20.5	/		
	23	20.0	/		
	24	20.5	/		
	25	19.0	/		
	26	16.0			✓
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.53 g
Number of survivors: 28/26
Number of deformed/have difficulty swimming: 1/0
Initials: MM

Reviewed by: Jon

Date Reviewed: Feb-6/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: Control
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
Control B	1	19.5	/		
	2	21.0	/		
	3	20.5	/		
	4	20.0	/		
	5	21.5	/		
	6	20.0	/		
	7	20.5	/		
	8	21.0	/		
	9	21.0	/		
	10	21.0	/		
	11	21.0	/		
	12	20.5	/		
	13	20.5	/		
	14	20.0	/		
	15	20.0	/		
	16	21.0	/		
	17	21.5	/		
	18	21.0	/		
	19	20.0	/		
	20	20.0	/		
	21	21.5	/		
	22	20.5	/		
	23	16.5	/		
	24	20.5	/		
	25	20.0	/		
	26	22.0	/		
	27	20.5	/		
	28	21.0	/		
	29	20.5	/		
	30	21.5	/		
31					
32					
33					
34					
35					

Total Weight (pooled): 3.165
Number of survivors: 30
Number of deformed/have difficulty swimming: 0/0
Initials: WV
Reviewed by: Jen

Date Reviewed: Feb. 6/19

pg 3/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: Control

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
Control C	1	20.5	/		
	2	20.5	/		
	3	21.0	/		
	4	21.0	/		
	5	21.0	/		
	6	21.0	/		
	7	20.5	/		
	8	21.0	/		
	9	20.0	/		
	10	21.5	/		
	11	20.5	/		
	12	21.0	/		
	13	21.0	/		
	14	21.0	/		
	15	21.0	/		
	16	20.5	/		
	17	21.5	/		
	18	21.5	/		
	19	22.0	/		
	20	21.5	/		
	21	21.5	/		
	22	22.0	/		
	23	20.0	/		
	24	21.0	/		
	25	20.5	/		
	26	19.0	X _u	/	abnormal jaw
	27	20.0	X _u	/	halksac edema
	28	20.5	X _u	/	lordosis
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.91g

Number of survivors: 28

Number of deformed/have difficulty swimming: 3/0

Initials: UWL

Reviewed by: Jou

Date Reviewed: Feb. 6/19

PS 4/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: Control

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control D	1	20.0	/			
	2	21.0	/			
	3	21.0	/			
	4	22.0	/			
	5	22.0	/			
	6	22.0	/			
	7	22.5	/			
	8	21.0	/			
	9	21.0	/			
	10	22.0	/			
	11	22.0	/			
	12	22.0	/			
	13	19.5	/			
	14	21.5	/			
	15	21.0	/			
	16	22.0	/			
	17	21.5	/			
	18	21.0	/			
	19	21.0	/			
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.98g

Number of survivors: 19

Number of deformed/have difficulty swimming: 0/0

Initials: UWE

Reviewed by: JGU

Date Reviewed: Feb-6/19

18/163

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: October 31, 2018

Sample ID: FR-UFR1

Termination Date: November 30, 2018

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	21.0	/			
	2	20.5	/			
	3	21.0	/			
	4	21.0	/			
	5	21.5	/			
	6	20.5	/			
	7	20.0	/			
	8	21.0	/			
	9	20.5	/			
	10	21.0	/			
	11	21.5	/			
	12	20.5	/			
	13	21.0	/			
	14	20.5	/			
	15	20.0	/			
	16	22.0	/			
	17	21.5	/			
	18	21.0	/			
	19	21.5	/			
	20	21.0	/			
	21	20.5	/			
	22	21.5	/			
	23	21.0	/			
	24	22.0	/			
	25	20.0	/			
	26	17.5			/	yolk sac edema, shortened pectoral fins
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 265g

Number of survivors: 26

Number of deformed/have difficulty swimming: 1/0

Initials: UML

Reviewed by: JGw

Date Reviewed: Feb. 6/19

12/6/13

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR UFR1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	20.5	/		
	2	21.5	/		
	3	21.5	/		
	4	20.0	/		
	5	20.0	/		
	6	22.0	/		
	7	21.0	/		
	8	21.5	/		
	9	22.5	/		
	10	22.5	/		
	11	22.0	/		
	12	22.0	/		
	13	21.5	/		
	14	21.5	/		
	15	20.5	/		
	16	21.5	/		
	17	21.5	/		
	18	22.0	/		
	19	21.0	/		
	20	22.5	/		
	21	21.0	/		
	22	21.0	/		
	23	21.0	/		
	24	19.0	/		
	25	20.0			/
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.67g

Number of survivors: 25

Number of deformed/have difficulty swimming: 1/0

Initials: KLMM

Reviewed by: [Signature]

Date Reviewed: Feb. 6/19

187163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: FR_VFR1
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 C	1	22.5	/			
	2	22.5	/			
	3	22.0	/			
	4	20.5	/			
	5	20.5	/			
	6	22.0	/			
	7	21.0	/			
	8	21.0	/			
	9	20.0	/			
	10	22.0	/			
	11	21.0	/			
	12	21.0	/			
	13	22.0	/			
	14	21.0	/			
	15	23.0	/			
	16	21.5	/			
	17	21.0	/			
	18	20.0	/			
	19	22.0	/			
	20	21.5	/			
	21	21.0	/			
	22	19.0	/			
	23	22.0	/			
	24	22.0	/			
	25	20.0	/			
	26	22.0	/			
	27	15.0			/	two-truncated two alevins joined at tail sharing yolk sac
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.77g
Number of survivors: 27
Number of deformed/have difficulty swimming: 1
Initials: KUW
Reviewed by: JKW

Date Reviewed: Feb - 6 / 19

19 8/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR_UFR1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.5	/			
	2	21.5	/			
	3	22.0	/			
	4	22.0	/			
	5	20.0	/			
	6	21.5	/			
	7	21.0	/			
	8	21.5	/			
	9	21.0	/			
	10	21.0	/			
	11	21.0	/			
	12	21.0	/			
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): total 1.28g

Number of survivors: 12

Number of deformed/have difficulty swimming: 0%

Initials: KCM/L

Reviewed by: _____

Date Reviewed: _____

P29163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-ER2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	22.0 22.0	/		
	2	20.0	/		
	3	21.0	/		
	4	21.5	/		
	5	22.0	/		
	6	20.0	/		
	7	21.5	/		
	8	21.0	/		
	9	20.0	/		
	10	21.5	/		
	11	21.5	/		
	12	23.0	/		
	13	22.0	/		
	14	22.0	/		
	15	21.5	/		
	16	20.5	/		
	17	21.5	/		
	18	20.5	/		
	19	20.0	/		
	20	21.0	/		
	21	20.0	/		
	22	21.5	/		
	23	21.0	/		
	24	21.0	/		
	25	21.0	/		
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.46g

Number of survivors: 23

Number of deformed/have difficulty swimming: 0/0

Initials: KPMU

Reviewed by: JGM

Date Reviewed: Feb. 6/19

2810163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-ERZ

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 B	1	22.0	✓			
	2	21.0	✓			
	3	21.5 22.0	✓			
	4	21.0	✓			
	5	21.5 22.0	✓			
	6	21.0	✓			
	7	21.0	✓			
	8	21.5	✓			
	9	22.0	✓			
	10	22.0	✓			
	11	18.0	✓			
	12	20.0	✓			
	13	22.0	✓			
	14	20.0	✓			
	15	20.0	✓			
	16	20.5	✓			
	17	21.0	✓			
	18	21.0	✓			
	19	21.0	✓			
	20	22.0	✓			
	21	22.5	✓			
	22	21.0	✓			
	23	21.0	✓			
	24	22.0	✓			
	25	21.0	✓			
	26	22.0	✓			
	27	21.0	✓			
	28	21.0	✓			
	29	21.0	✓			
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 3.02g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: KRM

Reviewed by: Jan

Date Reviewed: Feb. 6/19

PS 11/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GHLER2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	20.0	/		
	2	21.0	/		
	3	22.0	/		
	4	20.0	/		
	5	22.0	/		
	6	20.5	/		
	7	22.0	/		
	8	21.0	/		
	9	22.0	/		
	10	21.0	/		
	11	21.0	/		
	12	22.0	/		
	13	19.0	/		
	14	21.5	/		
	15	20.0	/		
	16	21.0	/		
	17	22.0	/		
	18	21.5	/		
	19	21.0	/		
	20	21.0	/		
	21	21.5	/		
	22	21.0	/		
	23	22.0	/		
	24	21.0	/		
	25	22.0	/		
	26	21.5	/		
	27	20.0	/		
	28	21.0	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.84g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: KHML

Reviewed by: JOh

Date Reviewed: Feb. 6/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: HLER2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	20.5	/			
	2	20.0	/			
	3	20.0	//			
	4	21.8	//			
	5	21.8	/			
	6	19.0	/			
	7	20.0	/			
	8	20.0	/			
	9	19.5	/			
	10	21.5	/			
	11	21.5	/			
	12	21.5	/			
	13	21.0	/			
	14	21.0	/			
	15	21.0	/			
	16	20.5	/			
	17	21.5	/			
	18	21.0	/			
	19	21.0	/			
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.96g

Number of survivors: 19

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: Jon

Date Reviewed: Feb - 6/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: CM-MCI
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.0	/		
	2	22.0	/		
	3	22.5	/		
	4	22.0	/		
	5	22.0	/		
	6	21.5	/		
	7	20.0	/		
	8	21.5	/		
	9	21.0	/		
	10	21.5	/		
	11	22.0	/		
	12	22.0	/		
	13	21.0	/		
	14	21.0	/		
	15	23.0	/		
	16	21.5	/		
	17	22.5	/		
	18	22.0	/		
	19	20.0	/		
	20	21.0	/		
	21	22.0	/		
	22	22.0	/		
	23	22.0	/		
	24	23.0	/		
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.60g

Number of survivors: 24

Number of deformed/have difficulty swimming: 0/0

Initials: KJMM

Reviewed by: JM

Date Reviewed: Feb - 6/19

03/14/03

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: CM-MCI
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	21.5	/		
	2	21.0	/		
	3	21.0	/		
	4	21.0	/		
	5	21.0	/		
	6	21.5	/		
	7	20.0	/		
	8	21.0	/		
	9	21.0	/		
	10	21.0	/		
	11	20.0	/		
	12	21.0	/		
	13	21.0	/		
	14	21.0	/		
	15	20.0	/		
	16	21.0	/		
	17	22.0	/		
	18	22.0	/		
	19	21.0	/		
	20	20.5	/		
	21	20.5	/		
	22	21.0	/		
	23	21.5	/		
	24	21.0	/		
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 250g

Number of survivors: 24

Number of deformed/have difficulty swimming: 0/0

Initials: KEM

Reviewed by: JCH

Date Reviewed: Feb 6/19

RSIS/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: October 31, 2018

Sample ID: CM MCI

Termination Date: November 30, 2018

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.0	/		
	2	21.5	/		
	3	21.5	/		
	4	21.5 21.0	/		
	5	23.0	/		
	6	22.0	/		
	7	21.0	/		
	8	20.0 20.0	/		
	9	21.5	/		
	10	21.0	/		
	11	22.0	/		
	12	22.0	/		
	13	21.5	/		
	14	21.5	/		
	15	21.5	/		
	16	20.0	/		
	17	21.5	/		
	18	22.0	/		
	19	21.5	/		
	20	23.0	/		
	21	21.5	/		
	22	20.0	/		
	23	21.5	/		
	24	22.0	/		
	25				
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.50g

Number of survivors: 24

Number of deformed/have difficulty swimming: 0/0

Initials: KL/ML

Reviewed by: Jan

Date Reviewed: Feb. 6/19

13-16/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: CM/MC1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.0	/			
	2	19.5	/			
	3	22.0	/			
	4	21.0	/			
	5	21.5	/			
	6	20.0	/			
	7	22.0	/			
	8	21.0	/			
	9	21.5	/			
	10	21.0	/			
	11	21.5	/			
	12	22.0	/			
	13	20.5	/			
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.35g

Number of survivors: 13

Number of deformed/have difficulty swimming: 0/6

Initials: Kelme

Reviewed by: JOU

Date Reviewed: Feb-6/19

ps 17/63

Alevin Test Data Sheet Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-SLC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	20.5	/		
	2	22.0	/		
	3	21.0	/		
	4	19.0	/		
	5	21.0	/		
	6	21.0	/		
	7	22.0	/		
	8	21.5	/		
	9	22.0	/		
	10	20.5	/		
	11	22.0	/		
	12	21.5	/		
	13	22.0	/		
	14	21.0	/		
	15	21.0	/		
	16	20.0	/		
	17	21.0	/		
	18	22.0	/		
	19	21.0	/		
	20	22.0	/		
	21	21.0	/		
	22	22.0	/		
	23	22.0	/		
	24	20.5	/		
	25	21.0	/		
	26	21.0	/		
	27	21.5	/		
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.81g

Number of survivors: 27

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JGM

Date Reviewed: Feb-6/19

13-18/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-SLC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	21.5	/		
	2	21.0	/		
	3	21.0	/		
	4	21.5	/		
	5	21.0	/		
	6	21.0	/		
	7	21.5	/		
	8	21.5	/		
	9	21.0	/		
	10	20.5	/		
	11	21.0	/		
	12	21.0	/		
	13	21.0	/		
	14	22.0	/		
	15	20.5	/		
	16	21.0	/		
	17	20.0	/		
	18	21.0	/		
	19	21.0	/		
	20	21.0	/		
	21	21.0	/		
	22	21.2	/		
	23	21.0	/		
	24	21.0	/		
	25	21.0	/		
	26	21.5	/		
	27	21.5	/		
	28	22.0 21.5	/		
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.85g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: KLYW

Reviewed by: JGh

Date Reviewed: Feb. 6/19

12/19/18

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-SLC
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.0	/		
	2	21.5	/		
	3	22.0	/		
	4	22.0	/		
	5	22.0	/		
	6	19.0	/		
	7	21.0	/		
	8	22.0	/		
	9	22.5	/		
	10	22.5	/		
	11	21.0	/		
	12	21.5	/		
	13	21.5	/		
	14	22.5	/		
	15	21.5	/		
	16	21.5	/		
	17	22.5	/		
	18	22.0	/		
	19	22.0	/		
	20	21.0	/		
	21	22.5	/		
	22	22.5	/		
	23	22.0	/		
	24	17.0		/	yolk sac edema
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.60g
Number of survivors: 24
Number of deformed/have difficulty swimming: 1/0
Initials: KLM

Reviewed by: Jan

Date Reviewed: Feb. 6/19

B. 20/103

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: CC-SLC
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	22.0	/			
	2	22.0	/			
	3	23.5	/			
	4	23.0	/			
	5	21.0	/			
	6	20.5	/			
	7	22.0	/			
	8	23.0	/			
	9	22.5 23.0	/			
	10	22.5	/			
	11	22.0	/			
	12	22.5	/			
	13	20.0	/			
	14	22.0	/			
	15	22.5	/			
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.64g

Number of survivors: 15

Number of deformed/have difficulty swimming: 0/0

Initials: KLP

Reviewed by: JG

Date Reviewed: Feb 6/19

B3 21/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR_FRCPI

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	16.5	—			
	2	17.0	—			
	3	17.0	—			
	4	18.0	—			
	5	17.0	—			
	6	16.5	—			
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 0.53g

Number of survivors: 6

Number of deformed/have difficulty swimming: 0/0

Initials: KMM

Reviewed by: JGH

Date Reviewed: Feb - 6/19

MS 22/163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR_FRCP1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 B	1	17.5	/			
	2	17.0	/			
	3	18.0	/			
	4	17.5	/			
	5	17.0	/			
	6	16.5	/			
	7	17.5	/			
	8	17.0	/			
	9	17.5	/			
	10	17.0			/	kyphosis
	11	16.5			/	abnormal jaw
	12	18.0			/	" "
	13	16.0			/	" "
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.16g

Number of survivors: 13

Number of deformed/have difficulty swimming: 3/1

Initials: KCP

Reviewed by: YOU

Date Reviewed: Feb. 6/19

PS 23163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR FRCP1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 mg D	1	18.5	/			
	2	15.5		-	pale thin body	
	3	15.0		/	↓ 1 Kyphosis	
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 0.27g

Number of survivors: 3

Number of deformed/have difficulty swimming: 2/1

Initials: KLM

Reviewed by: Joh

Date Reviewed: Feb. 6/19

PS 24/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR-FRABCH

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	20.0	—		
	2	19.5	—		
	3	20.0	—		
	4	19.0	✓		
	5	20.0		—	cranial facial deformity (eye)
	6	19.0	—		
	7	19.0	—		
	8	21.0	—		
	9	19.0	—		
	10	19.0	—		
	11	19.5	—		
	12	19.0	—		
	13	19.5	—		
	14	20.5	—		
	15	19.0	—		
	16	20.0	✓		
	17	19.0	✓		
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.63g

Number of survivors: 17

Number of deformed/have difficulty swimming: 1/0

Initials: KLM

Reviewed by: JGM

Date Reviewed: Feb. 7/19

ps 25/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR-FRABCH

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	20.5	/		
	2	21.0	/		
	3	21.0	/		
	4	21.5	/		
	5	21.5	/		
	6	21.5	/		
	7	22.0	/		
	8	20.0 21.5	/		
	9	21.5	/		
	10	21.0	/		
	11	18.5	/		
	12	21.5	/		
	13	21.0	/		
	14	21.0	/		
	15	21.5	/		
	16	21.0	/		
	17	21.0	/		
	18	20.5	/		
	19	21.5	/		
	20	21.5	/		
	21	20.5	/		
	22	21.0	/		
	23	20.5	/		
	24	21.5	/		
	25	20.5	/		
	26	20.5	/		
	27	21.0	/		
	28	20.5	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.84g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: Jou

Date Reviewed: Feb. 7/19

2/16/13

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR_FRABCH

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 C	1	21.5	/			
	2	20.0	/			
	3	21.0	/			
	4	20.5	/			
	5	21.5	/			
	6	20.5	/			
	7	21.5	/			
	8	21.0	/			
	9	20.0 20.5	/			
	10	20.0	/			
	11	21.0	/			
	12	20.0	/			
	13	20.0	/			
	14	19.5	/			
	15	21.0	/			
	16	22.0	/			
	17	21.0	/			
	18	19.0	/			
	19	21.5	/			
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.00g^{ve} 2.00g

Number of survivors: 19

Number of deformed/have difficulty swimming: 0/0

Initials: KLMM

Reviewed by: Jan

Date Reviewed: Feb-7/19

03-27/163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: FR-FRABCH

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	19.0	/			
	2	21.0	/			
	3	21.5	/			
	4	21.0	/			
	5	21.0	/			
	6	22.0	/			
	7	21.5	/			
	8	21.0	/			
	9	21.5	/			
	10	21.5	/			
	11	21.0	/			
	12	18.5	/			
	13	19.5	/			
	14	21.5	/			
	15	22.0	/			
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.55g

Number of survivors: 15

Number of deformed/have difficulty swimming: 0/0

Initials: KUMM

Reviewed by: JCH

Date Reviewed: Feb-7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: GH-FR1
 Work Order No.: 181873

Start Date: **October 31, 2018**
 Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	20.5	/			
	2	20.0	/			
	3	21.0	/			
	4	20.0	/			
	5	20.0	/			
	6	20.0	/			
	7	20.0 14.5	/			
	8	19.0	/			
	9	20.5	/			
	10	18.5	/			
	11	18.5	/			
	12	20.0	/			
	13	20.5	/			
	14	20.0	/			
	15	20.0	/			
	16	19.0	/			
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.60g

Number of survivors: 16

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JG

Date Reviewed: Feb 7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: BHLFR1
 Work Order No.: 181873

Start Date: **October 31, 2018**
 Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 B	1	20.0	/			
	2	20.0	/			
	3	20.0	/			
	4	19.5	/			
	5	20.0	/			
	6	19.5	/			
	7	21.0	/			
	8	19.0 20.0	/			
	9	20.0	/			
	10	20.0	/			
	11	19.5	/			
	12	20.5	/			
	13	20.5	/			
	14	19.0	/			
	15	20.0	/			
	16	20.0	/			
	17	19.0	/			
	18	19.0	/			
	19	19.5	/			
	20	20.0	/			
	21	20.0	/			
	22	21.0	/			
	23	19.0	/			
	24	19.5	/			
	25	17.0			/	Yolk-sac edema
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.58 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 1/0

Initials: KL/ML

Reviewed by: JM

Date Reviewed: Feb. 7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: GHLFR1
 Work Order No.: 181873

Start Date: **October 31, 2018**
 Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	20.5	/		
	2	21.0	/		
	3	20.5	/		
	4	21.5	/		
	5	20.5	/		
	6	19.0	/		
	7	20.0	/		
	8	21.0	/		
	9	19.5	/		
	10	20.5	/		
	11	19.0	/		
	12	18.5	/		
	13	17.5	/		
	14	20.5	/		
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 1.34g

Number of survivors: 14

Number of deformed/have difficulty swimming: 0/0

Initials: KCL/WW

Reviewed by: John

Date Reviewed: Feb. 7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-FR1

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	20.5	//			
	2	18.0	//			
	3	21.22 ^{mm}	//			
	4	19.5	//			
	5	18.0		/	yolk sac edema	
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 0.57^{kg}

Number of survivors: 5

Number of deformed/have difficulty swimming: 1/0

Initials: KLM

Reviewed by: JOU

Date Reviewed: Feb 7/19

PS 32163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-ERC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	20.5	/		
	2	22.0	/		
	3	21.5	/		
	4	22.5	/		
	5	20.0	/		
	6	20.0	/		
	7	21.0	/		
	8	21.5	/		
	9	20.5	/		
	10	21.5	/		
	11	21.0	/		
	12	22.0	/		
	13	21.5	/		
	14	21.0	/		
	15	22.5	/		
	16	20.0	/		
	17	20.0	/		
	18	21.5	/		
	19	21.0	/		
	20	21.5	/		
	21	21.5	/		
	22	21.5	/		
	23	21.5	/		
	24	21.0	/		
	25	21.0	/		
	26	21.0	/		
	27	20.0		/	Kyphosis
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 274 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 1/0

Initials: KC/MW

Reviewed by: JGU

Date Reviewed: Feb. 7/19

P33163

Alevin Test Data Sheet Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-ERC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 B	1	21.5	/			
	2	20.5	/			
	3	21.0	/			
	4	20.0 ⁰	/			
	5	20.5	/			
	6	19.0	/			
	7	22.0	/			
	8	20.5	/			
	9	21.5	/			
	10	21.5	/			
	11	20.0	/			
	12	20.5	/			
	13	20.5	/			
	14	20.0	/			
	15	19.5	/			
	16	20.5	/			
	17	20.5	/			
	18	22.0	/			
	19	19.5	/			
	20	22.0	/			
	21	20.0	/			
	22	20.5	/			
	23	20.5	/			
	24	20.5	/			
	25	21.0	/			
	26	20.5	/			
	27	21.0	/			
	28			2/2		
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.65g

Number of survivors: 27

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JCH

Date Reviewed: Feb. 7/19

AS-34163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: BH-ERC
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 C	1	21.5	/			
	2	19.0	/			
	3	21.0	/			
	4	21.0	/			
	5	21.5	/			
	6	19.5	/			
	7	30 20.0	/			
	8	19.0	/			
	9	21.0	/			
	10	20.0	/			
	11	22.0	/			
	12	22.5	/			
	13	21.0	/			
	14	21.0	/			
	15	21.0	/			
	16	22.5	/			
	17	21.5	/			
	18	21.0	/			
	19	21.0	/			
	20	19.0	/			
	21	20.0	/			
	22	20.5	/			
	23	19.5	/			
	24	20.0	/			
	25	20.0	/			
	26	18.0			/	yolk sac edema
	27	16.0			/	byphosis
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.60 g
Number of survivors: 27
Number of deformed/have difficulty swimming: 2/1
Initials: KCM
Reviewed by: JCh

Date Reviewed: Feb. 7/19

PS35163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: GH-ERC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	20.0	/		
	2	22.5	/		
	3	22.0	/		
	4	21.5	/		
	5	22.0	/		
	6	22.5	/		
	7	21.0	/		
	8	19.5		/	cranial facial deformity - eye
	9	21.5	/		
	10	21.5	/		
	11	21.0	/		
	12	21.5	/		
	13	22.5	/		
	14	22.0	/		
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 1.44g

Number of survivors: 14

Number of deformed/have difficulty swimming: 1/0

Initials: KCHM

Reviewed by: JOH

Date Reviewed: Feb-7/19

Pg 36/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV_HCI
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	24.5	/		
	2	22.5	/		
	3	21.5	/		
	4	24.5 22.5	/		
	5	24.5	/		
	6	21.5	/		
	7	21.5	/		
	8	24.5	/		
	9	21.0	/		
	10	21.0	/		
	11	24.5	/		
	12	21.0	/		
	13	24.5	/		
	14	21.0	/		
	15	21.0	/		
	16	24.5	/		
	17	22.0	/		
	18	21.0	/		
	19	24.5	/		
	20	21.0	/		
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.19g

Number of survivors: 20

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: Jan

Date Reviewed: Feb. 7/19

PS 37/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: EV-HCI

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	22.0	/		
	2	22.0	/		
	3	22.5	/		
	4	21.5	/		
	5	20.5	/		
	6	22.0	/		
	7	21.5	/		
	8	20.5	/		
	9	22.5	/		
	10	21.5	/		
	11	21.5	/		
	12	22.0	/		
	13	21.0	/		
	14	21.0	/		
	15	22.0	/		
	16	21.5	/		
	17	22.0	/		
	18	22.5	/		
	19	22.0	/		
	20	22.0	/		
	21	22.0	/		
	22	22.5	/		
	23	22.0	/		
	24	22.0	/		
	25	21.5	/		
	26	21.5	/		
	27	22.0	/		
	28	22.0	/		
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.02g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JGA

Date Reviewed: Feb. 7/19

P3 38/63

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-HCI
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	19.5	/		
	2	21.0	/		
	3	21.5	/		
	4	19.5	/		
	5	19.5	/		
	6	20.0	/		
	7	20.5	/		
	8	20.0	/		
	9	19.0	/		
	10	19.5	/		
	11	21.0	/		
	12	20.0	/		
	13	21.5	/		
	14	21.0	/		
	15	20.5	/		
	16	20.0	/		
	17	20.0	/		
	18	21.520	/		
	19	19.0	/		
	20	19.5	/		
	21	20.0	/		
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.06 g

Number of survivors: 21

Number of deformed/have difficulty swimming: 0/0

Initials: [Signature]

Reviewed by: [Signature]

Date Reviewed: Feb. 7/19

19 39/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-HC1
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	22.5	/			
	2	22.5	/			
	3	22.5	/			
	4	22.5	/			
	5	22.0	/			
	6	22.5	/			
	7	22.5	/			
	8	22.0	/			
	9	22.0	/			
	10	22.0	/			
	11	22.0	/			
	12	22.0	/			
	13	23.0	/			
	14	22.0	/			
	15	22.0	/			
	16	19.0	/			
	17	21.5	/			
	18	22.0	/			
	19	22.0	/			
	20	23.0	/			
	21	22.0	/			
	22	21.0	/			
	23	22.0	/			
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.56g

Number of survivors: 23

Number of deformed/have difficulty swimming: 0%

Initials: ALM

Reviewed by: Jan

Date Reviewed: Feb. 7/19

23.40/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV-MCZ
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.0	/		
	2	21.0	/		
	3	22.0	/		
	4	21.0	/		
	5	22.0	/		
	6	21.5	/		
	7	21.5	/		
	8	21.5	/		
	9	22.0	/		
	10	22.0	/		
	11	21.5	/		
	12	22.5	/		
	13	22.5	/		
	14	21.0	/		
	15	21.0	/		
	16	22.0	/		
	17	21.5	/		
	18	22.0	/		
	19	22.0	/		
	20	22.0	/		
	21	21.0	/		
	22	21.5	/		
	23	21.5	/		
	24	23.0	/		
	25	22.0	/		
	26	22.0	/		
	27	22.0	/		
	28	22.5	/		
	29	21.0	/		
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 24ⁿ 3.06g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JGU

Date Reviewed: Feb. 7/19

PS 41/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: EV-MCZ

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 B	1	21.5	/			
	2	21.5	/			
	3	21.5	/			
	4	22.0	/			
	5	22.0	/			
	6	22.0	/			
	7	22.0	/			
	8	21.0	/			
	9	21.0	/			
	10	21.5	/			
	11	21.5	/			
	12	22.0	/			
	13	21.5	/			
	14	21.5	/			
	15	21.5	/			
	16	21.5	/			
	17	21.0	/			
	18	22.0	/			
	19	22.0	/			
	20	22.0	/			
	21	21.5	/			
	22	22.0	/			
	23	22.5	/			
	24	20.5	/			
	25	21.0	/			
	26	22.5	/			
	27	21.5	/			
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.99 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 0/0

Initials: KLH

Reviewed by: JG

Date Reviewed: Feb. 7/19

1342163

Alevin Test Data Sheet
Length, Wet Weight, Deformities.

Client: Teck

Start Date: **October 31, 2018**

Sample ID: EV-MC2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	20.5	/		
	2	21.5	/		
	3	21.0	/		
	4	20.0	/		
	5	22.0	/		
	6	22.0	/		
	7	21.0	/		
	8	22.0	/		
	9	21.0	/		
	10	21.0	/		
	11	20.8 ^{mm}	/		
	12	22.0	/		
	13	22.5	/		
	14	22.0	/		
	15	21.0	/		
	16	22.0	/		
	17	22.0	/		
	18	20.0	/		
	19	21.5	/		
	20	22.0	/		
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.15g

Number of survivors: 20

Number of deformed/have difficulty swimming: 0/0

Initials: KLH

Reviewed by: JG

Date Reviewed: Feb 7/19

PS 43/63

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck
Sample ID: EV_M02
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.5	/			
	2	22.0	/			
	3	21.5	/			
	4	22.0	/			
	5	21.5	/			
	6	21.5	/			
	7	23.0	/			
	8	21.5	/			
	9	22.0	/			
	10	21.5	/			
	11	21.5	/			
	12	21.5	/			
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 21.30g
Number of survivors: 12
Number of deformed/have difficulty swimming: 0/0
Initials: KMM
Reviewed by: JKH

Date Reviewed: Feb. 7/19

13 44/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: CM MC2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	24.5	/		
	2	21.5	/		
	3	22.0	/		
	4	22.0	/		
	5	21.0	/		
	6	22.5	/		
	7	22.5	/		
	8	21.0	/		
	9	22.5	/		
	10	21.0	/		
	11	20.5	/		
	12	22.0	/		
	13	21.5	/		
	14	21.5	/		
	15	21.5	/		
	16	21.0	/		
	17	21.0	/		
	18	21.0	/		
	19	21.0	/		
	20	21.0	/		
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.28g

Number of survivors: 20

Number of deformed/have difficulty swimming: 0/0

Initials: KRM

Reviewed by: JRM

Date Reviewed: Feb. 2/19

P345/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: CM-MC2
 Work Order No.: 181873

Start Date: **October 31, 2018**
 Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	21.5	/		
	2	21.5	/		
	3	22.0	/		
	4	21.5	/		
	5	21.5	/		
	6	21.0	/		
	7	21.0	/		
	8	22.0	/		
	9	20.0	/		
	10	20.0	/		
	11	21.0	/		
	12	21.5	/		
	13	20.5	/		
	14	21.0	/		
	15	21.5	/		
	16	20.0	/		
	17	20.0	/		
	18	21.0	/		
	19	21.0	/		
	20	21.5	/		
	21	21.0	/		
	22	21.5	/		
	23	20.5	/		
	24	20.5	/		
	25	21.0	/		
	26	22.0	/		
	27	20.5	/		
	28	22.0	/		
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.99 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JOU

Date Reviewed: Feb. 7/19

B-46/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: CML M02

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 C	1	21.5	/			
	2	21.0	/			
	3	21.0	/			
	4	21.0	/			
	5	21.0	/			
	6	22.5	/			
	7	22.0	/			
	8	22.0	/			
	9	21.5	/			
	10	22.0	/			
	11	21.5	/			
	12	22.0	/			
	13	21.5	/			
	14	21.0	/			
	15	21.5	/			
	16	22.5	/			
	17	22.0	/			
	18	22.0	/			
	19	20.21.0	/			
	20	21.0	/			
	21	22.0	/			
	22	15.0			✓	Kyphosis
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 247 g

Number of survivors: 22

Number of deformed/have difficulty swimming: 1/01

Initials: KLM

Reviewed by: JOU

Date Reviewed: Feb 7/19

PS. 47/63

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: CM-MC2

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.5	/			
	2	18.0	/			
	3	22.0	/			
	4	21.0	/			
	5	21.0	/			
	6	21.0	/			
	7	21.0	/			
	8	21.5	/			
	9	21.5	/			
	10	20.5	/			
	11	15.5			/	pale thin body
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.19 g

Number of survivors: _____

Number of deformed/have difficulty swimming: 1/0

Initials: KLW

Reviewed by: _____

Date Reviewed: _____

B48163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LCDSSCCC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.5	/		
	2	21.5	/		
	3	19.0	/		
	4	21.0	/		
	5	21.0	/		
	6	22.5	/		
	7	22.5 22.5	/		
	8	21.5	/		
	9	21.5 22.0	/		
	10	21.0	/		
	11	21.5	/		
	12	21.5	/		
	13	21.0	/		
	14	22.0	/		
	15	22.0	/		
	16	22.5	/		
	17	22.0	/		
	18	21.5	/		
	19	22.0	/		
	20	22.5	/		
	21	21.0	/		
	22	23.0	/		
	23	22.0	/		
	24	22.0	/		
	25	21.0	/		
	26	23.5	/		
	27	22.0	/		
	28	21.0	/		
	29	21.5	/		
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.16g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: KJmm

Reviewed by: JCh

Date Reviewed: Feb. 7/19

0349163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-LWSSLCC
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	22.5	/		
	2	21.5	/		
	3	21.5 22.5	/		
	4	22.0	/		
	5	21.0	/		
	6	22.0	/		
	7	22.0	/		
	8	22.5	/		
	9	23.0	/		
	10	22.0	/		
	11	22.0	/		
	12	22.5	/		
	13	21.5	/		
	14	22.0	/		
	15	21.0	/		
	16	20.0	/		
	17	22.0	/		
	18	22.0	/		
	19	22.0	/		
	20	22.5	/		
	21	22.5	/		
	22	22.5	/		
	23	22.5	/		
	24	21.5	/		
	25	21.5	/		
	26	22.0	/		
	27	23.0	/		
	28	21.0	/		
	29	19.0	/		
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 3.39 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0%

Initials: KLMW

Reviewed by: JCW

Date Reviewed: Feb. 7/19

P3.5163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-LCDSSLCC
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.0	/		
	2	22.0	/		
	3	21.0	/		
	4	22.0	/		
	5	19.5	/		
	6	23.0	/		
	7	22.0	/		
	8	22.5	/		
	9	22.3	/		
	10	22.5	/		
	11	22.5	/		
	12	22.5	/		
	13	20.0	/		
	14	23.0	/		
	15	22.0	/		
	16	21.0	/		
	17	22.0	/		
	18	21.0	/		
	19	22.0	/		
	20	21.0	/		
	21	22.5	/		
	22	21.0	/		
	23	22.0	/		
	24	16.0		/	extra growth on body
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.65g

Number of survivors: 24

Number of deformed/have difficulty swimming: 1/1

Initials: KLM

Reviewed by: JOK

Date Reviewed: Feb. 7/19

1351163

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LC055LCC

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	20.5	/		
	2	22.0	/		
	3	21.0	/		
	4	20.5	/		
	5	22.0	/		
	6	19.0	/		
	7	22.0	/		
	8	21.0	/		
	9	21.5	/		
	10	22.0	/		
	11	19.0	/		
	12	21.0	/		
	13	21.0	/		
	14	21.5	/		
	15	23.0	/		
	16	22.0	/		
	17	21.5	/		
	18	21.0	/		
	19	22.0	/		
	20	22.0	/		
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.13g

Number of survivors: 20

Number of deformed/have difficulty swimming: 0/0

Initials: KHMM

Reviewed by: JGM

Date Reviewed: Feb 7/19

res 52/63

Alevin Test Data Sheet Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LC3

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.3	/		
	2	21.5	/		
	3	21.8	/		
	4	22.0	/		
	5	21.0	/		
	6	22.3	/		
	7	22.5	/		
	8	22.3	/		
	9	22.3	/		
	10	21.8	/		
	11	21.5	/		
	12	22.0	/		
	13	21.5	/		
	14	21.0	/		
	15	21.0	/		
	16	21.0	/		
	17	20.5	/		
	18	21.5	/		
	19	20.0	/		
	20	22.3	/		
	21	21.8	/		
	22	21.0	/		
	23	21.5	/		
	24	21.5	/		
	25	22.0	/		
	26	20.8	/		
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.79g

Number of survivors: 26

Number of deformed/have difficulty swimming: 0/0

Initials: KLMW

Reviewed by: JG

Date Reviewed: Feb 7/19

MS 53163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-LC3
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	20.5	/		
	2	22.0	/		
	3	21.5	/		
	4	21.0	/		
	5	21.0	/		
	6	22.0	/		
	7	22.0	/		
	8	22.0	/		
	9	22.0	/		
	10	22.0	/		
	11	21.0	/		
	12	21.0	/		
	13	21.5 24 ^h	/		
	14	21.5	/		
	15	21.0	/		
	16	21.5	/		
	17	22.0	/		
	18	21.0	/		
	19	23.0	/		
	20	21.0	/		
	21	21.5	/		
	22	21.5	/		
	23	20.0	/		
	24	22.0	/		
	25	22.0	/		
	26	20.0	/		
	27	21.0	/		
	28	22.0	/		
	29	21.5	/		
	30	22.0	/		Kyphosis
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.27g
 Number of survivors: 44 28 30
 Number of deformed/have difficulty swimming: 1/1
 Initials: KMM
 Reviewed by: JOU

Date Reviewed: Feb 7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
 Sample ID: L2C3
 Work Order No.: 181873

Start Date: **October 31, 2018**
 Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 C	1	21.5	/			
	2	21.5	/			
	3	22.5	/			
	4	23.0	/			
	5	22.0	/			
	6	22.0	/			
	7	22.5	/			
	8	21.0	/			
	9	20.0	/			
	10	21.5	/			
	11	20.0	/			
	12	21.5	/			
	13	21.0	/			
	14	21.5	/			
	15	22.0	/			
	16	21.0	/			
	17	21.0	/			
	18	22.5	/			
	19	22.5	/			
	20	22.0	/			
	21	21.0	/			
	22	17.0			/	Yolk sac edema
	23	19.0			/	kyphosis
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.68g
 Number of survivors: 13
 Number of deformed/have difficulty swimming: 2/1
 Initials: KC/um
 Reviewed by: JK

Date Reviewed: Feb. 7/19

18-55163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-L03

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.5	/			
	2	21.8	/			
	3	21.5	/			
	4	21.5	/			
	5	22.0	/			
	6	21.0	/			
	7	22.0	/			
	8	22.5	/			
	9	22.0	/			
	10	22.0	/			
	11	21.5	/			
	12	22.5	/			
	13	22.0	/			
	14	22.0	/			
	15	20.0	/			
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.75g

Number of survivors: 15

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JCH

Date Reviewed: Feb. 7/19

1856/63

Alevin Test Data Sheet

Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LCS

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 A	1	21.5	/		
	2	21.5	/		
	3	22.0	/		
	4	21.5	/		
	5	21.5	/		
	6	22.0	/		
	7	23.0	/		
	8	22.0	/		
	9	21.0	/		
	10	21.5	/		
	11	22.0	/		
	12	22.5	/		
	13	22.3	/		
	14	21.5	/		
	15	21.5	/		
	16	21.5	/		
	17	20.5	/		
	18	20.0	/		
	19	22.0	/		
	20	21.5	/		
	21	21.0	/		
	22	22.0	/		
	23	22.0	/		
	24	19.0			/
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.58g

Number of survivors: 24

Number of deformed/have difficulty swimming: 1/0

Initials: KLM

Reviewed by: JG

Date Reviewed: Feb 7/19

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LCS

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	21.5	/		
	2	21.5	/		
	3	21.5	/		
	4	21.0	/		
	5	21.0	/		
	6	22.0	/		
	7	22.0	/		
	8	21.0	/		
	9	21.0	/		
	10	21.5	/		
	11	21.5	/		
	12	22.0	/		
	13	22.0	/		
	14	22.0	/		
	15	23.0	/		
	16	21.5	/		
	17	22.0	/		
	18	21.0	/		
	19	22.0	/		
	20	22.0	/		
	21	21.0	/		
	22	22.0	/		
	23	22.0	/		
	24	22.0	/		
	25	21.0	/		
	26	22.0	/		
	27	23.0	/		
	28	22.0	/		
	29	21.5	/		
	30	21.0			
31					
32					
33					
34					
35					

Total Weight (pooled): 3.19g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: KCM

Reviewed by: Jon

Date Reviewed: Feb. 7/19

PS-58/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-LCS
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 c	1	21.0	/			
	2	21.0	/			
	3	21.0	/			
	4	20.0	/			
	5	21.0	/			
	6	21.0	/			
	7	20.5	/			
	8	22.0/21.5	/			
	9	22.0	/			
	10	21.0	/			
	11	22.0	/			
	12	21.0	/			
	13	21.0	/			
	14	21.0	/			
	15	21.5	/			
	16	22.0	/			
	17	21.5	/			
	18	20.0	/			
	19	21.5	/			
	20	22.0	/			
	21	21.0	/			
	22	22.0	/			
	23	20.0	/			
	24	21.0	/			
	25	21.0	/			
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.65g

Number of survivors: 25

Number of deformed/have difficulty swimming: 0/0

Initials: MLM

Reviewed by: JOU

Date Reviewed: Feb-7/19

B59/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-LCS

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 D	1	21.5	/			
	2	22.5	/			
	3	22.5	/			
	4	22.5	/			
	5	21.0	/			
	6	22.0	/			
	7	22.0	/			
	8	23.0	/			
	9	22.0	/			
	10	22.0	/			
	11	22.0	/			
	12	22.0	/			
	13	22.0	/			
	14	22.0	/			
	15	22.5	/			
	16	22.0	/			
	17	20.5	/			
	18	22.5	/			
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.03g

Number of survivors: 18

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: JOU

Date Reviewed: Feb. 7/19

PS 60163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-DCDS
Work Order No.: 181873

Start Date: **October 31, 2018**
Termination Date: **November 30, 2018**

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
100 A	1	22.0	/			
	2	22.0	/			
	3	22.0	/			
	4	22.0	/			
	5	22.0	/			
	6	22.5	/			
	7	22.5	/			
	8	22.0	/			
	9	20.5	/			
	10	22.0	/			
	11	22.0	/			
	12	22.0	/			
	13	22.0	/			
	14	22.0	/			
	15	22.5	/			
	16	21.5	/			
	17	22.5	/			
	18	22.0	/			
	19	23.0	/			
	20	22.0	/			
	21	24.5	/			
	22	21.5	/			
	23	22.0	/			
	24	22.5	/			
	25	22.0	/			
	26	21.0	/			
	27	20.5			/	yolk sac edema
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 3.04g

Number of survivors: 24

Number of deformed/have difficulty swimming: 10/6

Initials: _____

Reviewed by: JCH

Date Reviewed: Feb. 7/19

1361/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LCDCDS

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 B	1	21.0	/		
	2	22.05	/		
	3	21.0	/		
	4	21.0	/		
	5	20.0	/		
	6	19.5	/		
	7	21.5	/		
	8	22.0	/		
	9	21.0	/		
	10	22.0	/		
	11	23.0	/		
	12	22.0	/		
	13	22.0	/		
	14	22.0	/		
	15	21.5	/		
	16	21.5	/		
	17	22.0	/		
	18	22.0	/		
	19	23.0	/		
	20	22.5	/		
	21	22.0	/		
	22	22.0	/		
	23	22.5	/		
	24	21.0	/		
	25	22.0	/		
	26	21.0	/		
	27	21.5	/		
	28	22.5	/		
	29	22.5	/		
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 329 g

Number of survivors: 29

Number of deformed/have difficulty swimming: 0/0

Initials: KLM

Reviewed by: Jou

Date Reviewed: Feb. 7/19

2362163

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck

Start Date: **October 31, 2018**

Sample ID: LC-DCDS

Termination Date: **November 30, 2018**

Work Order No.: 181873

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 C	1	22.0	/		
	2	22.0	/		
	3	22.0	/		
	4	22.5	/		
	5	22.0	/		
	6	21.0	/		
	7	21.0	/		
	8	22.0	/		
	9	23.0	/		
	10	23.0	/		
	11	21.5	/		
	12	21.5	/		
	13	21.5	/		
	14	22.5	/		
	15	22.5	/		
	16	20.5	/		
	17	22.0	/		
	18	22.0	/		
	19	22.0	/		
	20	22.5	/		
	21	22.5	/		
	22	21.0	/		
	23	21.5	/		
	24	23.0	/		
	25	23.0	/		
	26	22.5	/		
	27	22.5	/		
	28	21.5	/		
	29	19.0			/ bent tail & abnormal fin
	30	15.5			/ two-headed.
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 3.33g

Number of survivors: 30

Number of deformed/have difficulty swimming: 2/2

Initials: _____

Reviewed by: JGh

Date Reviewed: Feb 7/19

1363/63

Alevin Test Data Sheet
Length, Wet Weight, Deformities

Client: Teck
Sample ID: LC-DC08
Work Order No.: 181873

Start Date: October 31, 2018
Termination Date: November 30, 2018

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
100 D	1	21.5	/		
	2	22.5	/		
	3	23.0	/		
	4	21.0	/		
	5	21.0	/		
	6	21.5	/		
	7	22.0	/		
	8	21.0	/		
	9	22.0	/		
	10	21.0	/		
	11	22.0	/		
	12	23.0	/		
	13	21.5	/		
	14	20.0	/		
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.64g
Number of survivors: 14
Number of deformed/have difficulty swimming: 0/0
Initials: KLM

Reviewed by: JLW

Date Reviewed: Feb 7/19

CETIS Summary Report

Report Date: 04 Feb-19 10:44 (p 1 of 13)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Batch ID: 14-5761-4807 Test Type: Survival-Development Analyst: Yvonne Lam
 Start Date: 31 Oct-18 15:30 Protocol: EC/EPS 1/RM/28 Diluent: Dechlorinated Tap Water
 Ending Date: 30 Nov-18 09:30 Species: Oncorhynchus mykiss Brine:
 Test Length: 29d 18h Taxon: Actinopterygii Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	05-4624-2341	30 Oct-18	30 Oct-18	40h	Teck Coal	
④ FR_UFR1	09-0464-6301	30 Oct-18 09:56 ✓	31 Oct-18 11:50	30h (0 °C)		
④ GH_ER2	15-7965-2256	30 Oct-18 11:30 ✓	31 Oct-18 11:50	28h (1.5 °C)		
④ CM_MC1	02-7025-1432	30 Oct-18 09:38 ✓	31 Oct-18 11:50	30h (0 °C)		
④ LC_SLC	12-8491-0507	30 Oct-18 10:07 ✓	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00 ✓	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30 ✓	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05 ✓	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30 ✓	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30 ✓	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15 ✓	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20 ✓	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43 ✓	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38 ✓	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44 ✓	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45 ✓	31 Oct-18 11:50	28h (0.5 °C)		

- only 3 replicates used in statistical analyses (Rep D excluded due to possible poor egg quality)
 ① Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
④ FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
④ GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
④ CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
④ LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_HC1 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC1 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_SLC passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_FRCP1 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	Control passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_FR1 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_DCDS passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ER2 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	GH_ERC passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	FR_UFR1 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	EV_MC2 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	CM_MC2 passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LCDSSLCC passed proportion normal	1
18-1729-3758	Proportion Normal	Fisher Exact/Bonferroni-Holm Test	1.0000	LC_LC3 passed proportion normal	1

CETIS Summary Report

Report Date: 04 Feb-19 10:44 (p 11 of 13)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Proportion Normal Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	3	0.8799	0.6195	1.0000	0.8065	1.0000	0.0605	0.1049	11.92%	0.00%
① FR_UFR1		3	0.8333	0.7505	0.9161	0.8000	0.8667	0.0193	0.0333	4.00%	5.30%
② GH_ER2		3	0.8785	0.6379	1.0000	0.7667	0.9355	0.0559	0.0969	11.02%	0.16%
③ CM_MC1		3	0.8000	0.8000	0.8000	0.8000	0.8000	0.0000	0.0000	0.00%	9.08%
④ LC_SLC		3	0.8858	0.6863	1.0000	0.7931	0.9333	0.0464	0.0803	9.07%	-0.67%
FR_FRCP1		3	0.1667	0.0000	0.5461	0.0000	0.3000	0.0882	0.1528	91.65%	81.06%
FR_FRABCH		3	0.6932	0.1672	1.0000	0.5333	0.9333	0.1222	0.2117	30.55%	21.22%
GH_FR1		3	0.6000	0.1618	1.0000	0.4667	0.8000	0.1018	0.1764	29.40%	31.81%
GH_ERC		3	0.8667	0.7839	0.9495	0.8333	0.9000	0.0193	0.0333	3.85%	1.51%
EV_HC1		3	0.7747	0.4261	1.0000	0.6667	0.9333	0.0810	0.1403	18.12%	11.96%
EV_MC2		3	0.8424	0.4929	1.0000	0.6897	0.9667	0.0812	0.1407	16.70%	4.26%
CM_MC2		3	0.7667	0.4057	1.0000	0.6667	0.9333	0.0839	0.1453	18.95%	12.87%
LC_LCDSSLCC		3	0.9088	0.6599	1.0000	0.7931	0.9667	0.0579	0.1002	11.03%	-3.28%
LC_LC3		3	0.8444	0.5098	1.0000	0.7000	0.9667	0.0778	0.1347	15.95%	4.03%
LC_LC5		3	0.8556	0.6026	1.0000	0.7667	0.9667	0.0588	0.1018	11.90%	2.77%
LC_DCDS		3	0.9222	0.7957	1.0000	0.8667	0.9667	0.0294	0.0509	5.52%	-4.81%

Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	3	0.9240	0.7227	1.0000	0.8387	1.0000	0.0468	0.0811	8.77%	0.00%
① FR_UFR1		3	0.8667	0.7839	0.9495	0.8333	0.9000	0.0193	0.0333	3.85%	6.21%
② GH_ER2		3	0.8785	0.6379	1.0000	0.7667	0.9355	0.0559	0.0969	11.02%	4.93%
③ CM_MC1		3	0.8000	0.8000	0.8000	0.8000	0.8000	0.0000	0.0000	0.00%	13.42%
④ LC_SLC		3	0.8973	0.7473	1.0000	0.8276	0.9333	0.0349	0.0604	6.73%	2.89%
FR_FRCP1		3	0.2111	0.0000	0.7499	0.0000	0.4333	0.1252	0.2169	102.73%	77.15%
FR_FRABCH		3	0.7043	0.2082	1.0000	0.5667	0.9333	0.1153	0.1997	28.35%	23.78%
GH_FR1		3	0.6111	0.1259	1.0000	0.4667	0.8333	0.1128	0.1953	31.96%	33.86%
GH_ERC		3	0.9000	0.9000	0.9000	0.9000	0.9000	0.0000	0.0000	0.00%	2.60%
EV_HC1		3	0.7747	0.4261	1.0000	0.6667	0.9333	0.0810	0.1403	18.12%	16.16%
EV_MC2		3	0.8424	0.4929	1.0000	0.6897	0.9667	0.0812	0.1407	16.70%	8.83%
CM_MC2		3	0.7778	0.4330	1.0000	0.6667	0.9333	0.0801	0.1388	17.84%	15.83%
LC_LCDSSLCC		3	0.9203	0.7208	1.0000	0.8276	0.9667	0.0464	0.0803	8.73%	0.40%
LC_LC3		3	0.8778	0.5870	1.0000	0.7667	1.0000	0.0676	0.1171	13.34%	5.00%
LC_LC5		3	0.8667	0.6476	1.0000	0.8000	0.9667	0.0509	0.0882	10.18%	6.21%
LC_DCDS		3	0.9556	0.8291	1.0000	0.9000	1.0000	0.0294	0.0509	5.33%	-3.41%

① Reference sites

Feb. 7/19

CETIS Summary Report

Report Date: 04 Feb-19 10:44 (p 12 of 13)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	0.8065	1.0000	0.8333
① FR_UFR1		0.8333	0.8000	0.8667
① GH_ER2		0.7667	0.9355	0.9333
① CM_MC1		0.8000	0.8000	0.8000
① LC_SLC		0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	0.8387	1.0000	0.9333
① FR_UFR1		0.8667	0.8333	0.9000
① GH_ER2		0.7667	0.9355	0.9333
① CM_MC1		0.8000	0.8000	0.8000
① LC_SLC		0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

① Reference sites

CETIS Summary Report

Report Date: 04 Feb-19 10:44 (p 13 of 13)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	25/31	30/30	25/30
① FR_UFR1		25/30	24/30	26/30
① GH_ER2		23/30	29/31	28/30
① CM_MC1		24/30	24/30	24/30
① LC_SLC		27/29	28/30	23/29
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	26/31	30/30	28/30
① FR_UFR1		26/30	25/30	27/30
① GH_ER2		23/30	29/31	28/30
① CM_MC1		24/30	24/30	24/30
① LC_SLC		27/29	28/30	24/29
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

① Reference sites

JG
Feb 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 04-8582-1416	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:15	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	05-4624-2341	30 Oct-18	30 Oct-18	40h	Teck Coal	
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)		
② GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
③ CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
④ LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		① Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
② GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
③ CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
④ LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		① FR_UFR1	0.1598	Exact	1.0000	Non-Significant Effect
		② GH_ER2	0.2286	Exact	1.0000	Non-Significant Effect
		③ CM_MC1	0.0137	Exact	0.1375	Non-Significant Effect
		④ LC_SLC	0.3700	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	5.5E-23	Significant Effect
		FR_FRABCH*	0.0001	Exact	0.0014	Significant Effect
		GH_FR1*	0.0000	Exact	5.4E-06	Significant Effect
		GH_ERC	0.3882	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0047	Exact	0.0561	Non-Significant Effect
		EV_MC2	0.0773	Exact	0.6957	Non-Significant Effect
		CM_MC2	0.0051	Exact	0.0565	Non-Significant Effect
		LC_LCDSSLCC	0.5921	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 04-8582-1416 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:15 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-HoIm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_LC3	0.2211	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.1598	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.8905	Exact	0.8905	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control	N	84	7	91	0.9231	0.07692	-15.38%
FR_UFR1		78	12	90	0.8667	0.1333	-8.33%
GH_ER2		80	11	91	0.8791	0.1209	-9.89%
CM_MC1		72	18	90	0.8	0.2	0.0%
LC_SLC		79	9	88	0.8977	0.1023	-12.22%
FR_FRCP1		19	71	90	0.2111	0.7889	73.61%
FR_FRABCH		64	27	91	0.7033	0.2967	12.09%
GH_FR1		55	35	90	0.6111	0.3889	23.61%
GH_ERC		81	9	90	0.9	0.1	-12.5%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		70	20	90	0.7778	0.2222	2.78%
LC_LCDSSLCC		82	7	89	0.9213	0.07865	-15.17%
LC_LC3		79	11	90	0.8778	0.1222	-9.72%
LC_LC5		78	12	90	0.8667	0.1333	-8.33%
LC_DCDS		86	4	90	0.9556	0.04444	-19.44%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	0.8387	1.0000	0.9333
FR_UFR1		0.8667	0.8333	0.9000
GH_ER2		0.7667	0.9355	0.9333
CM_MC1		0.8000	0.8000	0.8000
LC_SLC		0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

① Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 04-8582-1416
 Analyzed: 02 Feb-19 4:15

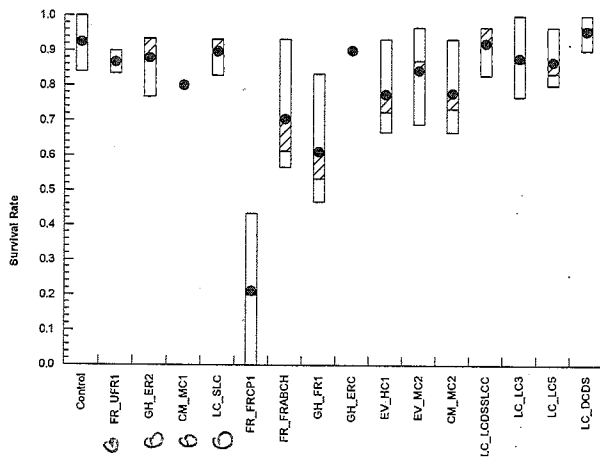
Endpoint: Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	26/31	30/30	28/30
FR_UFR1		26/30	25/30	27/30
GH_ER2		23/30	29/31	28/30
CM_MC1		24/30	24/30	24/30
LC_SLC		27/29	28/30	24/29
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

Graphics



Reference sites.

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-1729-3758	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:15	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	05-4624-2341	30 Oct-18	30 Oct-18	40h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	0.2529	Exact	1.0000	Non-Significant Effect
		GH_ER2	0.5897	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.1057	Exact	1.0000	Non-Significant Effect
		LC_SLC	0.6483	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	2.3E-22	Significant Effect
		FR_FRABCH*	0.0017	Exact	0.0227	Significant Effect
		GH_FR1*	0.0000	Exact	2.0E-04	Significant Effect
		GH_ERC	0.4886	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0493	Exact	0.5423	Non-Significant Effect
		EV_MC2	0.3228	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0364	Exact	0.4364	Non-Significant Effect
		LC_LCDSSLCC	0.8208	Exact	1.0000	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-1729-3758 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:15 Analysis: STP 2xK Contingency Tables Status Level: 1

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
		LC_LC3	0.3228	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.4021	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.8886	Exact	0.8886	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control	N	80	11	91	0.8791	0.1209	-9.89%
① FR_UFR1		75	15	90	0.8333	0.1667	-4.17%
① GH_ER2		80	11	91	0.8791	0.1209	-9.89%
① CM_MC1		72	18	90	0.8	0.2	0.0%
① LC_SLC		78	10	88	0.8864	0.1136	-10.8%
FR_FRCP1		15	75	90	0.1667	0.8333	79.17%
FR_FRABCH		63	28	91	0.6923	0.3077	13.46%
GH_FR1		54	36	90	0.6	0.4	25.0%
GH_ERC		78	12	90	0.8667	0.1333	-8.33%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		69	21	90	0.7667	0.2333	4.17%
LC_LCDSSLCC		81	8	89	0.9101	0.08989	-13.76%
LC_LC3		76	14	90	0.8444	0.1556	-5.56%
LC_LC5		77	13	90	0.8556	0.1444	-6.94%
LC_DCDS		83	7	90	0.9222	0.07778	-15.28%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	0.8065	1.0000	0.8333
① FR_UFR1		0.8333	0.8000	0.8667
① GH_ER2		0.7667	0.9355	0.9333
① CM_MC1		0.8000	0.8000	0.8000
① LC_SLC		0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

① Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

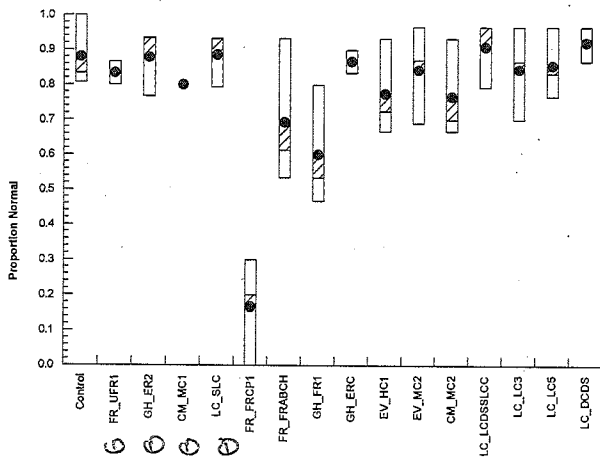
Nautilus Environmental

Analysis ID: 18-1729-3758 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:15 Analysis: STP 2xK Contingency Tables Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	25/31	30/30	25/30
⑥ FR_UFR1		25/30	24/30	26/30
⑥ GH_ER2		23/30	29/31	28/30
⑥ CM_MC1		24/30	24/30	24/30
⑥ LC_SLC		27/29	28/30	23/29
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Graphics



① reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 16-7550-8253	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:17	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
④ GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
⑥ CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		① Reference sites
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
④ GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
⑥ CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Upstream Control (FR_UFR1)		④ GH_ER2	0.6822	Exact	1.0000	Non-Significant Effect
		⑥ CM_MC1	0.1587	Exact	1.0000	Non-Significant Effect
		① LC_SLC	0.8088	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	1.1E-18	Significant Effect
		FR_FRABCH	0.0060	Exact	0.0722	Non-Significant Effect
		GH_FR1*	0.0001	Exact	9.9E-04	Significant Effect
		GH_ERC	0.8233	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0804	Exact	0.8843	Non-Significant Effect
		EV_MC2	0.4162	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0859	Exact	0.8586	Non-Significant Effect
		LC_LCDSSLCC	0.9244	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.6720	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.5865	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9920	Exact	0.9920	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 16-7550-8253 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:17 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	U	78	12	90	0.8667	0.1333	-8.33%
② GH_ER2		80	11	91	0.8791	0.1209	-9.89%
③ CM_MC1		72	18	90	0.8	0.2	0.0%
④ LC_SLC		79	9	88	0.8977	0.1023	-12.22%
FR_FRCP1		19	71	90	0.2111	0.7889	73.61%
FR_FRABCH		64	27	91	0.7033	0.2967	12.09%
GH_FR1		55	35	90	0.6111	0.3889	23.61%
GH_ERC		81	9	90	0.9	0.1	-12.5%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		70	20	90	0.7778	0.2222	2.78%
LC_LCDSSLCC		82	7	89	0.9213	0.07865	-15.17%
LC_LC3		79	11	90	0.8778	0.1222	-9.72%
LC_LC5		78	12	90	0.8667	0.1333	-8.33%
LC_DCDS		86	4	90	0.9556	0.04444	-19.44%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
① FR_UFR1	U	0.8667	0.8333	0.9000
② GH_ER2		0.7667	0.9355	0.9333
③ CM_MC1		0.8000	0.8000	0.8000
④ LC_SLC		0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

① Reference sites

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 16-7550-8253
 Analyzed: 02 Feb-19 4:17

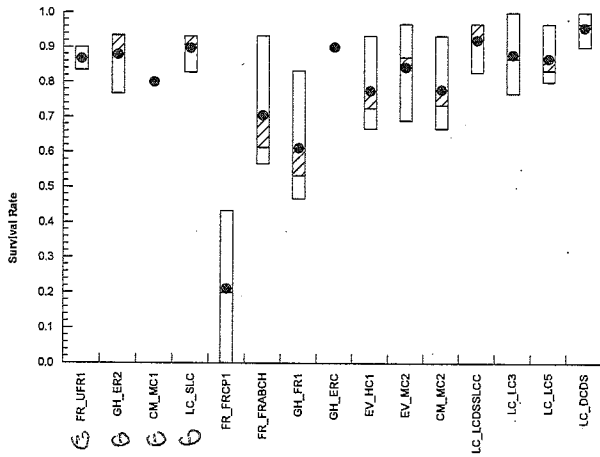
Endpoint: Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
GH_ER2		23/30	29/31	28/30
CM_MC1		24/30	24/30	24/30
LC_SLC		27/29	28/30	24/29
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

Graphics



① Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 06-8864-1375	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:17	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

① Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Upstream Control (FR_UFR1)		① GH_ER2	0.8622	Exact	1.0000	Non-Significant Effect
		① CM_MC1	0.3502	Exact	1.0000	Non-Significant Effect
		① LC_SLC	0.8917	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	3.4E-19	Significant Effect
		FR_FRABCH	0.0196	Exact	0.2349	Non-Significant Effect
		GH_FR1*	0.0004	Exact	0.0055	Significant Effect
		GH_ERC	0.7979	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.2147	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.6572	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.1758	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.9616	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.6572	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.7311	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9807	Exact	0.9807	Non-Significant Effect

Analyst: *mm* *QA*
 JGA
 Feb. 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 06-8864-1375 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:17 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	U	75	15	90	0.8333	0.1667	-4.17%
GH_ER2		80	11	91	0.8791	0.1209	-9.89%
CM_MC1		72	18	90	0.8	0.2	0.0%
LC_SLC		78	10	88	0.8864	0.1136	-10.8%
FR_FRCP1		15	75	90	0.1667	0.8333	79.17%
FR_FRABCH		63	28	91	0.6923	0.3077	13.46%
GH_FR1		54	36	90	0.6	0.4	25.0%
GH_ERC		78	12	90	0.8667	0.1333	-8.33%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		69	21	90	0.7667	0.2333	4.17%
LC_LCDSSLCC		81	8	89	0.9101	0.08989	-13.76%
LC_LC3		76	14	90	0.8444	0.1556	-5.56%
LC_LC5		77	13	90	0.8556	0.1444	-6.94%
LC_DCDS		83	7	90	0.9222	0.07778	-15.28%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1	U	0.8333	0.8000	0.8667
GH_ER2		0.7667	0.9355	0.9333
CM_MC1		0.8000	0.8000	0.8000
LC_SLC		0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

① reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 06-8864-1375
 Analyzed: 02 Feb-19 4:17

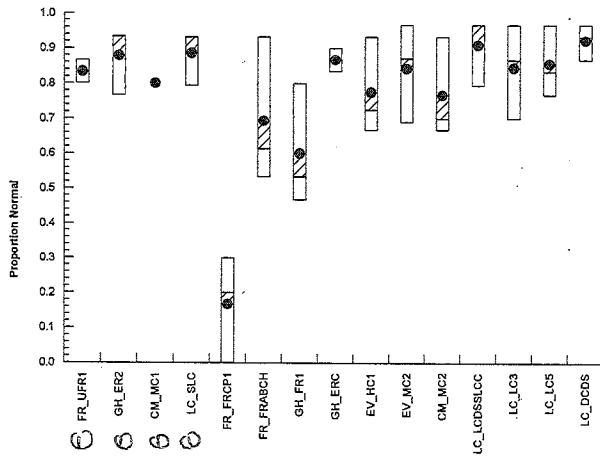
Endpoint: Proportion Normal
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
GH_ER2		23/30	29/31	28/30
CM_MC1		24/30	24/30	24/30
LC_SLC		27/29	28/30	23/29
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Graphics



Ⓡ Reference sites

Job Feb 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 13-8196-5245	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:18	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		① Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Receiving Water		① FR_UFR1	0.4886	Exact	1.0000	Non-Significant Effect
(GH_ER2)		① CM_MC1	0.1057	Exact	0.9517	Non-Significant Effect
		① LC_SLC	0.7357	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	1.2E-19	Significant Effect
		FR_FRABCH*	0.0029	Exact	0.0345	Significant Effect
		GH_FR1*	0.0000	Exact	3.5E-04	Significant Effect
		GH_ERC	0.7529	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0493	Exact	0.5423	Non-Significant Effect
		EV_MC2	0.3228	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0530	Exact	0.5299	Non-Significant Effect
		LC_LCDSSLCC	0.8839	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.5788	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.4886	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9852	Exact	0.9852	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 13-8196-5245 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:18 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1		78	12	90	0.8667	0.1333	-8.33%
① GH_ER2	R	80	11	91	0.8791	0.1209	-9.89%
① CM_MC1		72	18	90	0.8	0.2	0.0%
① LC_SLC		79	9	88	0.8977	0.1023	-12.22%
FR_FRCP1		19	71	90	0.2111	0.7889	73.61%
FR_FRABCH		64	27	91	0.7033	0.2967	12.09%
GH_FR1		55	35	90	0.6111	0.3889	23.61%
GH_ERC		81	9	90	0.9	0.1	-12.5%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		70	20	90	0.7778	0.2222	2.78%
LC_LCDSSLCC		82	7	89	0.9213	0.07865	-15.17%
LC_LC3		79	11	90	0.8778	0.1222	-9.72%
LC_LC5		78	12	90	0.8667	0.1333	-8.33%
LC_DCDS		86	4	90	0.9556	0.04444	-19.44%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
① FR_UFR1		0.8667	0.8333	0.9000
① GH_ER2	R	0.7667	0.9355	0.9333
① CM_MC1		0.8000	0.8000	0.8000
① LC_SLC		0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

① reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

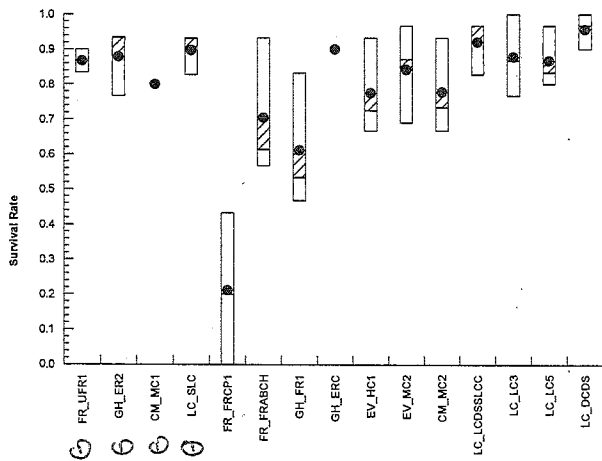
Analysis ID: 13-8196-5245 Endpoint: Survival Rate
 Analyzed: 02 Feb-19 4:18 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		26/30	25/30	27/30
CM_MC1		24/30	24/30	24/30
LC_SLC		27/29	28/30	24/29
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

Graphics



① Reference sites.

Jlu
 Feb. 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-4838-1152	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:18	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		① Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Receiving Water		① FR_UFR1	0.2529	Exact	1.0000	Non-Significant Effect
(GH-ER2)		① CM_MC1	0.1057	Exact	0.9517	Non-Significant Effect
		① LC_SLC	0.6483	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	2.1E-22	Significant Effect
		FR_FRABCH*	0.0017	Exact	0.0210	Significant Effect
		GH_FR1*	0.0000	Exact	1.9E-04	Significant Effect
		GH_ERC	0.4886	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0493	Exact	0.4930	Non-Significant Effect
		EV_MC2	0.3228	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0364	Exact	0.4000	Non-Significant Effect
		LC_LCDSSLCC	0.8208	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.3228	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.4021	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.8886	Exact	0.8886	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:45 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 18-4838-1152 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:18 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		75	15	90	0.8333	0.1667	-4.17%
GH_ER2	R	80	11	91	0.8791	0.1209	-9.89%
CM_MC1		72	18	90	0.8	0.2	0.0%
LC_SLC		78	10	88	0.8864	0.1136	-10.8%
FR_FRCP1		15	75	90	0.1667	0.8333	79.17%
FR_FRABCH		63	28	91	0.6923	0.3077	13.46%
GH_FR1		54	36	90	0.6	0.4	25.0%
GH_ERC		78	12	90	0.8667	0.1333	-8.33%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		69	21	90	0.7667	0.2333	4.17%
LC_LCDSSLCC		81	8	89	0.9101	0.08989	-13.76%
LC_LC3		76	14	90	0.8444	0.1556	-5.56%
LC_LC5		77	13	90	0.8556	0.1444	-6.94%
LC_DCDS		83	7	90	0.9222	0.07778	-15.28%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		0.8333	0.8000	0.8667
GH_ER2	R	0.7667	0.9355	0.9333
CM_MC1		0.8000	0.8000	0.8000
LC_SLC		0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

① reference sites

JG
Feb 7/19

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

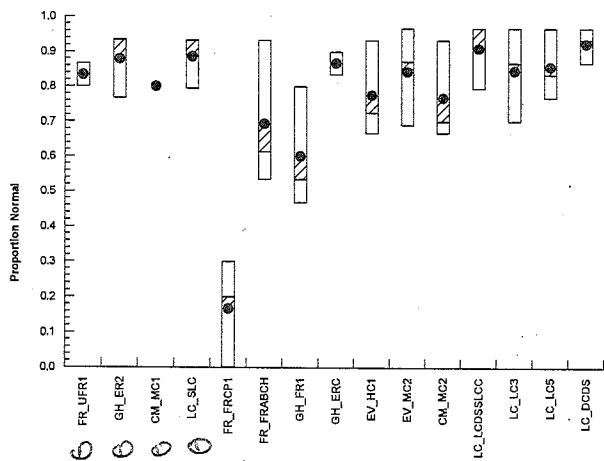
Analysis ID: 18-4838-1152 Endpoint: Proportion Normal
 Analyzed: 02 Feb-19 4:18 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		25/30	24/30	26/30
CM_MC1		24/30	24/30	24/30
LC_SLC		27/29	28/30	23/29
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Graphics



Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-5251-4779	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:19	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.9196	Exact	1.0000	Non-Significant Effect
(CM_MC1)		GH_ER2	0.9514	Exact	1.0000	Non-Significant Effect
		LC_SLC	0.9795	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	9.0E-15	Significant Effect
		FR_FRABCH	0.0911	Exact	1.0000	Non-Significant Effect
		GH_FR1	0.0043	Exact	0.0556	Non-Significant Effect
		GH_ERC	0.9823	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.4124	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.8351	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.4276	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.9953	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.9482	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.9196	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9998	Exact	0.9998	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-5251-4779 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:19 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		78	12	90	0.8667	0.1333	-8.33%
GH_ER2		80	11	91	0.8791	0.1209	-9.89%
CM_MC1	XC	72	18	90	0.8	0.2	0.0%
LC_SLC		79	9	88	0.8977	0.1023	-12.22%
FR_FRCP1		19	71	90	0.2111	0.7889	73.61%
FR_FRABCH		64	27	91	0.7033	0.2967	12.09%
GH_FR1		55	35	90	0.6111	0.3889	23.61%
GH_ERC		81	9	90	0.9	0.1	-12.5%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		70	20	90	0.7778	0.2222	2.78%
LC_LCDSSLCC		82	7	89	0.9213	0.07865	-15.17%
LC_LC3		79	11	90	0.8778	0.1222	-9.72%
LC_LC5		78	12	90	0.8667	0.1333	-8.33%
LC_DCDS		86	4	90	0.9556	0.04444	-19.44%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		0.8667	0.8333	0.9000
GH_ER2		0.7667	0.9355	0.9333
CM_MC1	XC	0.8000	0.8000	0.8000
LC_SLC		0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

Reference sites

Feb 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-5251-4779
 Analyzed: 02 Feb-19 4:19

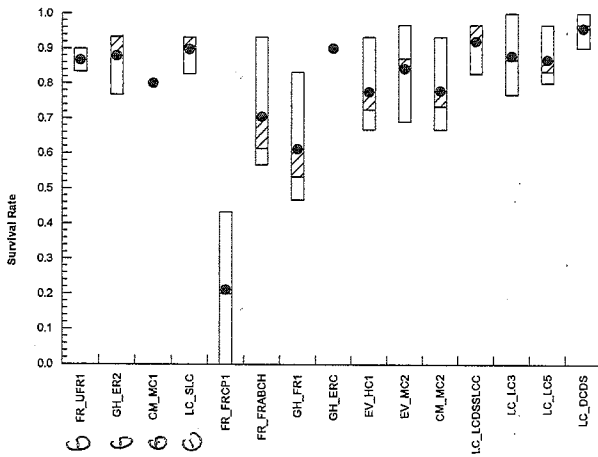
Endpoint: Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		26/30	25/30	27/30
GH_ER2		23/30	29/31	28/30
LC_SLC		27/29	28/30	24/29
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

Graphics



Reference sites

Feb-7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 05-3694-3509	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:19	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		Reference sites
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		FR_UFR1	0.7793	Exact	1.0000	Non-Significant Effect
(CM_MC1)		GH_ER2	0.9514	Exact	1.0000	Non-Significant Effect
		LC_SLC	0.9639	Exact	1.0000	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	3.1E-17	Significant Effect
		FR_FRABCH	0.0674	Exact	0.8091	Non-Significant Effect
		GH_FR1*	0.0027	Exact	0.0353	Significant Effect
		GH_ERC	0.9196	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.4124	Exact	1.0000	Non-Significant Effect
		EV_MC2	0.8351	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.3589	Exact	1.0000	Non-Significant Effect
		LC_LCDSSLCC	0.9901	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.8351	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.8820	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9957	Exact	0.9957	Non-Significant Effect

JG
Feb. 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 05-3694-3509 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:19 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		75	15	90	0.8333	0.1667	-4.17%
GH_ER2		80	11	91	0.8791	0.1209	-9.89%
CM_MC1	XC	72	18	90	0.8	0.2	0.0%
LC_SLC		78	10	88	0.8864	0.1136	-10.8%
FR_FRCP1		15	75	90	0.1667	0.8333	79.17%
FR_FRABCH		63	28	91	0.6923	0.3077	13.46%
GH_FR1		54	36	90	0.6	0.4	25.0%
GH_ERC		78	12	90	0.8667	0.1333	-8.33%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		69	21	90	0.7667	0.2333	4.17%
LC_LCDSSLCC		81	8	89	0.9101	0.08989	-13.76%
LC_LC3		76	14	90	0.8444	0.1556	-5.56%
LC_LC5		77	13	90	0.8556	0.1444	-6.94%
LC_DCDS		83	7	90	0.9222	0.07778	-15.28%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		0.8333	0.8000	0.8667
GH_ER2		0.7667	0.9355	0.9333
CM_MC1	XC	0.8000	0.8000	0.8000
LC_SLC		0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

Reference sites

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 05-3694-3509
 Analyzed: 02 Feb-19 4:19

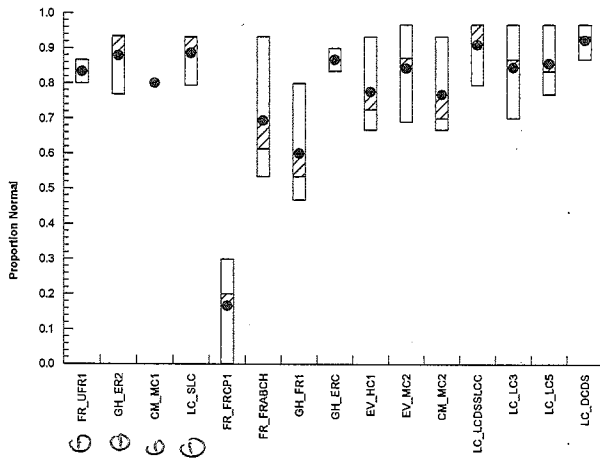
Endpoint: Proportion Normal
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		25/30	24/30	26/30
GH_ER2		23/30	29/31	28/30
LC_SLC		27/29	28/30	23/29
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Graphics



① reference sites

JGA
 Feb 7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 02-3949-6382	Endpoint: Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:20	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		① Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
① Unamended Sample		FR_UFR1	0.3416	Exact	1.0000	Non-Significant Effect
(LC-SLC)		① GH_ER2	0.4379	Exact	1.0000	Non-Significant Effect
		① CM_MC1	0.0532	Exact	0.4785	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	1.3E-20	Significant Effect
		FR_FRABCH*	0.0010	Exact	0.0114	Significant Effect
		GH_FR1*	0.0000	Exact	8.6E-05	Significant Effect
		GH_ERC	0.6173	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0222	Exact	0.2439	Non-Significant Effect
		EV_MC2	0.2018	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0240	Exact	0.2403	Non-Significant Effect
		LC_LCDSSLCC	0.7907	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.4275	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.3416	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.9633	Exact	0.9633	Non-Significant Effect

Feb-7/19

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 02-3949-6382 Endpoint: Survival Rate CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:20 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1		78	12	90	0.8667	0.1333	-8.33%
GH_ER2		80	11	91	0.8791	0.1209	-9.89%
CM_MC1		72	18	90	0.8	0.2	0.0%
LC_SLC	US	79	9	88	0.8977	0.1023	-12.22%
FR_FRCP1		19	71	90	0.2111	0.7889	73.61%
FR_FRABCH		64	27	91	0.7033	0.2967	12.09%
GH_FR1		55	35	90	0.6111	0.3889	23.61%
GH_ERC		81	9	90	0.9	0.1	-12.5%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		70	20	90	0.7778	0.2222	2.78%
LC_LCDSSLCC		82	7	89	0.9213	0.07865	-15.17%
LC_LC3		79	11	90	0.8778	0.1222	-9.72%
LC_LC5		78	12	90	0.8667	0.1333	-8.33%
LC_DCDS		86	4	90	0.9556	0.04444	-19.44%

Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		0.8667	0.8333	0.9000
GH_ER2		0.7667	0.9355	0.9333
CM_MC1		0.8000	0.8000	0.8000
LC_SLC	US	0.9310	0.9333	0.8276
FR_FRCP1		0.2000	0.4333	0.0000
FR_FRABCH		0.5667	0.9333	0.6129
GH_FR1		0.5333	0.8333	0.4667
GH_ERC		0.9000	0.9000	0.9000
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7333
LC_LCDSSLCC		0.9667	0.9667	0.8276
LC_LC3		0.8667	1.0000	0.7667
LC_LC5		0.8000	0.9667	0.8333
LC_DCDS		0.9000	0.9667	1.0000

① Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 02-3949-6382
 Analyzed: 02 Feb-19 4:20

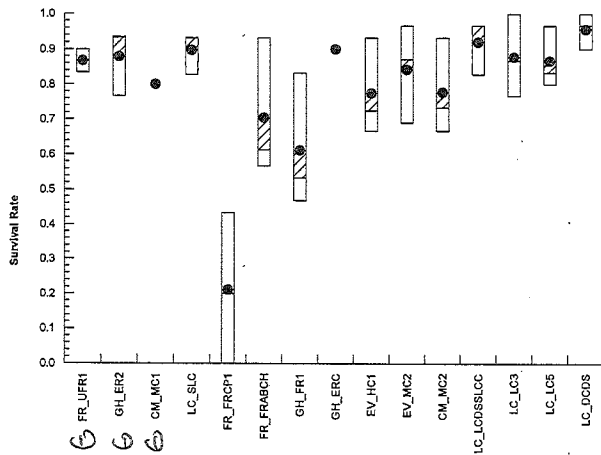
Endpoint: Survival Rate
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		26/30	25/30	27/30
GH_ER2		23/30	29/31	28/30
CM_MC1		24/30	24/30	24/30
FR_FRCP1		6/30	13/30	0/30
FR_FRABCH		17/30	28/30	19/31
GH_FR1		16/30	25/30	14/30
GH_ERC		27/30	27/30	27/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	22/30
LC_LCDSSLCC		29/30	29/30	24/29
LC_LC3		26/30	30/30	23/30
LC_LC5		24/30	29/30	25/30
LC_DCDS		27/30	29/30	30/30

Graphics



① Reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 1 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-5531-5827	Endpoint: Proportion Normal	CETIS Version: CETISv1.9.4
Analyzed: 02 Feb-19 4:20	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 14-5761-4807	Test Type: Survival-Development	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		<i>Reference sites</i>
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Unamended Sample		FR_UFR1	0.2115	Exact	1.0000	Non-Significant Effect
(LC_SLC)		GH_ER2	0.5329	Exact	1.0000	Non-Significant Effect
		CM_MC1	0.0839	Exact	0.7550	Non-Significant Effect
		FR_FRCP1*	0.0000	Exact	1.6E-22	Significant Effect
		FR_FRABCH*	0.0012	Exact	0.0146	Significant Effect
		GH_FR1*	0.0000	Exact	1.2E-04	Significant Effect
		GH_ERC	0.4324	Exact	1.0000	Non-Significant Effect
		EV_HC1	0.0378	Exact	0.3778	Non-Significant Effect
		EV_MC2	0.2750	Exact	1.0000	Non-Significant Effect
		CM_MC2	0.0275	Exact	0.3028	Non-Significant Effect
		LC_LCDSSLCC	0.7794	Exact	1.0000	Non-Significant Effect
		LC_LC3	0.2750	Exact	1.0000	Non-Significant Effect
		LC_LC5	0.3491	Exact	1.0000	Non-Significant Effect
		LC_DCDS	0.8575	Exact	0.8575	Non-Significant Effect

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 2 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-5531-5827 Endpoint: Proportion Normal CETIS Version: CETISv1.9.4
 Analyzed: 02 Feb-19 4:20 Analysis: STP 2xK Contingency Tables Status Level: 1

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend Test			1.0000	Non-Significant Trend in Controls

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1		75	15	90	0.8333	0.1667	-4.17%
② GH_ER2		80	11	91	0.8791	0.1209	-9.89%
③ CM_MC1		72	18	90	0.8	0.2	0.0%
④ LC_SLC	US	78	10	88	0.8864	0.1136	-10.8%
FR_FRCP1		15	75	90	0.1667	0.8333	79.17%
FR_FRABCH		63	28	91	0.6923	0.3077	13.46%
GH_FR1		54	36	90	0.6	0.4	25.0%
GH_ERC		78	12	90	0.8667	0.1333	-8.33%
EV_HC1		69	20	89	0.7753	0.2247	3.09%
EV_MC2		76	14	90	0.8444	0.1556	-5.56%
CM_MC2		69	21	90	0.7667	0.2333	4.17%
LC_LCDSSLCC		81	8	89	0.9101	0.08989	-13.76%
LC_LC3		76	14	90	0.8444	0.1556	-5.56%
LC_LC5		77	13	90	0.8556	0.1444	-6.94%
LC_DCDS		83	7	90	0.9222	0.07778	-15.28%

Proportion Normal Detail

Sample	Code	Rep 1	Rep 2	Rep 3
① FR_UFR1		0.8333	0.8000	0.8667
② GH_ER2		0.7667	0.9355	0.9333
③ CM_MC1		0.8000	0.8000	0.8000
④ LC_SLC	US	0.9310	0.9333	0.7931
FR_FRCP1		0.2000	0.3000	0.0000
FR_FRABCH		0.5333	0.9333	0.6129
GH_FR1		0.5333	0.8000	0.4667
GH_ERC		0.8667	0.9000	0.8333
EV_HC1		0.6667	0.9333	0.7241
EV_MC2		0.9667	0.8710	0.6897
CM_MC2		0.6667	0.9333	0.7000
LC_LCDSSLCC		0.9667	0.9667	0.7931
LC_LC3		0.8667	0.9667	0.7000
LC_LC5		0.7667	0.9667	0.8333
LC_DCDS		0.8667	0.9667	0.9333

① reference sites

CETIS Analytical Report

Report Date: 04 Feb-19 10:46 (p 3 of 3)
 Test Code/ID: 181873a / 16-8741-0932

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 11-5531-5827
 Analyzed: 02 Feb-19 4:20

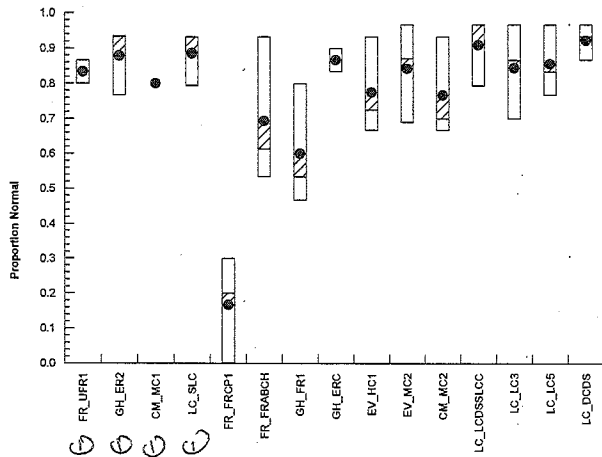
Endpoint: Proportion Normal
 Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
 Status Level: 1

Proportion Normal Binomials

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		25/30	24/30	26/30
GH_ER2		23/30	29/31	28/30
CM_MC1		24/30	24/30	24/30
FR_FRCP1		6/30	9/30	0/30
FR_FRABCH		16/30	28/30	19/31
GH_FR1		16/30	24/30	14/30
GH_ERC		26/30	27/30	25/30
EV_HC1		20/30	28/30	21/29
EV_MC2		29/30	27/31	20/29
CM_MC2		20/30	28/30	21/30
LC_LCDSSLCC		29/30	29/30	23/29
LC_LC3		26/30	29/30	21/30
LC_LC5		23/30	29/30	25/30
LC_DCDS		26/30	29/30	28/30

Graphics



Ⓞ Reference sites

CETIS Summary Report

Report Date: 14 Jan-19 16:30 (p 1 of 12)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	07-2637-5525	31 Oct-18	31 Oct-18	16h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

- Only 3 replicates used in statistical analyses (Rep D excluded due to possible poor egg quality)

Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	EV_HC1 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	CM_MC1 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	LC_SLC passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	FR_FRCP1 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	Control passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	GH_FR1 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	LC_DCDS passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	GH_ER2 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	GH_ERC passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	FR_UFR1 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	EV_MC2 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	CM_MC2 passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	LC_LCDSSLCC passed length-mm	1
12-2193-2455	Length-mm	Dunnett Multiple Comparison Test	0.9997	LC_LC3 passed length-mm	1

CETIS Summary Report

Report Date: 14 Jan-19 16:30 (p 11 of 12)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Length-mm Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	3	20.58	19.94	21.22	20.35	20.86	0.1493	0.2585	1.26%	0.00%
① FR_UFR1		3	21.04	20.5	21.58	20.81	21.24	0.125	0.2166	1.03%	-2.24%
① GH_ER2		3	21.12	21.06	21.19	21.1	21.15	0.01453	0.02517	0.12%	-2.65%
① CM_MC1		3	21.38	20.49	22.28	20.98	21.67	0.2076	0.3595	1.68%	-3.91%
① LC_SLC		3	21.31	20.73	21.89	21.11	21.56	0.1341	0.2322	1.09%	-3.55%
FR_FRCP1		2	17.08	16.1	18.06	17	17.15	0.077	0.1089	0.64%	17.02%
FR_FRABCH		3	20.34	18.31	22.36	19.41	20.95	0.4707	0.8153	4.01%	1.17%
GH_FR1		3	19.84	19.51	20.16	19.7	19.96	0.07632	0.1322	0.67%	3.61%
GH_ERC		3	20.72	19.8	21.64	20.41	21.13	0.2138	0.3702	1.79%	-0.70%
EV_HC1		3	21.15	19.04	23.26	20.19	21.8	0.4898	0.8483	4.01%	-2.77%
EV_MC2		3	21.58	21.24	21.93	21.42	21.69	0.08023	0.139	0.64%	-4.87%
CM_MC2		3	21.27	20.71	21.83	21.09	21.52	0.1308	0.2266	1.07%	-3.37%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.56	21.93	0.1071	0.1854	0.85%	-5.61%
LC_LC3		3	21.31	20.76	21.86	21.13	21.56	0.128	0.2217	1.04%	-3.55%
LC_LC5		3	21.55	20.96	22.15	21.3	21.78	0.1382	0.2394	1.11%	-4.73%
LC_DCDS		3	21.75	21.51	21.98	21.67	21.85	0.0547	0.09474	0.44%	-5.68%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	N	3	102.2	91.54	112.8	97.31	105.3	2.475	4.286	4.19%	0.00%
① FR_UFR1		3	103.8	97.2	110.3	101.9	106.8	1.526	2.644	2.55%	-1.55%
① GH_ER2		3	104.7	99.44	109.9	102.9	107	1.211	2.097	2.00%	-2.41%
① CM_MC1		3	105.6	99.58	111.5	104.2	108.3	1.389	2.406	2.28%	-3.29%
① LC_SLC		3	104.7	96.48	113	101.8	108.3	1.918	3.323	3.17%	-2.49%
FR_FRCP1		2	88.78	83.08	94.48	88.33	89.23	0.4487	0.6346	0.71%	13.12%
FR_FRABCH		3	100.9	89.14	112.6	95.88	105.3	2.723	4.716	4.68%	1.30%
GH_FR1		3	99.64	90.31	109	95.71	103.2	2.169	3.756	3.77%	2.50%
GH_ERC		3	98.64	92.11	105.2	96.3	101.5	1.517	2.628	2.66%	3.47%
EV_HC1		3	105.2	89.84	120.5	98.1	109.5	3.56	6.165	5.86%	-2.90%
EV_MC2		3	107.9	101.4	114.5	105.5	110.7	1.522	2.637	2.44%	-5.61%
CM_MC2		3	111	101.7	120.4	106.8	114	2.175	3.767	3.39%	-8.64%
LC_LCDSSLCC		3	112.1	101.6	122.6	109	116.9	2.438	4.223	3.77%	-9.69%
LC_LC3		3	110.9	98.76	123.1	107.3	116.5	2.832	4.905	4.42%	-8.57%
LC_LC5		3	107.8	102.8	112.9	106	110	1.167	2.021	1.87%	-5.52%
LC_DCDS		3	112.3	109.3	115.4	111	113.4	0.7173	1.242	1.11%	-9.94%

① Reference sites

CETIS Summary Report

Report Date: 14 Jan-19 16:30 (p 12 of 12)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	20.35	20.53	20.86
FR_UFR1		20.81	21.24	21.07
GH_ER2		21.15	21.12	21.1
CM_MC1		21.67	20.98	21.5
LC_SLC		21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	97.31	105.3	103.9
FR_UFR1		101.9	106.8	102.6
GH_ER2		107	104.1	102.9
CM_MC1		108.3	104.2	104.2
LC_SLC		104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3	109	116.5
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

Reference sites

CETIS Analytical Report

Report Date: 30 Dec-18 14:48 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 12-2193-2455	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 30 Dec-18 14:40	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	07-2637-5525	31 Oct-18	31 Oct-18	16h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

See Feb. 11/10

CETIS Analytical Report

Report Date: 30 Dec-18 14:48 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 12-2193-2455 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 30 Dec-18 14:40 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	3.91%
		GH_ER2 passed length-mm	3.91%
		CM_MC1 passed length-mm	3.91%
		LC_SLC passed length-mm	3.91%
		FR_FRCP1 failed length-mm	3.91%
		FR_FRABCH passed length-mm	3.91%
		GH_FR1 passed length-mm	3.91%
		GH_ERC passed length-mm	3.91%
		EV_HC1 passed length-mm	3.91%
		EV_MC2 passed length-mm	3.91%
		CM_MC2 passed length-mm	3.91%
		LC_LCDSSLCC passed length-mm	3.91%
		LC_LC3 passed length-mm	3.91%
		LC_LC5 passed length-mm	3.91%
		LC_DCDS passed length-mm	3.91%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		FR_UFR1	-1.551	2.702	0.805	4	CDF	0.9997	Non-Significant Effect
		GH_ER2	-1.832	2.702	0.805	4	CDF	0.9999	Non-Significant Effect
		CM_MC1	-2.698	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		LC_SLC	-2.456	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		FR_FRCP1*	10.52	2.702	0.9	3	CDF	1.7E-07	Significant Effect
		FR_FRABCH	0.806	2.702	0.805	4	CDF	0.7036	Non-Significant Effect
		GH_FR1	2.494	2.702	0.805	4	CDF	0.0765	Non-Significant Effect
		GH_ERC	-0.4825	2.702	0.805	4	CDF	0.9846	Non-Significant Effect
		EV_HC1	-1.912	2.702	0.805	4	CDF	0.9999	Non-Significant Effect
		EV_MC2	-3.368	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		CM_MC2	-2.326	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		LC_LCDSSLCC	-3.879	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-2.453	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		LC_LC5	-3.272	2.702	0.805	4	CDF	1.0000	Non-Significant Effect
		LC_DCDS	-3.926	2.702	0.805	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	43.3266	2.88844	15	21.72	<1.0E-37	Significant Effect
Error	4.12336	0.133012	31			
Total	47.4499		46			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	27.99	30.58	0.0216	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9185	0.9333	0.0030	Non-Normal Distribution

Reference sheet

Salmonid Embryo-Alevin-Ery Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 12-2193-2455 Endpoint: Length-mm
 Analyzed: 30 Dec-18 14:40 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Summary

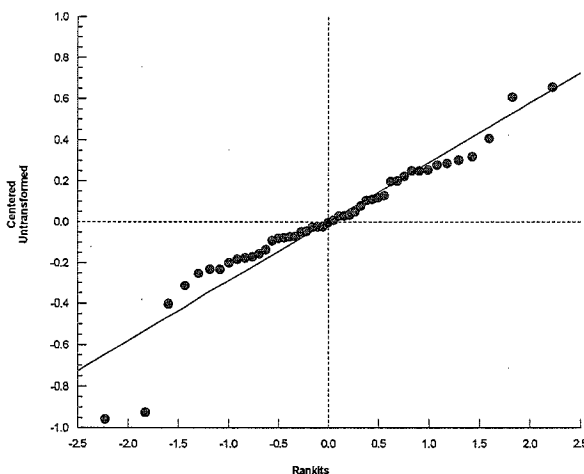
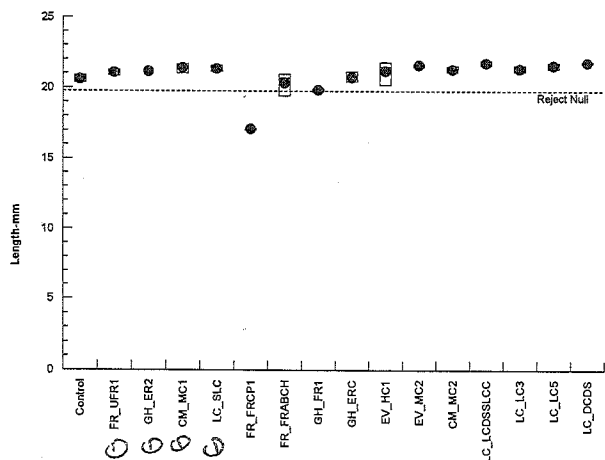
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	N	3	20.58	19.94	21.22	20.53	20.35	20.86	0.1493	1.26%	0.00%
FR_UFR1		3	21.04	20.5	21.58	21.07	20.81	21.24	0.1258	1.04%	-2.25%
GH_ER2		3	21.12	21.06	21.19	21.12	21.1	21.15	0.01518	0.12%	-2.65%
CM_MC1		3	21.38	20.49	22.27	21.5	20.98	21.67	0.2072	1.68%	-3.90%
LC_SLC		3	21.31	20.74	21.88	21.26	21.11	21.56	0.1323	1.08%	-3.55%
FR_FRCP1		2	17.08	16.1	18.06	17.08	17	17.15	0.07704	0.64%	17.02%
FR_FRABCH		3	20.34	18.31	22.36	20.66	19.41	20.95	0.4707	4.01%	1.17%
GH_FR1		3	19.84	19.51	20.16	19.84	19.7	19.96	0.0763	0.67%	3.61%
GH_ERC		3	20.72	19.8	21.64	20.63	20.41	21.13	0.2138	1.79%	-0.70%
EV_HC1		3	21.15	19.04	23.26	21.45	20.19	21.8	0.4898	4.01%	-2.77%
EV_MC2		3	21.58	21.24	21.93	21.63	21.42	21.69	0.08021	0.64%	-4.87%
CM_MC2		3	21.27	20.71	21.83	21.2	21.09	21.52	0.1308	1.07%	-3.37%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.71	21.56	21.93	0.1071	0.85%	-5.61%
LC_LC3		3	21.31	20.76	21.86	21.24	21.13	21.56	0.128	1.04%	-3.55%
LC_LC5		3	21.55	20.96	22.15	21.58	21.3	21.78	0.1382	1.11%	-4.73%
LC_DCDS		3	21.75	21.51	21.98	21.72	21.67	21.85	0.05475	0.44%	-5.68%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	20.35	20.53	20.86
FR_UFR1		20.81	21.24	21.07
GH_ER2		21.15	21.12	21.1
CM_MC1		21.67	20.98	21.5
LC_SLC		21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

① Reference sites

Graphics



CETIS Analytical Report

Report Date: 28 Dec-18 08:56 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin- Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 20-1569-1333 **Endpoint:** Mean ^{WET} Dry Weight-mg **CETIS Version:** CETISv1.9.4
 Analyzed: 28 Dec-18 8:55 **Analysis:** Parametric-Control vs Treatments **Status Level:** 1

Batch ID: 17-8614-0161 **Test Type:** Survival-Development-Growth **Analyst:** Yvonne Lam
 Start Date: 31 Oct-18 15:30 **Protocol:** EC/EPS 1/RM/28 **Diluent:** Dechlorinated Tap Water
 Ending Date: 30 Nov-18 09:30 **Species:** Oncorhynchus mykiss **Brine:**
 Test Length: 29d 18h **Taxon:** Actinopterygii **Source:** Lyndon Fish Hatcheries **Age:**

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control	07-2637-5525	31 Oct-18	31 Oct-18	16h	Teck Coal	
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)		
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control	control	Teck Coal	Control	
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

File Feb. 7/19

CETIS Analytical Report

Report Date: 28 Dec-18 08:56 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-1569-1333 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 8:55 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg GH_ER2 passed mean dry weight-mg CM_MC1 passed mean dry weight-mg LC_SLC passed mean dry weight-mg FR_FRCP1 failed mean dry weight-mg FR_FRABCH passed mean dry weight-mg GH_FR1 passed mean dry weight-mg GH_ERC passed mean dry weight-mg EV_HC1 passed mean dry weight-mg EV_MC2 passed mean dry weight-mg CM_MC2 passed mean dry weight-mg LC_LCDSSLCC passed mean dry weight-mg LC_LC3 passed mean dry weight-mg LC_LC5 passed mean dry weight-mg LC_DCDS passed mean dry weight-mg	7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69% 7.69%

Dunnett Multiple Comparison Test

Sample I	vs Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control	FR_UFR1	-0.5439	2.702	7.858	4	CDF	0.9873	Non-Significant Effect
	GH_ER2	-0.846	2.702	7.858	4	CDF	0.9954	Non-Significant Effect
	CM_MC1	-1.157	2.702	7.858	4	CDF	0.9985	Non-Significant Effect
	LC_SLC	-0.8736	2.702	7.858	4	CDF	0.9959	Non-Significant Effect
	FR_FRCP1*	4.123	2.702	8.786	3	CDF	0.0016	Significant Effect
	FR_FRABCH	0.4579	2.702	7.858	4	CDF	0.8347	Non-Significant Effect
	GH_FR1	0.8773	2.702	7.858	4	CDF	0.6722	Non-Significant Effect
	GH_ERC	1.22	2.702	7.858	4	CDF	0.5097	Non-Significant Effect
	EV_HC1	-1.018	2.702	7.858	4	CDF	0.9975	Non-Significant Effect
	EV_MC2	-1.97	2.702	7.858	4	CDF	0.9999	Non-Significant Effect
	CM_MC2	-3.036	2.702	7.858	4	CDF	1.0000	Non-Significant Effect
	LC_LCDSSLCC	-3.405	2.702	7.858	4	CDF	1.0000	Non-Significant Effect
	LC_LC3	-3.009	2.702	7.858	4	CDF	1.0000	Non-Significant Effect
	LC_LC5	-1.94	2.702	7.858	4	CDF	0.9999	Non-Significant Effect
	LC_DCDS	-3.492	2.702	7.858	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1391.56	92.7704	15	7.31	1.7E-06	Significant Effect
Error	393.425	12.6911	31			
Total	1784.98		46			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.312	30.58	0.8606	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9805	0.9333	0.6113	Normal Distribution

Ⓞ Reference sites.

Salmonid Embryo-Alevin-~~ry~~ Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-1569-1333 Endpoint: Mean ~~Dry~~ Weight-mg
 Analyzed: 28 Dec-18 8:55 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Summary

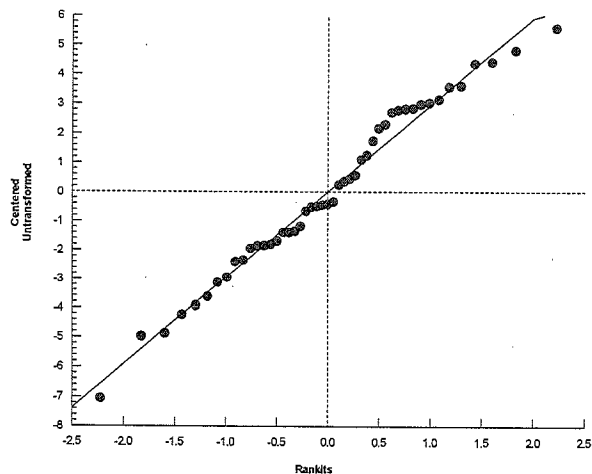
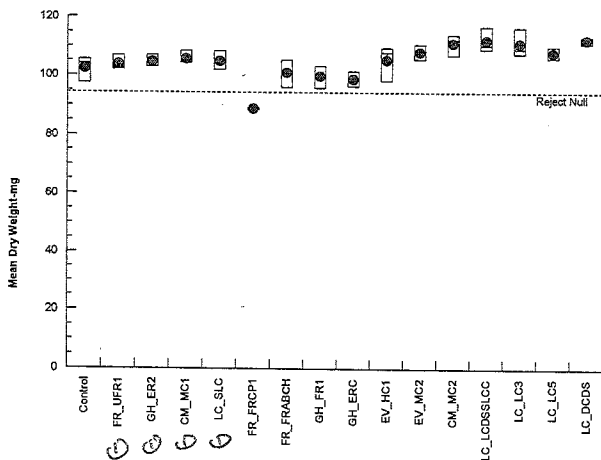
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	N	3	102.2 ✓	91.54	112.8	103.9	97.31	105.3	2.475	4.19%	0.00%
FR_UFR1		3	103.8 ✓	97.2	110.3	102.6	101.9	106.8	1.526	2.55%	-1.55%
GH_ER2		3	104.7 ✓	99.44	109.9	104.1	102.9	107	1.211	2.00%	-2.41%
CM_MC1		3	105.6 ✓	99.58	111.5	104.2	104.2	108.3	1.389	2.28%	-3.29%
LC_SLC		3	104.7 ✓	96.48	113	104.1	101.8	108.3	1.918	3.17%	-2.49%
FR_FRCP1		2	88.78 ✓	83.08	94.49	88.78	88.33	89.23	0.4489	0.72%	13.12%
FR_FRABCH		3	100.9 ✓	89.14	112.6	101.4	95.88	105.3	2.723	4.68%	1.30%
GH_FR1		3	99.64 ✓	90.31	109	100	95.71	103.2	2.168	3.77%	2.50%
GH_ERC		3	98.64 ✓	92.11	105.2	98.15	96.3	101.5	1.517	2.66%	3.47%
EV_HC1		3	105.2 ✓	89.84	120.5	107.9	98.1	109.5	3.56	5.86%	-2.90%
EV_MC2		3	107.9 ✓	101.4	114.5	107.5	105.5	110.7	1.522	2.44%	-5.61%
CM_MC2		3	111 ✓	101.7	120.4	112.3	106.8	114	2.175	3.39%	-8.64%
LC_LCDSSLCC		3	112.1 ✓	101.6	122.6	110.4	109	116.9	2.438	3.77%	-9.69%
LC_LC3		3	110.9 ✓	98.76	123.1	109	107.3	116.5	2.832	4.42%	-8.57%
LC_LC5		3	107.8 ✓	102.8	112.9	107.5	106	110	1.167	1.87%	-5.52%
LC_DCDS		3	112.3 ✓	109.3	115.4	112.6	111	113.4	0.7174	1.11%	-9.94%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
Control	N	97.31	105.3	103.9
FR_UFR1		101.9	106.8	102.6
GH_ER2		107	104.1	102.9
CM_MC1		108.3	104.2	104.2
LC_SLC		104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3 ✓	109 ✓	116.5 ✓
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

Reference sites

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 14:16 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-5287-7106	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 30 Dec-18 14:43	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		① reference sites
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 14:16 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-5287-7106 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 30 Dec-18 14:43 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	GH_ER2 passed length-mm	3.87%
		CM_MC1 passed length-mm	3.87%
		LC_SLC passed length-mm	3.87%
		FR_FRCP1 failed length-mm	3.87%
		FR_FRABCH passed length-mm	3.87%
		GH_FR1 failed length-mm	3.87%
		GH_ERC passed length-mm	3.87%
		EV_HC1 passed length-mm	3.87%
		EV_MC2 passed length-mm	3.87%
		CM_MC2 passed length-mm	3.87%
		LC_LCDSSLCC passed length-mm	3.87%
		LC_LC3 passed length-mm	3.87%
		LC_LC5 passed length-mm	3.87%
		LC_DCDS passed length-mm	3.87%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control (FRUFR1)		GH_ER2	-0.2763	2.69	0.815	4	CDF	0.9691	Non-Significant Effect
		CM_MC1	-1.127	2.69	0.815	4	CDF	0.9982	Non-Significant Effect
		LC_SLC	-0.8893	2.69	0.815	4	CDF	0.9956	Non-Significant Effect
		FR_FRCP1*	11.71	2.69	0.911	3	CDF	<1.0E-37	Significant Effect
		FR_FRABCH	2.318	2.69	0.815	4	CDF	0.1042	Non-Significant Effect
		GH_FR1*	3.978	2.69	0.815	4	CDF	0.0023	Significant Effect
		GH_ERC	1.051	2.69	0.815	4	CDF	0.5803	Non-Significant Effect
		EV_HC1	-0.3544	2.69	0.815	4	CDF	0.9754	Non-Significant Effect
		EV_MC2	-1.786	2.69	0.815	4	CDF	0.9999	Non-Significant Effect
		CM_MC2	-0.7617	2.69	0.815	4	CDF	0.9932	Non-Significant Effect
		LC_LCDSSLCC	-2.288	2.69	0.815	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-0.886	2.69	0.815	4	CDF	0.9956	Non-Significant Effect
		LC_LC5	-1.692	2.69	0.815	4	CDF	0.9998	Non-Significant Effect
		LC_DCDS	-2.335	2.69	0.815	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	42.9079	3.06485	14	22.28	<1.0E-37	Significant Effect
Error	3.98967	0.137575	29			
Total	46.8976		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	27.62	29.14	0.0160	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9156	0.9295	0.0034	Non-Normal Distribution

Ⓞ Reference sites

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-5287-7106 Endpoint: Length-mm
 Analyzed: 30 Dec-18 14:43 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Summary

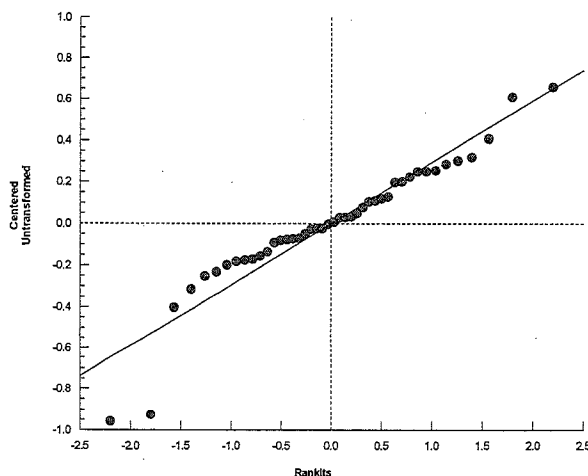
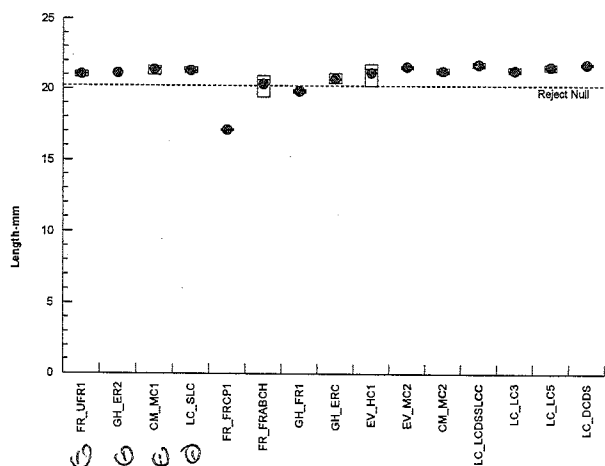
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	3	21.04	20.5	21.58	21.07	20.81	21.24	0.1258	1.04%	0.00%
GH_ER2		3	21.12	21.06	21.19	21.12	21.1	21.15	0.01518	0.12%	-0.40%
CM_MC1		3	21.38	20.49	22.27	21.5	20.98	21.67	0.2072	1.68%	-1.62%
LC_SLC		3	21.31	20.74	21.88	21.26	21.11	21.56	0.1323	1.08%	-1.28%
FR_FRCP1		2	17.08	16.1	18.06	17.08	17	17.15	0.07704	0.64%	18.84%
FR_FRABCH		3	20.34	18.31	22.36	20.66	19.41	20.95	0.4707	4.01%	3.34%
GH_FR1		3	19.84	19.51	20.16	19.84	19.7	19.96	0.0763	0.67%	5.73%
GH_ERC		3	20.72	19.8	21.64	20.63	20.41	21.13	0.2138	1.79%	1.51%
EV_HC1		3	21.15	19.04	23.26	21.45	20.19	21.8	0.4898	4.01%	-0.51%
EV_MC2		3	21.58	21.24	21.93	21.63	21.42	21.69	0.08021	0.64%	-2.57%
CM_MC2		3	21.27	20.71	21.83	21.2	21.09	21.52	0.1308	1.07%	-1.10%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.71	21.56	21.93	0.1071	0.85%	-3.29%
LC_LC3		3	21.31	20.76	21.86	21.24	21.13	21.56	0.128	1.04%	-1.28%
LC_LC5		3	21.55	20.96	22.15	21.58	21.3	21.78	0.1382	1.11%	-2.43%
LC_DCDS		3	21.75	21.51	21.98	21.72	21.67	21.85	0.05475	0.44%	-3.36%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1	U	20.81	21.24	21.07
GH_ER2		21.15	21.12	21.1
CM_MC1		21.67	20.98	21.5
LC_SLC		21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

Reference sites

Graphics



Feb 11/19

CETIS Analytical Report

Report Date: 28 Dec-18 09:14 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 14-2432-0839	Endpoint: Mean ^{wet} Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 28 Dec-18 9:14	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		⓪ Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 28 Dec-18 09:14 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Ery Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 14-2432-0839 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 9:14 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	① GH_ER2 passed mean dry weight-mg ① CM_MC1 passed mean dry weight-mg ① LC_SLC passed mean dry weight-mg FR_FRCP1 failed mean dry weight-mg FR_FRABCH passed mean dry weight-mg GH_FR1 passed mean dry weight-mg GH_ERC passed mean dry weight-mg EV_HC1 passed mean dry weight-mg EV_MC2 passed mean dry weight-mg CM_MC2 passed mean dry weight-mg LC_LCDSSLCC passed mean dry weight-mg LC_LC3 passed mean dry weight-mg LC_LC5 passed mean dry weight-mg LC_DCDS passed mean dry weight-mg	7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42% 7.42%

Dunnett Multiple Comparison Test

Sample I	vs Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Control	① GH_ER2	-0.3068	2.69	7.702	4	CDF	0.9717	Non-Significant Effect
① (FR_FR1)	① CM_MC1	-0.6229	2.69	7.702	4	CDF	0.9892	Non-Significant Effect
	① LC_SLC	-0.335	2.69	7.702	4	CDF	0.9739	Non-Significant Effect
	FR_FRCP1*	4.682	2.69	8.611	3	CDF	3.6E-04	Significant Effect
	FR_FRABCH	1.018	2.69	7.702	4	CDF	0.5964	Non-Significant Effect
	GH_FR1	1.444	2.69	7.702	4	CDF	0.3932	Non-Significant Effect
	GH_ERC	1.791	2.69	7.702	4	CDF	0.2495	Non-Significant Effect
	EV_HC1	-0.4815	2.69	7.702	4	CDF	0.9832	Non-Significant Effect
	EV_MC2	-1.448	2.69	7.702	4	CDF	0.9995	Non-Significant Effect
	CM_MC2	-2.531	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
	LC_LCDSSLCC	-2.906	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
	LC_LC3	-2.504	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
	LC_LC5	-1.418	2.69	7.702	4	CDF	0.9994	Non-Significant Effect
	LC_DCDS	-2.995	2.69	7.702	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1364.46	97.4614	14	7.924	1.6E-06	Significant Effect
Error	356.685	12.2995	29			
Total	1721.14		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.158	29.14	0.8208	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9801	0.9295	0.6384	Normal Distribution

① Reference sites

JGL
 Feb. 7/18

CETIS Analytical Report

Report Date: 28 Dec-18 09:14 (p 3 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 14-2432-0839 Endpoint: Mean Dry Weight-mg
 Analyzed: 28 Dec-18 9:14 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Summary

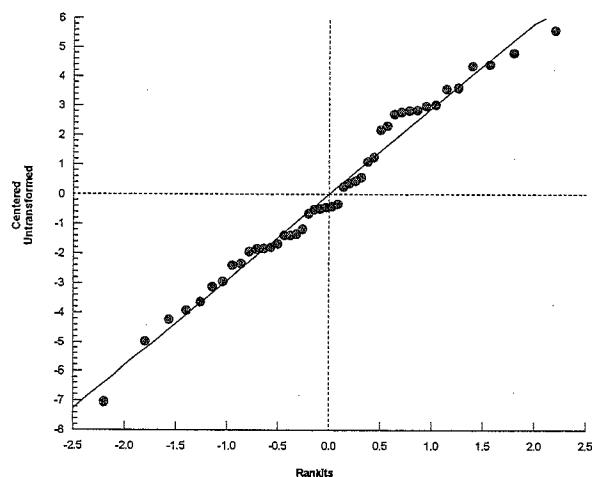
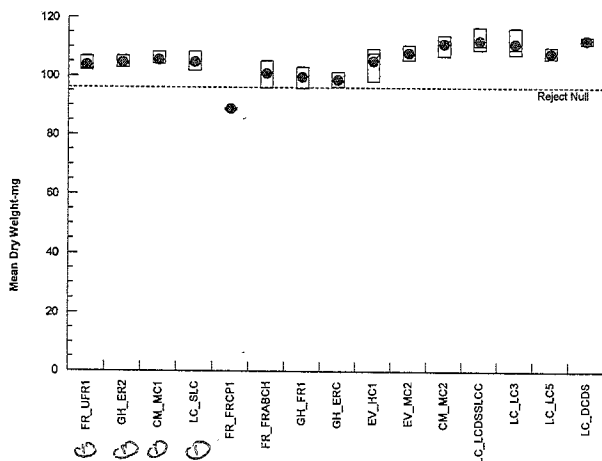
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	U	3	103.8	97.2	110.3	102.6	101.9	106.8	1.526	2.55%	0.00%
GH_ER2		3	104.7	99.44	109.9	104.1	102.9	107	1.211	2.00%	-0.85%
CM_MC1		3	105.6	99.58	111.5	104.2	104.2	108.3	1.389	2.28%	-1.72%
LC_SLC		3	104.7	96.48	113	104.1	101.8	108.3	1.918	3.17%	-0.92%
FR_FRCP1		2	88.78	83.08	94.49	88.78	88.33	89.23	0.4489	0.72%	14.44%
FR_FRABCH		3	100.9	89.14	112.6	101.4	95.88	105.3	2.723	4.68%	2.81%
GH_FR1		3	99.64	90.31	109	100	95.71	103.2	2.168	3.77%	3.98%
GH_ERC		3	98.64	92.11	105.2	98.15	96.3	101.5	1.517	2.66%	4.94%
EV_HC1		3	105.2	89.84	120.5	107.9	98.1	109.5	3.56	5.86%	-1.33%
EV_MC2		3	107.9	101.4	114.5	107.5	105.5	110.7	1.522	2.44%	-4.00%
CM_MC2		3	111	101.7	120.4	112.3	106.8	114	2.175	3.39%	-6.98%
LC_LCDSSLCC		3	112.1	101.6	122.6	110.4	109	116.9	2.438	3.77%	-8.02%
LC_LC3		3	110.9	98.76	123.1	109	107.3	116.5	2.832	4.42%	-6.91%
LC_LC5		3	107.8	102.8	112.9	107.5	106	110	1.167	1.87%	-3.91%
LC_DCDS		3	112.3	109.3	115.4	112.6	111	113.4	0.7174	1.11%	-8.26%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1	U	101.9	106.8	102.6
GH_ER2		107	104.1	102.9
CM_MC1		108.3	104.2	104.2
LC_SLC		104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3	109	116.5
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

① Reference sites.

Graphics



CETIS Analytical Report

Report Date: 11 Feb-19 14:16 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 01-3717-2249	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 30 Dec-18 14:45	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		① Reference sites
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 01-3717-2249 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 30 Dec-18 14:45 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	3.86%
		CM_MC1 passed length-mm	3.86%
		LC_SLC passed length-mm	3.86%
		FR_FRCP1 failed length-mm	3.86%
		FR_FRABCH passed length-mm	3.86%
		GH_FR1 failed length-mm	3.86%
		GH_ERC passed length-mm	3.86%
		EV_HC1 passed length-mm	3.86%
		EV_MC2 passed length-mm	3.86%
		CM_MC2 passed length-mm	3.86%
		LC_LCDSSLCC passed length-mm	3.86%
		LC_LC3 passed length-mm	3.86%
		LC_LC5 passed length-mm	3.86%
		LC_DCDS passed length-mm	3.86%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water (GH-ERC)		FR_UFR1	0.2785	2.69	0.814	4	CDF	0.8787	Non-Significant Effect
		CM_MC1	-0.8509	2.69	0.814	4	CDF	0.9950	Non-Significant Effect
		LC_SLC	-0.6132	2.69	0.814	4	CDF	0.9889	Non-Significant Effect
		FR_FRCP1*	11.96	2.69	0.911	3	CDF	<1.0E-37	Significant Effect
		FR_FRABCH	2.595	2.69	0.814	4	CDF	0.0608	Non-Significant Effect
		GH_FR1*	4.255	2.69	0.814	4	CDF	0.0011	Significant Effect
		GH_ERC	1.328	2.69	0.814	4	CDF	0.4473	Non-Significant Effect
		EV_HC1	-0.07816	2.69	0.814	4	CDF	0.9473	Non-Significant Effect
		EV_MC2	-1.51	2.69	0.814	4	CDF	0.9996	Non-Significant Effect
		CM_MC2	-0.4855	2.69	0.814	4	CDF	0.9834	Non-Significant Effect
		LC_LCDSSLCC	-2.012	2.69	0.814	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-0.6099	2.69	0.814	4	CDF	0.9888	Non-Significant Effect
		LC_LC5	-1.416	2.69	0.814	4	CDF	0.9994	Non-Significant Effect
		LC_DCDS	-2.059	2.69	0.814	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	42.9076	3.06483	14	22.28	<1.0E-37	Significant Effect
Error	3.98849	0.137534	29			
Total	46.8961		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	27.63	29.14	0.0159	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9154	0.9295	0.0033	Non-Normal Distribution

① Reference sites

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 01-3717-2249 Endpoint: Length-mm
 Analyzed: 30 Dec-18 14:45 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Summary

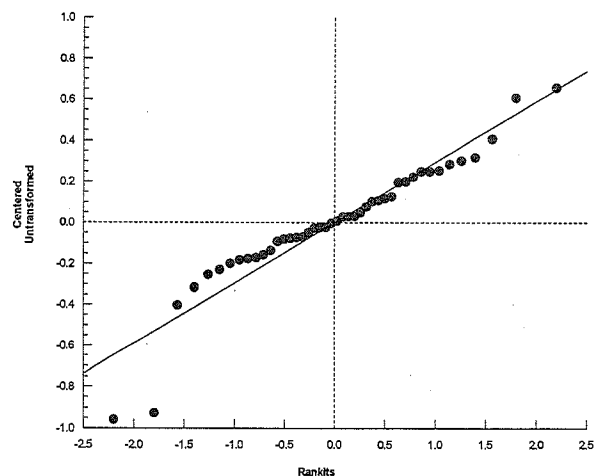
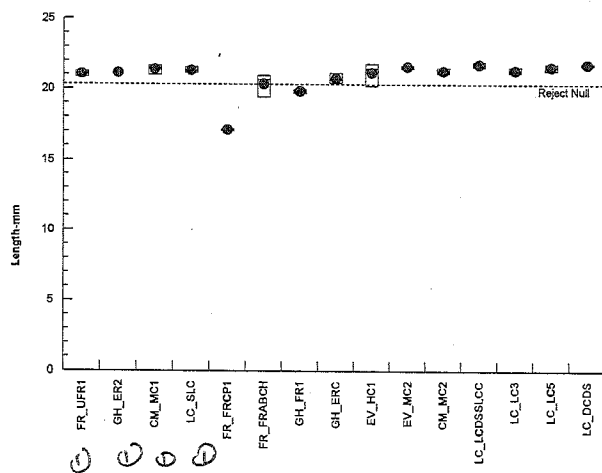
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		3	21.04	20.5	21.58	21.07	20.81	21.24	0.1251	1.03%	0.00%
GH_ER2	R	3	21.12	21.06	21.19	21.12	21.1	21.15	0.01518	0.12%	-0.40%
CM_MC1		3	21.38	20.49	22.27	21.5	20.98	21.67	0.2072	1.68%	-1.63%
LC_SLC		3	21.31	20.74	21.88	21.26	21.11	21.56	0.1323	1.08%	-1.28%
FR_FRCP1		2	17.08	16.1	18.06	17.08	17	17.15	0.07704	0.64%	18.84%
FR_FRABCH		3	20.34	18.31	22.36	20.66	19.41	20.95	0.4707	4.01%	3.33%
GH_FR1		3	19.84	19.51	20.16	19.84	19.7	19.96	0.0763	0.67%	5.72%
GH_ERC		3	20.72	19.8	21.64	20.63	20.41	21.13	0.2138	1.79%	1.51%
EV_HC1		3	21.15	19.04	23.26	21.45	20.19	21.8	0.4898	4.01%	-0.51%
EV_MC2		3	21.58	21.24	21.93	21.63	21.42	21.69	0.08021	0.64%	-2.57%
CM_MC2		3	21.27	20.71	21.83	21.2	21.09	21.52	0.1308	1.07%	-1.10%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.71	21.56	21.93	0.1071	0.85%	-3.30%
LC_LC3		3	21.31	20.76	21.86	21.24	21.13	21.56	0.128	1.04%	-1.28%
LC_LC5		3	21.55	20.96	22.15	21.58	21.3	21.78	0.1382	1.11%	-2.44%
LC_DCDS		3	21.75	21.51	21.98	21.72	21.67	21.85	0.05475	0.44%	-3.36%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		20.81	21.24	21.07
GH_ER2	R	21.15	21.12	21.1
CM_MC1		21.67	20.98	21.5
LC_SLC		21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

① Reference sites

Graphics



JGw
 Feb. 11/19

CETIS Analytical Report

Report Date: 28 Dec-18 09:17 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-0118-8110	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 28 Dec-18 9:16	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

① Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

JOB 7397 Feb. 4/19

CETIS Analytical Report

Report Date: 28 Dec-18 09:17 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 20-0118-8110 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 9:16 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	① FR_UFR1 passed mean dry weight-mg ① CM_MC1 passed mean dry weight-mg ① LC_SLC passed mean dry weight-mg FR_FRCP1 failed mean dry weight-mg FR_FRABCH passed mean dry weight-mg GH_FR1 passed mean dry weight-mg GH_ERC passed mean dry weight-mg EV_HC1 passed mean dry weight-mg EV_MC2 passed mean dry weight-mg CM_MC2 passed mean dry weight-mg LC_LCDSSLCC passed mean dry weight-mg LC_LC3 passed mean dry weight-mg LC_LC5 passed mean dry weight-mg LC_DCDS passed mean dry weight-mg	7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36% 7.36%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Receiving Water	①	FR_UFR1	0.3068	2.69	7.702	4	CDF	0.8714	Non-Significant Effect
① (GH_ERC)	①	CM_MC1	-0.3161	2.69	7.702	4	CDF	0.9725	Non-Significant Effect
	①	LC_SLC	-0.02812	2.69	7.702	4	CDF	0.9402	Non-Significant Effect
		FR_FRCP1*	4.957	2.69	8.611	3	CDF	1.7E-04	Significant Effect
		FR_FRABCH	1.324	2.69	7.702	4	CDF	0.4488	Non-Significant Effect
		GH_FR1	1.75	2.69	7.702	4	CDF	0.2647	Non-Significant Effect
		GH_ERC	2.098	2.69	7.702	4	CDF	0.1538	Non-Significant Effect
		EV_HC1	-0.1747	2.69	7.702	4	CDF	0.9592	Non-Significant Effect
		EV_MC2	-1.142	2.69	7.702	4	CDF	0.9983	Non-Significant Effect
		CM_MC2	-2.224	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LCDSSLCC	-2.599	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-2.198	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LC5	-1.112	2.69	7.702	4	CDF	0.9980	Non-Significant Effect
		LC_DCDS	-2.688	2.69	7.702	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1364.46	97.4614	14	7.924	1.6E-06	Significant Effect
Error	356.685	12.2995	29			
Total	1721.14		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.158	29.14	0.8208	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9801	0.9295	0.6384	Normal Distribution

① reference sites

Salmonid Embryo-Alevin Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 20-0118-8110 Endpoint: Mean Dry Weight-mg
 Analyzed: 28 Dec-18 9:16 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Summary

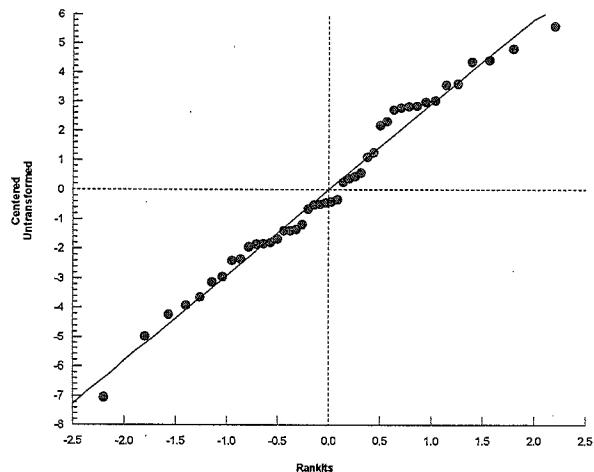
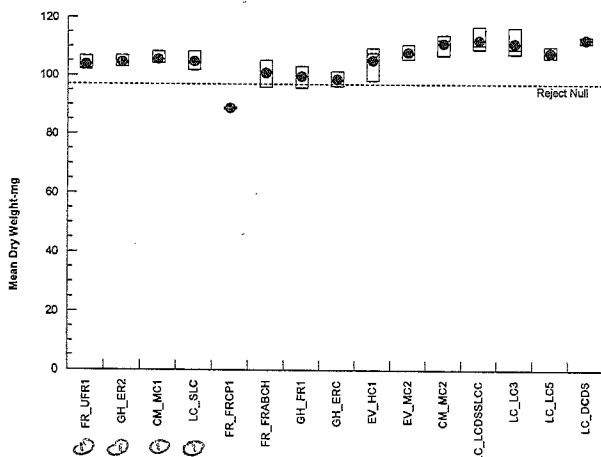
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		3	103.8	97.2	110.3	102.6	101.9	106.8	1.526	2.55%	0.00%
GH_ER2	R	3	104.7	99.44	109.9	104.1	102.9	107	1.211	2.00%	-0.85%
CM_MC1		3	105.6	99.58	111.5	104.2	104.2	108.3	1.389	2.28%	-1.72%
LC_SLC		3	104.7	96.48	113	104.1	101.8	108.3	1.918	3.17%	-0.92%
FR_FRCP1		2	88.78	83.08	94.49	88.78	88.33	89.23	0.4489	0.72%	14.44%
FR_FRABCH		3	100.9	89.14	112.6	101.4	95.88	105.3	2.723	4.68%	2.81%
GH_FR1		3	99.64	90.31	109	100	95.71	103.2	2.168	3.77%	3.98%
GH_ERC		3	98.64	92.11	105.2	98.15	96.3	101.5	1.517	2.66%	4.94%
EV_HC1		3	105.2	89.84	120.5	107.9	98.1	109.5	3.56	5.86%	-1.33%
EV_MC2		3	107.9	101.4	114.5	107.5	105.5	110.7	1.522	2.44%	-4.00%
CM_MC2		3	111	101.7	120.4	112.3	106.8	114	2.175	3.39%	-6.98%
LC_LCDSSLCC		3	112.1	101.6	122.6	110.4	109	116.9	2.438	3.77%	-8.02%
LC_LC3		3	110.9	98.76	123.1	109	107.3	116.5	2.832	4.42%	-6.91%
LC_LC5		3	107.8	102.8	112.9	107.5	106	110	1.167	1.87%	-3.91%
LC_DCDS		3	112.3	109.3	115.4	112.6	111	113.4	0.7174	1.11%	-8.26%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		101.9	106.8	102.6
GH_ER2	R	107	104.1	102.9
CM_MC1		108.3	104.2	104.2
LC_SLC		104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3	109	116.5
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

① Reference sites

Graphics



mm
Feb. 7/19

CETIS Analytical Report

Report Date: 11 Feb-19 14:21 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 03-5535-9253	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 30 Dec-18 14:46	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

① Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 11 Feb-19 14:21 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 03-5535-9253 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 30 Dec-18 14:46 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	① FR_UFR1 passed length-mm ① GH_ER2 passed length-mm ① LC_SLC passed length-mm FR_FRCP1 failed length-mm FR_FRABCH failed length-mm GH_FR1 failed length-mm GH_ERC passed length-mm EV_HC1 passed length-mm EV_MC2 passed length-mm CM_MC2 passed length-mm LC_LCDSSLCC passed length-mm LC_LC3 passed length-mm LC_LC5 passed length-mm LC_DCDS passed length-mm	3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81% 3.81%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
① Site Control (CM, MC1)		① FR_UFR1	1.129	2.69	0.814	4	CDF	0.5426	Non-Significant Effect
		① GH_ER2	0.8543	2.69	0.814	4	CDF	0.6721	Non-Significant Effect
		① LC_SLC	0.2378	2.69	0.814	4	CDF	0.8888	Non-Significant Effect
		FR_FRCP1*	12.72	2.69	0.911	3	CDF	<1.0E-37	Significant Effect
		FR_FRABCH*	3.446	2.69	0.814	4	CDF	0.0089	Significant Effect
		GH_FR1*	5.106	2.69	0.814	4	CDF	1.1E-04	Significant Effect
		GH_ERC	2.179	2.69	0.814	4	CDF	0.1340	Non-Significant Effect
		EV_HC1	0.7728	2.69	0.814	4	CDF	0.7078	Non-Significant Effect
		EV_MC2	-0.6594	2.69	0.814	4	CDF	0.9904	Non-Significant Effect
		CM_MC2	0.3655	2.69	0.814	4	CDF	0.8552	Non-Significant Effect
		LC_LCDSSLCC	-1.161	2.69	0.814	4	CDF	0.9984	Non-Significant Effect
		LC_LC3	0.2411	2.69	0.814	4	CDF	0.8880	Non-Significant Effect
		LC_LC5	-0.5647	2.69	0.814	4	CDF	0.9870	Non-Significant Effect
		LC_DCDS	-1.208	2.69	0.814	4	CDF	0.9986	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	42.9067	3.06476	14	22.28	<1.0E-37	Significant Effect
Error	3.98839	0.137531	29			
Total	46.8951		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	27.76	29.14	0.0153	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9154	0.9295	0.0033	Non-Normal Distribution

① Reference sites

CETIS Analytical Report

Report Date: 11 Feb-19 14:21 (p 3 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 03-5535-9253 Endpoint: Length-mm
 Analyzed: 30 Dec-18 14:46 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Summary

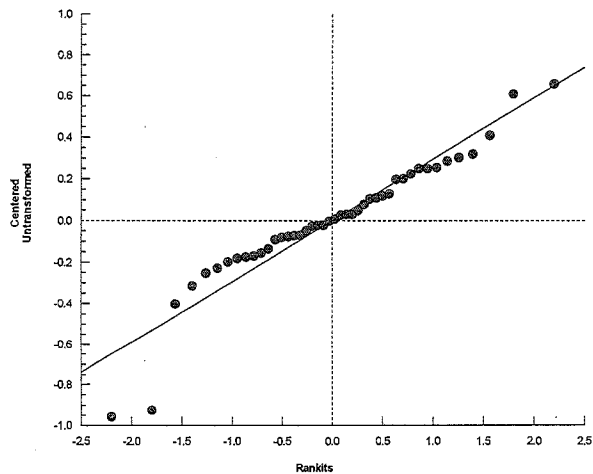
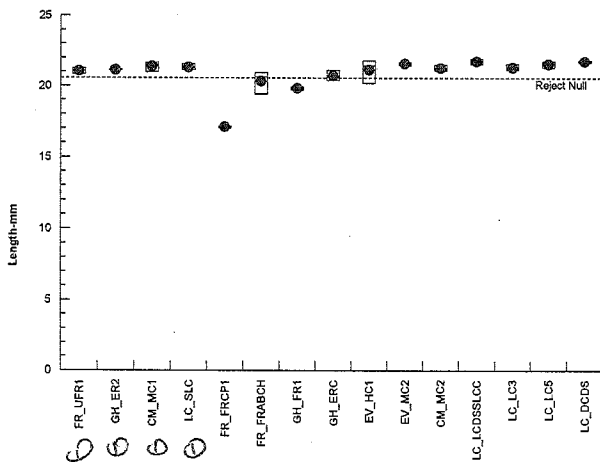
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1		3	21.04	20.5	21.58	21.07	20.81	21.24	0.1251	1.03%	0.00%
① GH_ER2		3	21.12	21.06	21.19	21.12	21.1	21.15	0.01458	0.12%	-0.40%
① CM_MC1	XC	3	21.38	20.49	22.27	21.5	20.98	21.67	0.2072	1.68%	-1.63%
① LC_SLC		3	21.31	20.74	21.88	21.26	21.11	21.56	0.1323	1.08%	-1.28%
FR_FRCP1		2	17.08	16.1	18.06	17.08	17	17.15	0.07704	0.64%	18.84%
FR_FRABCH		3	20.34	18.31	22.36	20.66	19.41	20.95	0.4707	4.01%	3.33%
GH_FR1		3	19.84	19.51	20.16	19.84	19.7	19.96	0.0763	0.67%	5.72%
GH_ERC		3	20.72	19.8	21.64	20.63	20.41	21.13	0.2138	1.79%	1.51%
EV_HC1		3	21.15	19.04	23.26	21.45	20.19	21.8	0.4898	4.01%	-0.51%
EV_MC2		3	21.58	21.24	21.93	21.63	21.42	21.69	0.08021	0.64%	-2.57%
CM_MC2		3	21.27	20.71	21.83	21.2	21.09	21.52	0.1308	1.07%	-1.10%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.71	21.56	21.93	0.1071	0.85%	-3.30%
LC_LC3		3	21.31	20.76	21.86	21.24	21.13	21.56	0.128	1.04%	-1.28%
LC_LC5		3	21.55	20.96	22.15	21.58	21.3	21.78	0.1382	1.11%	-2.44%
LC_DCDS		3	21.75	21.51	21.98	21.72	21.67	21.85	0.05475	0.44%	-3.36%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
① FR_UFR1		20.81	21.24	21.07
① GH_ER2		21.15	21.12	21.1
① CM_MC1	XC	21.67	20.98	21.5
① LC_SLC		21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

① Reference sites

Graphics



CETIS Analytical Report

Report Date: 28 Dec-18 09:21 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test **Nautilus Environmental**

Analysis ID: 07-6573-8780	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 28 Dec-18 9:21	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		① Reference sites
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

CETIS Analytical Report

Report Date: 28 Dec-18 09:21 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-6573-8780 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 9:21 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed mean dry weight-mg	7.30%
		GH_ER2 passed mean dry weight-mg	7.30%
		LC_SLC passed mean dry weight-mg	7.30%
		FR_FRCP1 failed mean dry weight-mg	7.30%
		FR_FRABCH passed mean dry weight-mg	7.30%
		GH_FR1 passed mean dry weight-mg	7.30%
		GH_ERC passed mean dry weight-mg	7.30%
		EV_HC1 passed mean dry weight-mg	7.30%
		EV_MC2 passed mean dry weight-mg	7.30%
		CM_MC2 passed mean dry weight-mg	7.30%
		LC_LCDSSLCC passed mean dry weight-mg	7.30%
		LC_LC3 passed mean dry weight-mg	7.30%
		LC_LC5 passed mean dry weight-mg	7.30%
		LC_DCDS passed mean dry weight-mg	7.30%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Site Control	⓪	FR_UFR1	0.6229	2.69	7.702	4	CDF	0.7687	Non-Significant Effect
⓪ (control)	⓪	GH_ER2	0.3161	2.69	7.702	4	CDF	0.8689	Non-Significant Effect
	⓪	LC_SLC	0.2879	2.69	7.702	4	CDF	0.8763	Non-Significant Effect
		FR_FRCP1*	5.239	2.69	8.611	3	CDF	7.9E-05	Significant Effect
		FR_FRABCH	1.64	2.69	7.702	4	CDF	0.3078	Non-Significant Effect
		GH_FR1	2.067	2.69	7.702	4	CDF	0.1623	Non-Significant Effect
		GH_ERC	2.414	2.69	7.702	4	CDF	0.0868	Non-Significant Effect
		EV_HC1	0.1414	2.69	7.702	4	CDF	0.9102	Non-Significant Effect
		EV_MC2	-0.8255	2.69	7.702	4	CDF	0.9945	Non-Significant Effect
		CM_MC2	-1.908	2.69	7.702	4	CDF	0.9999	Non-Significant Effect
		LC_LCDSSLCC	-2.283	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-1.881	2.69	7.702	4	CDF	0.9999	Non-Significant Effect
		LC_LC5	-0.7955	2.69	7.702	4	CDF	0.9939	Non-Significant Effect
		LC_DCDS	-2.372	2.69	7.702	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1364.46	97.4614	14	7.924	1.6E-06	Significant Effect
Error	356.685	12.2995	29			
Total	1721.14		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.158	29.14	0.8208	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9801	0.9295	0.6384	Normal Distribution

⓪ Reference sites

JGU
 Feb 7/19

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 07-6573-8780 Endpoint: Mean Dry Weight-mg
 Analyzed: 28 Dec-18 9:21 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Mean Dry Weight-mg Summary

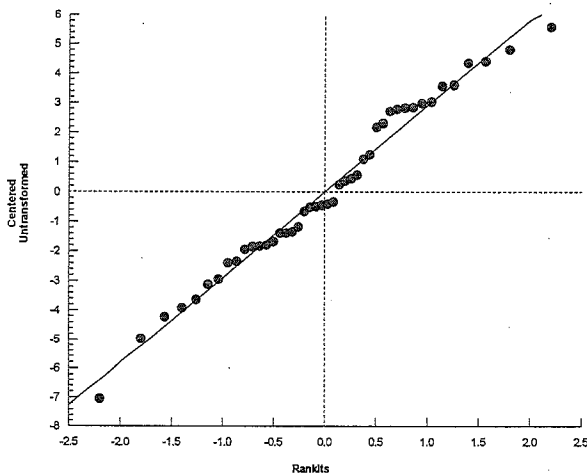
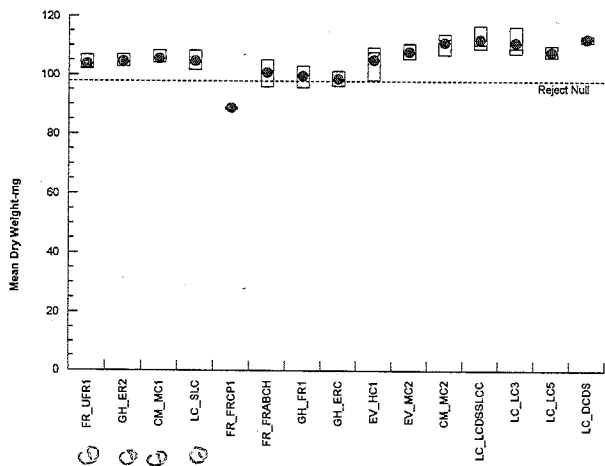
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		3	103.8	97.2	110.3	102.6	101.9	106.8	1.526	2.55%	0.00%
GH_ER2		3	104.7	99.44	109.9	104.1	102.9	107	1.211	2.00%	-0.85%
CM_MC1	XC	3	105.6	99.58	111.5	104.2	104.2	108.3	1.389	2.28%	-1.72%
LC_SLC		3	104.7	96.48	113	104.1	101.8	108.3	1.918	3.17%	-0.92%
FR_FRCP1		2	88.78	83.08	94.49	88.78	88.33	89.23	0.4489	0.72%	14.44%
FR_FRABCH		3	100.9	89.14	112.6	101.4	95.88	105.3	2.723	4.68%	2.81%
GH_FR1		3	99.64	90.31	109	100	95.71	103.2	2.168	3.77%	3.98%
GH_ERC		3	98.64	92.11	105.2	98.15	96.3	101.5	1.517	2.66%	4.94%
EV_HC1		3	105.2	89.84	120.5	107.9	98.1	109.5	3.56	5.86%	-1.33%
EV_MC2		3	107.9	101.4	114.5	107.5	105.5	110.7	1.522	2.44%	-4.00%
CM_MC2		3	111	101.7	120.4	112.3	106.8	114	2.175	3.39%	-6.98%
LC_LCDSSLCC		3	112.1	101.6	122.6	110.4	109	116.9	2.438	3.77%	-8.02%
LC_LC3		3	110.9	98.76	123.1	109	107.3	116.5	2.832	4.42%	-6.91%
LC_LC5		3	107.8	102.8	112.9	107.5	106	110	1.167	1.87%	-3.91%
LC_DCDS		3	112.3	109.3	115.4	112.6	111	113.4	0.7174	1.11%	-8.26%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		101.9	106.8	102.6
GH_ER2		107	104.1	102.9
CM_MC1	XC	108.3	104.2	104.2
LC_SLC		104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3	109	116.5
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

Reference status

Graphics



Feb 7/19

CETIS Analytical Report

Report Date: 11 Feb-19 14:21 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 10-9194-6511	Endpoint: Length-mm	CETIS Version: CETISv1.9.4
Analyzed: 30 Dec-18 14:47	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Reference sites

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

JGL
Feb. 11/19

CETIS Analytical Report

Report Date: 11 Feb-19 14:21 (p 2 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 10-9194-6511 Endpoint: Length-mm CETIS Version: CETISv1.9.4
 Analyzed: 30 Dec-18 14:47 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	FR_UFR1 passed length-mm	3.82%
		GH_ER2 passed length-mm	3.82%
		CM_MC1 passed length-mm	3.82%
		FR_FRCP1 failed length-mm	3.82%
		FR_FRABCH failed length-mm	3.82%
		GH_FR1 failed length-mm	3.82%
		GH_ERC passed length-mm	3.82%
		EV_HC1 passed length-mm	3.82%
		EV_MC2 passed length-mm	3.82%
		CM_MC2 passed length-mm	3.82%
		LC_LCDSSLCC passed length-mm	3.82%
		LC_LC3 passed length-mm	3.82%
		LC_LC5 passed length-mm	3.82%
		LC_DCDS passed length-mm	3.82%

Dunnett Multiple Comparison Test

Sample I	vs Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Unamended Sample (LC-SLC)	FR_UFR1	0.8916	2.69	0.815	4	CDF	0.6552	Non-Significant Effect
	GH_ER2	0.6164	2.69	0.815	4	CDF	0.7712	Non-Significant Effect
	CM_MC1	-0.2422	2.69	0.815	4	CDF	0.9660	Non-Significant Effect
	FR_FRCP1*	12.5	2.69	0.911	3	CDF	<1.0E-37	Significant Effect
	FR_FRABCH*	3.207	2.69	0.815	4	CDF	0.0158	Significant Effect
	GH_FR1*	4.867	2.69	0.815	4	CDF	2.2E-04	Significant Effect
	GH_ERC	1.941	2.69	0.815	4	CDF	0.1991	Non-Significant Effect
	EV_HC1	0.5349	2.69	0.815	4	CDF	0.8010	Non-Significant Effect
	EV_MC2	-0.8971	2.69	0.815	4	CDF	0.9957	Non-Significant Effect
	CM_MC2	0.1277	2.69	0.815	4	CDF	0.9130	Non-Significant Effect
	LC_LCDSSLCC	-1.399	2.69	0.815	4	CDF	0.9994	Non-Significant Effect
	LC_LC3	0.003302	2.69	0.815	4	CDF	0.9353	Non-Significant Effect
	LC_LC5	-0.8024	2.69	0.815	4	CDF	0.9941	Non-Significant Effect
	LC_DCDS	-1.445	2.69	0.815	4	CDF	0.9995	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	42.91	3.065	14	22.28	<1.0E-37	Significant Effect
Error	3.9893	0.137562	29			
Total	46.8993		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	27.76	29.14	0.0153	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9154	0.9295	0.0034	Non-Normal Distribution

Reference sites

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 10-9194-6511 Endpoint: Length-mm
 Analyzed: 30 Dec-18 14:47 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
 Status Level: 1

Length-mm Summary

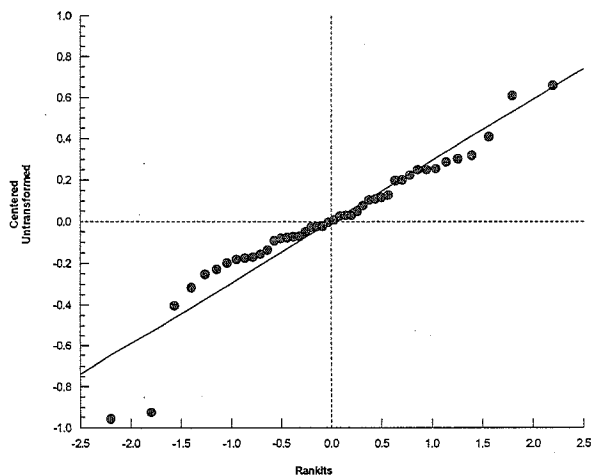
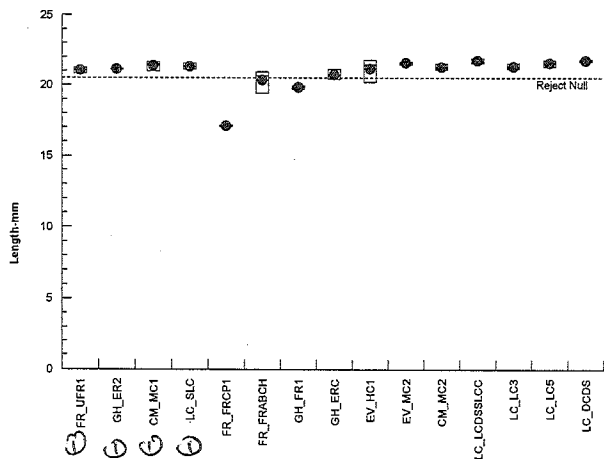
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		3	21.04	20.5	21.58	21.07	20.81	21.24	0.1251	1.03%	0.00%
GH_ER2		3	21.12	21.06	21.19	21.12	21.1	21.15	0.01458	0.12%	-0.40%
CM_MC1		3	21.38	20.49	22.28	21.5	20.98	21.67	0.2075	1.68%	-1.63%
LC_SLC	US	3	21.31	20.74	21.88	21.26	21.11	21.56	0.1323	1.08%	-1.28%
FR_FRCP1		2	17.08	16.1	18.06	17.08	17	17.15	0.07704	0.64%	18.84%
FR_FRABCH		3	20.34	18.31	22.36	20.66	19.41	20.95	0.4707	4.01%	3.33%
GH_FR1		3	19.84	19.51	20.16	19.84	19.7	19.96	0.0763	0.67%	5.72%
GH_ERC		3	20.72	19.8	21.64	20.63	20.41	21.13	0.2138	1.79%	1.51%
EV_HC1		3	21.15	19.04	23.26	21.45	20.19	21.8	0.4898	4.01%	-0.51%
EV_MC2		3	21.58	21.24	21.93	21.63	21.42	21.69	0.08021	0.64%	-2.57%
CM_MC2		3	21.27	20.71	21.83	21.2	21.09	21.52	0.1308	1.07%	-1.10%
LC_LCDSSLCC		3	21.73	21.27	22.19	21.71	21.56	21.93	0.1071	0.85%	-3.30%
LC_LC3		3	21.31	20.76	21.86	21.24	21.13	21.56	0.128	1.04%	-1.28%
LC_LC5		3	21.55	20.96	22.15	21.58	21.3	21.78	0.1382	1.11%	-2.44%
LC_DCDS		3	21.75	21.51	21.98	21.72	21.67	21.85	0.05475	0.44%	-3.36%

Length-mm Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		20.81	21.24	21.07
GH_ER2		21.15	21.12	21.1
CM_MC1		21.67	20.98	21.5
LC_SLC	US	21.26	21.11	21.56
FR_FRCP1		17	17.15	
FR_FRABCH		19.41	20.95	20.66
GH_FR1		19.84	19.7	19.96
GH_ERC		21.13	20.63	20.41
EV_HC1		21.45	21.8	20.19
EV_MC2		21.69	21.63	21.42
CM_MC2		21.52	21.09	21.2
LC_LCDSSLCC		21.71	21.93	21.56
LC_LC3		21.56	21.13	21.24
LC_LC5		21.58	21.78	21.3
LC_DCDS		21.85	21.72	21.67

Reference sites

Graphics



Jon
 Feb. 11/19

CETIS Analytical Report

Report Date: 28 Dec-18 09:23 (p 1 of 3)
 Test Code/ID: 181873b / 14-6771-3316

Salmonid Embryo-Alevin- Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 19-4163-6891	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.9.4
Analyzed: 28 Dec-18 9:23	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 17-8614-0161	Test Type: Survival-Development-Growth	Analyst: Yvonne Lam
Start Date: 31 Oct-18 15:30	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 30 Nov-18 09:30	Species: Oncorhynchus mykiss	Brine:
Test Length: 29d 18h	Taxon: Actinopterygii	Source: Lyndon Fish Hatcheries Age:

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
① FR_UFR1	09-0464-6301	30 Oct-18 09:56	31 Oct-18 11:50	30h (0 °C)	Teck Coal	
① GH_ER2	15-7965-2256	30 Oct-18 11:30	31 Oct-18 11:50	28h (1.5 °C)		
① CM_MC1	02-7025-1432	30 Oct-18 09:38	31 Oct-18 11:50	30h (0 °C)		
① LC_SLC	12-8491-0507	30 Oct-18 10:07	31 Oct-18 11:50	29h (0.5 °C)		
FR_FRCP1	10-0317-4874	30 Oct-18 11:00	31 Oct-18 11:50	28h (0.5 °C)		
FR_FRABCH	18-4940-3515	30 Oct-18 09:30	31 Oct-18 11:50	30h (1 °C)		
GH_FR1	12-7662-5088	30 Oct-18 15:05	31 Oct-18 11:50	24h (0 °C)		
GH_ERC	10-5398-7761	30 Oct-18 13:30	31 Oct-18 11:50	26h (2 °C)		
EV_HC1	03-4740-9533	30 Oct-18 08:30	31 Oct-18 11:50	31h (1.4 °C)		
EV_MC2	11-7226-0859	30 Oct-18 11:15	31 Oct-18 11:50	28h (1.7 °C)		
CM_MC2	14-5235-0284	30 Oct-18 10:20	31 Oct-18 11:50	29h (0 °C)		
LC_LCDSSLCC	13-5208-1720	30 Oct-18 11:43	31 Oct-18 11:50	28h (1.4 °C)		
LC_LC3	10-5439-2892	30 Oct-18 13:38	31 Oct-18 11:50	26h (1.9 °C)		
LC_LC5	08-6889-7074	30 Oct-18 14:44	31 Oct-18 11:50	25h (2 °C)		① Reference sites
LC_DCDS	05-1371-8064	30 Oct-18 11:45	31 Oct-18 11:50	28h (0.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2018-10-30	
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2018-10-30_	
① CM_MC1	Water Sample	Teck Coal	CM_MC1_Q4_WS_201810	
① LC_SLC	Water Sample	Teck Coal	LC_SLC_WS_2018-10-30_	
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2018-10-3	
FR_FRABCH	Water Sample	Teck Coal	FR_FRABCH_WS_2018-10	
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2018-10-30_	
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2018-10-30	
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2018-10-30_	
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2018-10-30_	
CM_MC2	Water Sample	Teck Coal	CM_MC2_Q4_WS_201810	
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2018-	
LC_LC3	Water Sample	Teck Coal	LC_LC3_WS_2018-10-30_	
LC_LC5	Water Sample	Teck Coal	LC_LC5_WS_2018-10-30_	
LC_DCDS	Water Sample	Teck Coal	LC_DCDS_WS_2018-10-30	

Salmonid Embryo-Alevin-Ery Survival Development and Growth Test Nautilus Environmental

Analysis ID: 19-4163-6891 Endpoint: Mean ^{wet} Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 9:23 Analysis: Parametric-Control vs Treatments Status Level: 1

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	Ⓞ FR_UFR1 passed mean dry weight-mg Ⓞ GH_ER2 passed mean dry weight-mg Ⓞ CM_MC1 passed mean dry weight-mg FR_FRCP1 failed mean dry weight-mg FR_FRABCH passed mean dry weight-mg GH_FR1 passed mean dry weight-mg GH_ERC passed mean dry weight-mg EV_HC1 passed mean dry weight-mg EV_MC2 passed mean dry weight-mg CM_MC2 passed mean dry weight-mg LC_LCDSSLCC passed mean dry weight-mg LC_LC3 passed mean dry weight-mg LC_LC5 passed mean dry weight-mg LC_DCDS passed mean dry weight-mg	7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35% 7.35%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Unamended Sample		Ⓞ FR_UFR1	0.335	2.69	7.702	4	CDF	0.8638	Non-Significant Effect
<i>0(LCSSLCC)</i>		Ⓞ GH_ER2	0.02812	2.69	7.702	4	CDF	0.9313	Non-Significant Effect
		Ⓞ CM_MC1	-0.2879	2.69	7.702	4	CDF	0.9701	Non-Significant Effect
		FR_FRCP1*	4.982	2.69	8.611	3	CDF	1.6E-04	Significant Effect
		FR_FRABCH	1.353	2.69	7.702	4	CDF	0.4355	Non-Significant Effect
		GH_FR1	1.779	2.69	7.702	4	CDF	0.2542	Non-Significant Effect
		GH_ERC	2.126	2.69	7.702	4	CDF	0.1466	Non-Significant Effect
		EV_HC1	-0.1466	2.69	7.702	4	CDF	0.9560	Non-Significant Effect
		EV_MC2	-1.113	2.69	7.702	4	CDF	0.9981	Non-Significant Effect
		CM_MC2	-2.196	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LCDSSLCC	-2.571	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LC3	-2.169	2.69	7.702	4	CDF	1.0000	Non-Significant Effect
		LC_LC5	-1.083	2.69	7.702	4	CDF	0.9978	Non-Significant Effect
		LC_DCDS	-2.66	2.69	7.702	4	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1364.46	97.4614	14	7.924	1.6E-06	Significant Effect
Error	356.685	12.2995	29			
Total	1721.14		43			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	9.158	29.14	0.8208	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9801	0.9295	0.6384	Normal Distribution

Ⓞ Reference stats.

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 19-4163-6891 Endpoint: Mean Dry Weight-mg CETIS Version: CETISv1.9.4
 Analyzed: 28 Dec-18 9:23 Analysis: Parametric-Control vs Treatments Status Level: 1

Mean Dry Weight-mg Summary

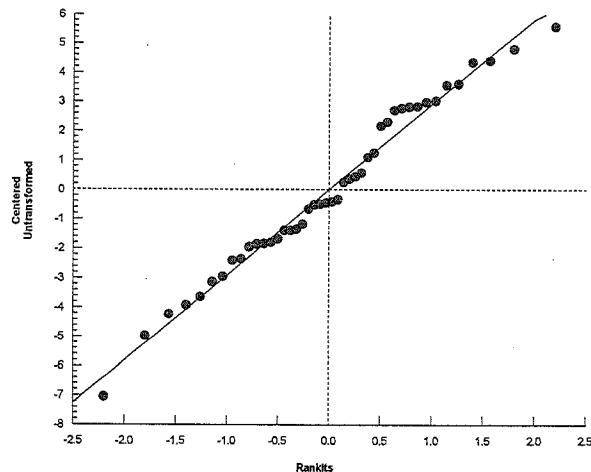
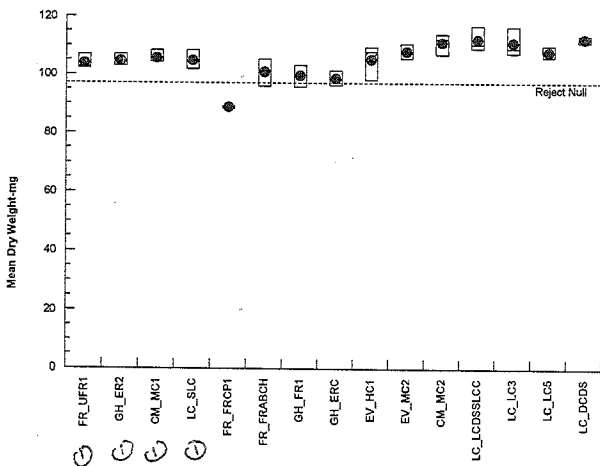
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1		3	103.8	97.2	110.3	102.6	101.9	106.8	1.526	2.55%	0.00%
GH_ER2		3	104.7	99.44	109.9	104.1	102.9	107	1.211	2.00%	-0.85%
CM_MC1		3	105.6	99.58	111.5	104.2	104.2	108.3	1.389	2.28%	-1.72%
LC_SLC	US	3	104.7	96.48	113	104.1	101.8	108.3	1.918	3.17%	-0.92%
FR_FRCP1		2	88.78	83.08	94.49	88.78	88.33	89.23	0.4489	0.72%	14.44%
FR_FRABCH		3	100.9	89.14	112.6	101.4	95.88	105.3	2.723	4.68%	2.81%
GH_FR1		3	99.64	90.31	109	100	95.71	103.2	2.168	3.77%	3.98%
GH_ERC		3	98.64	92.11	105.2	98.15	96.3	101.5	1.517	2.66%	4.94%
EV_HC1		3	105.2	89.84	120.5	107.9	98.1	109.5	3.56	5.86%	-1.33%
EV_MC2		3	107.9	101.4	114.5	107.5	105.5	110.7	1.522	2.44%	-4.00%
CM_MC2		3	111	101.7	120.4	112.3	106.8	114	2.175	3.39%	-6.98%
LC_LCDSSLCC		3	112.1	101.6	122.6	110.4	109	116.9	2.438	3.77%	-8.02%
LC_LC3		3	110.9	98.76	123.1	109	107.3	116.5	2.832	4.42%	-6.91%
LC_LC5		3	107.8	102.8	112.9	107.5	106	110	1.167	1.87%	-3.91%
LC_DCDS		3	112.3	109.3	115.4	112.6	111	113.4	0.7174	1.11%	-8.26%

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3
FR_UFR1		101.9	106.8	102.6
GH_ER2		107	104.1	102.9
CM_MC1		108.3	104.2	104.2
LC_SLC	US	104.1	101.8	108.3
FR_FRCP1		88.33	89.23	
FR_FRABCH		95.88	101.4	105.3
GH_FR1		100	103.2	95.71
GH_ERC		101.5	98.15	96.3
EV_HC1		109.5	107.9	98.1
EV_MC2		105.5	110.7	107.5
CM_MC2		114	106.8	112.3
LC_LCDSSLCC		109	116.9	110.4
LC_LC3		107.3	109	116.5
LC_LC5		107.5	110	106
LC_DCDS		112.6	113.4	111

Ⓞ Reference sites

Graphics



APPENDIX F - Chain-of-Custody Forms

COC ID: 20181030-1225

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution				
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			- Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	scott.routhead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			Email 6:	teckcoal@equisonline.com			X
								PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (s/y loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d C.dubia P/F	7-d C.dubia P/F (EDTA)	72-hr P. subcapitata P/F	30-d embryo EA P/F	30-d embryo EA P/F (20 ug/L Cu)	30-d embryo EA P/F (40 ug/L Cu)	7-d embryo P/F	28-d Hyalella P/F	28-d Hyalella P/F (EDTA)	30d FHM P/F - 10 ug/L Cu Conducted in Calgary	30d FHM P/F - 20 ug/L Cu Conducted in Calgary	Temp (°C)	
FR_FRABCH_WS_2018-10-30_NP	FR_FRABCH	WS		2018/10/30	09:30	G	6x20L	X	X	X	X				X	X		X	X	1.0
FR_FRCPI_WS_2018-10-30_N	FR_FRCPI	WS		2018/10/30	11:00	G	6x20L	X	X	X	X				X	X		X	X	2.5
FR_UFR1_WS_2018-10-30_N	FR_UFR1	WS		2018/10/30	09:56	G	7H 2.3 Barrels	X		X	X	X	X	X	X			X		0.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
③ Clear, colourless, odourless, no particulates	Chelsea Jensen/Jason Gravelle	30-Oct-18	Nautilus - Burnaby	Oct 31/18 @ 11:50
② Clear, colourless, odourless, some particulates			NY - Nan Yamamoto	Q4 - week 1
① Clear, turbid, colourless, hydrocarbon odour, no particulates				

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) <input checked="" type="checkbox"/>	Chelsea Jensen/Jason Gravelle	<i>Jan Gravelle</i>	250 425 4729	October 30, 2018
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: WEEKLY_CHRONIC_10302018_1		TURNAROUND TIME: Regular		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental		Report Format / Distribution	
Project Manager Jay Jones				Lab Contact Emma Marus		Excel X PDF X EDD X	
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca		Email 1: Scott.Holmgren@teck.com X X X	
Address PO Box 3000				Address 8664 commerce Court		Email 2: teckcoal@equisonline.com X X X	
City Sparwood		Province BC	Country Canada	City Burnaby		Province BC	Country Canada
Postal Code V0B 2G0				Postal Code V5A 4N7		Email 4: Don.Sacino@teck.com X X X	
Phone Number 1-250-425-7321				Phone Number 604-420-8773		Email 5: Jay.jones@teck.com X X X	
				PO number		478075	

SAMPLE DETAILS								ANALYSIS REQUESTED						Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d Cdubia P/F	7-d Cdubia P/F (EDTA)	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	28-d Hyalella P/F (EDTA)	30d FHM P/F - 10ug/L Cu Conducted in Calgary	30d FHM P/F - 20 ug/L Cu Conducted in Calgary	Temp (°C)	
CM_MC1_Q4_WS_20181030_N	CM_MC1	WS	n	10/30/2018	9:38	G	5x20L	X		X	X	X		X		0.0	
CM_MC2_Q4_WS_20181030_N <i>CM - P/F - EDTA NY</i>	CM_MC2	WS	n	10/30/2018	10:20	G	5x20L TH	X	X	X	X	X	X	X	X	0.0	
CM_MC3_Q4_WS_20181030_NP	CM_MC3	WS	n	10/30/2018	10:55	G	2x20L	X				X				1.0	


ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
① 1 carboy leaked ② Clear, odourless, odourless, some particulates						Nautilus - Burnaby NY - Nan Yamamoto		Oct 31/18 @ 11:50 Q4 - week 1	
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Mobile #		Date/Time			
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS		Sampler's Signature <i>[Signature]</i>		250 425 7518		10/30/2018 2:00:00 PM			

Teck

COC ID: 20181030CRN1		TURNAROUND TIME:		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#: Elkview Operations				Lab Name: Nautilus Environmental		Report Format / Distribution	
Job Description: Q4 Chronic Toxicity Sampling - Week 1				Lab Contact: Emma Marus		Excel	
Project Manager: Cameron Griffin				Email: Emma@nautilusenvironmental.ca		PDF	
Email: Cameron.Griffin@teck.com				Address: 8664 Commerce Court		EDD	
Address: RR#1 HWY# 3				Imperial Square, Lake City		X	
City: Sparwood Province: BC				City: Burnaby Province: BC		X	
Postal Code: V0B 2G1 Country: Canada				Postal Code: V5A 4N7 Country: Canada		X	
Phone Number: 1-250-425-8137				Phone Number: 604-420-8773		X	

SAMPLE DETAILS								ANALYSIS REQUESTED							
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G-Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P.subcapitata P/F	7d C.dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail	28d Hypolelella P/F	Temp °C
① EV_HC1_WS_2018-10-30_N	EV_HC1	WS	N	10/30/2018	8:30	G	5 X	ZOL	X	X	X			X	1.4
① EV_MC2_WS_2018-10-30_N	EV_MC2	WS	N	10/30/2018	11:15	G	3 X	ZOL	X	X	X			X	1.7
							Total	10							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
early life stage P/F 30d rainbow trout		Bryan Ogden		October 30, 2018		Nautilus - Burnaby NY - Nain Yamamoto		Oct 31/18 @ 11:50 Q4 - week 1	

Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Bryan Ogden	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	October 30, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

① Clear, colourless, odourless, fine particulates

COC ID:	20181030 Chronix tox	TURNAROUND TIME:		RUSH:		
PROJECT/CLIENT INFO			LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation	Lab Name	Nautilus Environmental - BC		Report Format / Distribution	Excel PDF EDD
Project Manager	Chris Blurton	Lab Contact			Email 1:	drake.lymstra@teck.com x x
Email	Chris.Blurton@teck.com	Email	BCinfo@nautilusenvironmental.ca		Email 2:	chris.blurton@teck.com x x
Address	Box 2003	Address	8664 Commerce Court		Email 3:	kirsten.campbell@teck.com x x
	15km North Hwy 43				Email 4:	teckcoal@equisonline.com x
City	Sparwood	Province	BC	City	Burnaby	Province BC
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country Canada
Phone Number	250-425-3196	Phone Number	604-420-8773		PO number	VPO00432106

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F; Field; L; Lab; PL; Field & Lab; N; None

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	Temp (°C)
LC_LCDSSLCC_WS_2018-10-30_N	LC_LCDSSLCC	WS	N	30-Oct	11:43	G	9x20L	7-d C.dubia P/F 72-hr P. subcapitata P/F 30-d embryo EA P/F 28-d Hyalella P/F 7-d C. dubia dilution series 72-hr P. subcapitata dilution series 7-d L. minor dilution series 7-d embryo dilution series	1.4
LC_SLC_WS_2018-10-30_N	LC_SLC	WS	N	30-Oct	10:07	G	5x20L		0.5
LC_LC3_WS_2018-10-30_N	LC_LC3	WS	N	30-Oct	13:38	G	5x20L		1.9
LC_LC5_WS_2018-10-30_N	LC_LC5	WS	N	30-Oct	14:44	G	9x20L		2.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available <i>Odean, colorless, odorless, no solid particulates</i>			<i>Nautilus - Burnaby</i>	<i>Oct 31/18 @ 11:50</i>
			<i>NY - Nain Yamamoto</i>	<i>Q4 - week 1</i>
SERVICE REQUEST (rush - subject to availability)				
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	<i>Drake Lystra</i>	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	<i>Oct 30, 2018</i>
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: **20181030-0945** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x	
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x	
Address	Box 2003			Address	8664 Commerce Court			Email 3:	kristen.campbell@teck.com	x	x	
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com			x
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO.number	VPO00432106			
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	250-425-3196			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED								Filtered - F: Field, L: Lab, FL: Field & Lab, N: None	
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	181880	181879	181881	181882	181871	181870	181873	181872	Temp (°C)
								7-d C. dubia dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	7-d C. dubia P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F		
LC_DC1_WS_2018-10-30_N	LC_DC1	WS	N	30-Oct	10:30	G	5x20L	X	X	X	X						0.0
LC_FRDSDC_WS_2018-10-30_N	LC_FRDSDC	WS	N	30-Oct	09:30	G	5x20L	X	X	X	X						0.5
LC_DCDS_WS_2018-10-30_N	LC_DCDS	WS	N	30-Oct	11:45	G	9x20L	X	X	X	X	X	X	X	X		0.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available			Nautilus - Burnaby	Oct 31/18 @ 11:50
Clear, colourless, odourless, low particulates			NY - Nari Yamamoto	Q4 - week 1
SERVICE REQUEST (rush - subject to availability)				
Regular (default) <input checked="" type="checkbox"/>	Sampler's Name		Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID:	WEEKLY_CHRONIC_11062018_1	TURNAROUND TIME:	Regular	RUSH:	
PROJECT/CLIENT INFO			LABORATORY	OTHER INFO	
Facility Name / Job#	Coal Mountain Operations	Lab Name	Nautilus Environmental	Report Format / Distribution	Excel PDF EDD
Project Manager	Jay Jones	Lab Contact	Emma Marus	Email 1:	Scott.Holmgren@teck.com X X X
Email	Jay.Jones@teck.com	Email	emma@nautilusenvironmental.ca	Email 2:	teckcoal@equisonline.com X X X
Address	PO Box 3000	Address	8664 commerce Court	Email 4:	Don.Sacino@teck.com X X X
City	Sparwood	City	Burnaby	Email 5:	Jay.jones@teck.com X X X
Postal Code	V0B 2G0	Postal Code	V5A 4N7	PO number	478075
Province	BC	Province	BC		
Country	Canada	Country	Canada		
Phone Number	1-250-425-7321	Phone Number	604-420-8773		

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F: Field, L: Lab, FL: Field & Lab, N: None
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PHYSICAL	PRESERV.	FILE	Temp (°C)	
CM_MC1_Q4_WS_20181106_N	CM_MC1	WS	n	11/6/2018	10:58	G	4 X 20L	28 d Hyalella P/F 30-d embryo EA P/F				1.5	
CM_MC2_Q4_WS_20181106_N ①	CM_MC2	WS	n	11/6/2018	11:52	G	5 X 20L	28-d Hyalella P/F (EDTA) 30d FHM P/F - 10 µg/L Cu Conducted in Calgary				0.0	
CM_MC3_Q4_WS_20181106_N	CM_MC3	WS	n	11/6/2018	13:10	G	1 X 20L	30d FHM P/F - 20 µg/L Cu Conducted in Calgary				0.0	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
① 1 carboy leaked - container was punctured			Nautilus - Burnaby	Nov 07/18 @ 10:20
			NY - Nari Yamamoto	04 - week 2
NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	DS/SB	Mobile #	250 425 7518
Regular (default) X	Sampler's Signature		Date/Time	11/6/2018 14:00:00
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

② clear, no colour, no colour, some particulates

Teck

COC ID: **20181106CRN2** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental			Report Format / Distribution				
Job Description	Q4 Chronic Toxicity Sampling - Week 2			Lab Contact	Emma Marus			Email 1:	Cameron.Griffin@teck.com	Excel	PDF	EDD
Project Manager	Cameron Griffin			Email	Emma@nautilusenvironmental.ca			Email 2:	teckcoai@equisonline.com			
Email	Cameron.Griffin@teck.com			Address	8664 Commerce Court			Email 3:	kimberley.hackett@teck.com	X	X	X
Address	RR#1 HWY# 3				Imperial Square, Lake City			Email 4:	Bryan.Ogden@Teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 6:	Teck.Lab.Results@sharepoint.teck.com	X	X	X
Postal Code	V0B 2G1	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number				
Phone Number	1-250-425-8137			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED							
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C.dupia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail	28-d Hyalella P/F	Temp (°C)
EV_HC1_WS_2018-11_MON_N	EV_HC1	WS	N	11/6/2018	8:00	G	4 x 20L		X	/				X	0.0
EV_MC2_WS_2018-11_MON_N	EV_MC2	WS	N	11/6/2018	9:15	G	4 x 20L		X	/				X	0.0
							Total	8							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
① 1 carboy test early life stage P/F	Kimberley Hackett	November 6, 2018	Nautilus - Burnaby NY - Wai Yamamoto	Nov 07/18 @ 10:20 Q4 - week 2

Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Kimberley Hackett	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	<i>Kimberley Hackett</i>	Date/Time	November 6, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

② clear, no colour, no odour, some particulates

COC ID:	20181106 Chronic tox	TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation	Lab Name	Nautilus Environmental - BC		
Project Manager	Chris Blurton	Lab Contact		Report Format / Distribution	Excel PDF EDD
Email	Chris.Blurton@teck.com	Email	BCinfo@nautilusenvironmental.ca	Email 1:	drake.tymstra@teck.com x x
Address	Box 2003	Address	8664 Commerce Court	Email 2:	chris.blurton@teck.com x x
	15km North Hwy 43			Email 3:	kirsten.campbell@teck.com x x
City	Sparwood	Province	BC	Email 4:	teckcoal@equisonline.com x
Postal Code	VOB 2G0	Country	Canada	PO number	VPO00432106
Phone Number	250-425-3196	Phone Number	604-420-8773		

SAMPLE DETAILS							ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d Caudata P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	7-d Caudata dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	Temp. (°C)
LC_LCDSSLCC_WS_2018-11-06_N	LC_LCDSSLCC	WS	N	6-Nov	11:18	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_SLC_WS_2018-11-06_N	LC_SLC	WS	N	6-Nov	13:40	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_LC3_WS_2018-11-06_N	LC_LC3	WS	N	6-Nov	12:58	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_LC5_WS_2018-11-06_N	LC_LC5	WS	N	6-Nov	12:08	G	4x20L	X	X	X	X	X	X	X	X	0.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	Kirsten Campbell		Nautilus - Burnaby	refuse sample
			Nov 07/18 @ 10:	Q4 - week 2
			NY - Nain Yamamoto	
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) X	Kirsten Campbell			Nov. 6, 2018
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Clear, no colour, no odour, some particulates

COC ID:	20181106 Tox refresh	TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY	
Facility Name / Job#	Line Creek Operation	Lab Name	Nautilus Environmental - BC	Report Format / Distribution	Excel PDF EDD
Project Manager	Chris Blurton	Lab Contact		Email 1:	drake.tymstra@teck.com
Email	Chris.Blurton@teck.com	Email	BCinfo@nautilusenvironmental.ca	Email 2:	chris.blurton@teck.com
Address	Box 2003	Address	8664 Commerce Court	Email 3:	kirsten.campbell@teck.com
	15km North Hwy 43			Email 4:	teckcon@equisonline.com
City	Sparwood	Province	BC	City	Burnaby
Postal Code	V0B 2G0	Country	Canada	Province	BC
Phone Number	250-425-3196	Postal Code	V5A 4N7	Country	Canada
		Phone Number	604-420-8773	PO number	

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d C. dubia dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	7-d Daphnia P/F	7-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	Temp °C	
LC_DCDS_WS_2018-11-06_N	LC_DCDS	WS	Z	6-Nov	12:38	G	4 X20L	X	X	X	X	X	X	X	X	0.5	
			Z														
			Z														
			Z														
			Z														
			Z														
			Z														
			Z														
			Z														
			Z														
			Z														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	K. Campbell	6-Nov	Nautilus - Burnaby NY - Nani Yamamoto	Nov 07/18 @ 10:20 Q4 - week 2
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Kirsten Campbell			November 6, 2018

① clear, no colour, no odour, some particulates.

COC ID: 20181113-1304 TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution			Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X	
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X	
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X	
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jason.gravelle@teck.com	X	X	X	
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X	
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number	teckcoal@equisonline.com			X	

SAMPLE DETAILS								ANALYSIS REQUESTED							
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30-d embryo EA P/F	30-d embryo EA P/F (20 ug/L Cu)	30-d embryo EA P/F (40 ug/L Cu)	28-d Hyalella P/F	28-d Hyalella P/F (EDTA)	30d FHM P/F - 10 ug/L Cu	30d FHM P/F - 20 ug/L Cu	Temp (°C)
① FR_FRABCH_WS_2018-11-13_NP	FR_FRABCH	WS		2018/11/13	10:00	G	5 x 20L	X			X	X	X	X	0.0
② FR_FRCPI_WS_2018-11-13_N	FR_FRCPI	WS		2018/11/13	11:00	G	5 x 20L	X			X	X	X	X	0.0
① FR_UFRI_WS_2018-11-13_N	FR_UFRI	WS		2018/11/13	10:29	G	1 barrel	X	X	X	X		X		2.3

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Chelsea Jensen/Jared Cayenne	11/13/18	Nautilus Burnaby	Nov. 14/18 @ 10:30
			TH - Tyrone Hamilton	Refresh samples
				Q4-W3

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/>	Chelsea Jensen/Jared Cayenne	250 425 4729
Priority (2-3 business days) - 50% surcharge		
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

① clear, no colour, no odour, some particulates
 ② slightly turbid, light grey, no odour, some particulates

COC ID: WEEKLY_CHRONIC_11132018_1 TURNAROUND TIME: Regular RUSH:

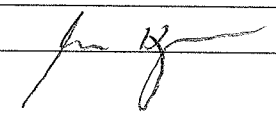
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Jay Jones			Lab Contact	Emma Marus			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
Address	PO Box 3000			Address	8664 commerce Court			Email 4:	Don.Sacino@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 5:	Jay.jones@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	478075			
Phone Number	1-250-425-7321			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS
CM_MC1_Q4_WS_20181113_N	CM_MC1	WS	n	11/13/2018	10:18	G	4 x 20L	30-d embryo EA P/F	28-d Hyalella P/F	28-d Hyalella P/F (EDTA)	30d FHM P/F - 10 µg/L Cu	30d FHM P/F - 20 µg/L Cu					Temp (°C)
CM_MC2_Q4_WS_20181113_N	CM_MC2	WS	n	11/13/2018	11:00	G	5 x 20L				Conducted in Calgary	Conducted in Calgary					0.0
CM_MC3_Q4_WS_20181113_N	CM_MC3	WS	n	11/13/2018	11:51	G	1 x 20L		X								0.0
								181872	181873	181874	181877	181878					

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Nautilus - Burnaby	Nov 14/18 @ 10:30
			NY - Nani Yamamoto	Refer to sample
				Q4 - week 3

NB OF BOTTLES RETURNED/DESCRIPTION	Regular (default)	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name	DS/SB	Mobile #	Date/Time
	X						250 425 7518	11/13/2018 14:00:00

① clear, no colour, no odour, some particulates



COC ID: **20181113 Chronic tox**

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excl	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x
Address	Box 2003			Address	8664 Commerce Court			Email 3:	kirsten.campbell@teck.com	x	x
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com		x
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	VPO00432106		
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada				
Phone Number	250-425-3196			Phone Number	604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED								Temp (°C)
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d C. dubia P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	7-d C. dubia dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	
LC_LCDSSLCC_WS_2018-11-13_N	LC_LCDSSLCC	WS	N	13-Nov	13:15	G	4 x 20L	X	X	X	X	X	X	X	X	0.0
LC_SLC_WS_2018-11-13_N	LC_SLC	WS	N	13-Nov	12:26	G	4 x 20L	X	X	X	X	X	X	X	X	0.0
LC_LC3_WS_2018-11-13_N	LC_LC3	WS	N	13-Nov	11:37	G	4 x 20L	X	X	X	X	X	X	X	X	1.0
LC_LC5_WS_2018-11-13_N	LC_LC5	WS	N	13-Nov	11:05	G	4 x 20L	X	X	X	X	X	X	X	X	0.4

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	K. Cambell/ B. Peachey		Nautilus - Burnaby	Nov. 14/18 @ 10:30
			TH - Tyrone Hamilton	Re-Test samples 04-63

SERVICE REQUEST (rush - subject to availability)				
Regular (default)	X	Sampler's Name	Kirsten Campbell	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time
Emergency (1 Business Day) - 100% surcharge				November 13, 2018
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Clear, no colour, no odour, some particulates

Teck

COC ID: 20181120CRN4		TURNAROUND TIME:		RUSH:				
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO		
Facility Name / Job# Elkview Operations		Lab Name Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD
Job Description Q4 Chronic Toxicity Sampling - Week 4		Lab Contact Emma Marus		Email 1: Cameron.Griffin@teck.com		X	X	X
Project Manager Cameron Griffin		Email Emma@nautilusenvironmental.ca		Email 2: teckcoal@equisonline.com		X		X
Email Cameron.Griffin@teck.com		Address 8664 Commerce Court		Email 3: kimberley.hackett@teck.com		X	X	X
Address RR#1 HWY# 3		Imperial Square, Lake City		Email 4: Bryan.Ogden@Teck.com		X	X	X
City Sparwood		City Burnaby		Email 6: Teck.Lab.Results@sharepoint.teck.com		X	X	X
Province BC		Province BC		PO number				
Postal Code V0B 2G1		Postal Code V5A 4N7						
Country Canada		Country Canada						
Phone Number 1-250-425-8137		Phone Number 604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P subcapitulum P/F	7d C-dupia P/F	96-hr rainbow trout Pass/Fish	48-hr Daphnia Pass/Fail	28d Myxozoa P/F			
EV_HC1_WS_2018-11-20_N *	EV_HC1	WS	N	11/20/2018	12:50	G	4 x 20L		X					X			Temp (°C)
EV_MC2_WS_2018-11-20_N *	EV_MC2	WS	N	11/20/2018	11:50	G	2 x 20L		X					X			0.0
Total							8		181873					181872			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
early life stage P/F *some ice formation	Kimberley Hackett	November 20, 2018	Tyronne Hamilton Nautilus - Burnaby	Nov. 21/18 @ 11:00 Q4-W4

Regular (default) <input checked="" type="checkbox"/>	Sampler's Name	Kimberley Hackett	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	<i>Kimberley Hackett</i>	Date/Time	November 20, 2018..
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

① clear, no colour, no odour some particulates

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO								
COC ID: 20181120 Chronic tox				TURNAROUND TIME:				RUSH:								
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution		Excel	PDF	EDD				
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x					
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x					
Address	Box 2003			Address	8664 Commerce Court			Email 3:	kirsten.campbell@teck.com	x	x					
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com			x				
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	VPO00432106							
Postal Code	VOB 2G0		Country	Canada	Postal Code	V5A 4N7		Country	Canada							
Phone Number	250-425-3196			Phone Number	604-420-8773											
SAMPLE DETAILS							ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	2-d Cadabta P/F	72-hr P-subcapitate P/F	Abt 30-d embryo-EA P/F	28-d Hyalella P/F	7-d C-dilution series	22-hr P-subcapitate dilution series	7-d L-minor dilution series	7-d embryo dilution series	Temp (C)
LC_LCDSSLCC_WS_2018-11-13_N	LC_LCDSSLCC	WS	N	20-Nov	12:30	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_SLC_WS_2018-11-13_N *	LC_SLC	WS	N	20-Nov	10:05	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_LC3_WS_2018-11-13_N	LC_LC3	WS	N	20-Nov	11:10	G	4x20L	X	X	X	X	X	X	X	X	0.0
LC_LC5_WS_2018-11-13_N	LC_LC5	WS	N	20-Nov	14:20	G	4x20L	X	X	X	X	X	X	X	X	0.0
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION			DATE/TIME	ACCEPTED BY/AFFILIATION			DATE/TIME					
Please provide preliminary update as results are available * some ice formation in sample				K. Cambell/ B.Peachey/D.Tymstra				Tymstra Hamilton Nautilus - Burnaby			Nov. 21/18 @ 11:00 04-W4					
SERVICE REQUEST (rush - subject to availability)																
Regular (default) X				Sampler's Name			Drake Tymstra	Mobile #								
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time			November 20, 2018					
Emergency (1 Business Day) - 100% surcharge																
For Emergency <1 Day, ASAP or Weekend - Contact ALS																

- 2 embryos labelled LC-LC5 are LC-LC3
 - Conductivity checked and match with LC-LC3
 - clear, no colour, no odour, some particulates

COC ID: 20181127-1336

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jared.cayenne@teck.com	X	X	X
Postal Code	VOB 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number	teckcoal@equisonline.com			X

SAMPLE DETAILS								ANALYSIS REQUESTED						Filtered - F: Field, L: Lab, FL: Field & Lab, N: None					
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 day embryo EA P/F	30 day Embryo EA P/F (40 ug/l Cu)	30 day Embryo EA P/F (20 ug/l Cu)									
FR_FRABCH_WS_2018-11-27_NP	FR_FRABCH	WS		2018/11/27	09:45	G	3 x 20	X											
FR_FRCPI_WS_2018-11-27_N	FR_FRCPI	WS		2018/11/27	12:00	G	3 x 20	X			X								
FR_UFRI_WS_2018-11-27_N	FR_UFRI	WS		2018/11/27	10:20	G	9 x 20	X	X	X									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jared Cayenne	27-Nov-18	Nautilus - Burnaby	Nov 28/18 @ 10:55
			NY - Nain Yamamoto	Q4 - week 5

SERVICE REQUEST (rush - subject to availability)				
Regular (default)	X	Sampler's Name	Chelsea Jensen/Jared Cayenne	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time
Emergency (1 Business Day) - 100% surcharge				November 27, 2018
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

① clear, no colour, no odour, some particulates
 ② slightly turbid, light grey, no odour some particulates

Teck																													
COC ID:		20181127CRN5				TURNAROUND TIME:				RUSH:																			
PROJECT/CLIENT INFO					LABORATORY					OTHER INFO																			
Facility Name / Job# Elkview Operations					Lab Name Nautilus Environmental					Report Format / Distribution																			
Job Description Q4 Chronic Toxicity Sampling - Week 5					Lab Contact Emma Marus					Email 1: Cameron.Griffin@teck.com																			
Project Manager Cameron Griffin					Email Emma@nautilusenvironmental.ca					Email 2: teckcoal@equisonline.com																			
Email Cameron.Griffin@teck.com					Address 8664 Commerce Court					Email 3: kimberley.hackett@teck.com																			
Address RR#1 HWY# 3					Imperial Square, Lake City					Email 4: Bryan.Ogden@Teck.com																			
City Sparwood					Province BC		City Burnaby			Province BC		Email 6: Teck.Lab.Results@sharepoint.teck.com																	
Postal Code V0B 2G1					Country Canada		Postal Code V5A 4N7			Country Canada		PO number																	
Phone Number 1-250-425-8137					Phone Number 604-420-8773																								
SAMPLE DETAILS										ANALYSIS REQUESTED																			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	30-day rainbow trout early life stage P/F	72h P. subcapitata P/F	7d C. dubia P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail																
EV_HC1_WS_2018-11-27_N	EV_HC1	WS	N	11/27/2018	8:20	G	4		X	(X204)											Temp (C)								
EV_MC2_WS_2018-11-27_N	EV_MC2	WS	N	11/27/2018	9:15	G	4		X	(X204)												0.0							
							Total	8																					
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS					RELINQUISHED BY/AFFILIATION					DATE/TIME					ACCEPTED BY/AFFILIATION					DATE/TIME									
early life stage P/F					30d rainbow trout					Jason Gravelle					November 27, 2018					Nautilus Burnaby					Nov 28/18 @ 10:55				
															NY - Nani Yamamoto					Q4 - week 5									
Regular (default) X					Sampler's Name					Kim Hackett/Jason Gravelle					Mobile #														
Priority (2-3 business days) - 50% surcharge					Sampler's Signature					<i>Jan Zull</i>					Date/Time					November 27, 2018									
Emergency (1 Business Day) - 100% surcharge																													
For Emergency <1 Day, ASAP or Weekend - Contact ALS																													

① clear, no colour, no odour, some particulates

COC ID:	20181127 Chronic tox	TURNAROUND TIME:		RUSH:		
PROJECT/CLIENT INFO			LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation		Lab Name	Nautilus Environmental - BC		
Project Manager	Chris Blurton		Lab Contact			
Email	Chris.Blurton@teck.com		Email	BCinfo@nautilusenvironmental.ca	Report Format / Distribution	
Address	Box 2003		Address	8664 Commerce Court	Excel	
	15km North Hwy 43				PDF	
City	Sparwood	Province	BC	City	Burnaby	
Postal Code	V0B 2G0	Country	Canada	Province	BC	
Phone Number	250-425-3196		Postal Code	V5A 4N7	Country	
			Phone Number	604-420-8773		
				PO number	VPO00432106	

SAMPLE DETAILS								ANALYSIS REQUESTED								
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d embryo P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	7-d embryo dilution series	72-hr P. subcapitata dilution series	7-d minor dilution series	7-d embryo dilution series	Temp (°C)
LC_LCDSSLCC_WS_2018-11-27_N	LC_LCDSSLCC	WS	N	27-Nov	11:00	G	3	X	X	X	X	X	X	X	X	0.0
LC_SLC_WS_2018-11-27_N	LC_SLC	WS	N	27-Nov	9:30	G	3	X	X	X	X	X	X	X	X	0.0
LC_LC3_WS_2018-11-27_N	LC_LC3	WS	N	27-Nov	10:15	G	3	X	X	X	X	X	X	X	X	0.0
LC_LC5_WS_2018-11-27_N	LC_LC5	WS	N	27-Nov	11:45	G	3	X	X	X	X	X	X	X	X	0.0

W04#
181873

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	K. Cambell/ B.Peachey/D.Tymstra		Nautilus - Burnaby	NOV 28/18 @ 10:55
			NY - Nari Yamamoto	Q4 - week 5
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Drake Tymstra	Mobile #	
Regular (default) X	Sampler's Signature		Date/Time	November 27, 2018
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

clear, no colour, no odour, some particulates

COC ID: 20181127 Tox refresh		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#		Line Creek Operation		Lab Name		Nautilus Environmental - BC			Report Format / Distribution			
Project Manager		Chris Blurton		Lab Contact					Excel	PDF	EDD	
Email		Chris.Blurton@teck.com		Email		BCinfo@nautilusenvironmental.ca			Email 1:	drake.lymstra@teck.com	x	x
Address		Box 2003		Address		8664 Commerce Court			Email 2:	chris.blurton@teck.com	x	x
		15km North Hwy 43							Email 3:	kirsten.campbell@teck.com	x	x
City		Sparwood		Province		BC			Email 4:	teckcoal@equisonline.com		X
Postal Code		V0B 2G0		Country		Canada			PO number	VPO00432106		
Phone Number		250-425-3196		City		Burnaby		Province		BC		
				Country		Canada		Country		Canada		
				Postal Code		V5A 4N7		Country		Canada		
				Phone Number		604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED										Filtered - P: Field, L: Lab, FL: Field & Lab, N: None						
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d-C-dilution series	72-hr P-subcapitata dilution series	7-d-L-minor dilution series	7-d-embryo dilution series	7-d-C-dilution P/F	72-hr P-subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F									
LC_DCDS_WS_2018-11-27_N	LC_DCDS	WS	N	27-Nov		G	3	X	X	X	X	X	X	X	X									temp(e)
																								0.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
Please provide preliminary update as results are available		K.Campbell		30-Nov Nov.27		Nautilus - Burnaby NY - Nari Yamamoto		Nov 28/18 @ 10:55 Q4 - week 5	
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		Sampler's Signature		Mobile #		Date/Time	
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS		Kirsten Campbell						November 27, 2018	

0 clear, no colour, no odour, some particulates.

COC ID: **20190109-1313** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO						
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution	Excel	PDF	EDD			
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X		
Email	Neil.MacDonald@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	dylan.beghin@teck.com	X	X	X		
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	chelsea.jensen@teck.com	X	X	X		
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 4:	jared.cayenne@teck.com	X	X	X		
Postal Code	VOB 1H0		Country	Canada	Postal Code	V5A 4N7		Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	604-420-8773			PO number	teckcoal@equisonline.com					

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	N	N								
FR_FRABCH_MON_2019-01-07_NP	FR_FRABCH	WS		2019/01/09	11:40	G	2											
FR_FRCP1_MON_2019-01-07_N	FR_FRCP1	WS		2019/01/09	12:39	G	2											
FR_SKP1_MON_2019-01-07_N	FR_SKP1	WS		2019/01/09	10:00	G	1											
FR_UFRI_MON_2019-01-07_N	FR_UFRI	WS		2019/01/09	11:00	G	1											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen		Tyrene Hamilton	Jan. 10/19 @ 10:00
			Nautilus - Burnaby	Q4-2018-Repeat

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Chelsea Jensen	Mobile #	250 425 4729
Regular (default) X	Sampler's Signature <td></td> <td>Date/Time</td> <td></td>		Date/Time	

COC ID: WEEKLY_CHRONIC_01092019_1		TURNAROUND TIME: Regular		RUSH:										
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO							
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental			Report Format / Distribution							
Project Manager Jay Jones				Lab Contact Emma Marus			Email 1:	Scott.Holmgren@teck.com	Excel	PDF	EDD			
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com	X	X	X			
Address PO Box 3000				Address 8664 commerce Court			Email 4:	Don.Sacino@teck.com	X	X	X			
City Sparwood		Province BC	City Burnaby	Province BC	Postal Code V5A 4N7	Country Canada	PO number	X	X	X				
Postal Code V0B 2G0		Country Canada	Phone Number 604-420-8773											
Phone Number 1-250-425-7321							Filtered - F: Field, L: Lab, FL: Field & Lab, N: None							
SAMPLE DETAILS								ANALYSIS REQUESTED						
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28-d Hyaella P/F						
CM_MC1_Q4_WS_2019-01-09_N	CM_MC1	WS	n	1/9/2019		G	1	X						4.2
CM_MC2_Q4_WS_2019-01-09_N	CM_MC2	WS	n	1/9/2019		G	2	X						3.1
CM_MC3_Q4_WS_2019-01-09_N	CM_MC3	WS	n	1/9/2019		G	1	X						2.8
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME					
							Tyronne Hamilton TH		Jan. 10/19 @ 10:00					
							Nautilus - Burnaby		Q4 - 2018 - Repeat					
NB OF BOTTLES RETURNED/DESCRIPTION			Sampler's Name			SH/DS	Mobile #	250 425 7518						
Regular (default) X			Sampler's Signature				Date/Time	1/9/2019 2:00:00 PM						
Priority (2-3 business days) - 50% surcharge														
Emergency (1 Business Day) - 100% surcharge														
For Emergency <1 Day, ASAP or Weekend - Contact ALS														

COC ID: **20190107 Chronic tox** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution			Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x		
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x		
Address	Box 2003			Address	8664 Commerce Court			Email 3:	kirsten.campbell@teck.com	x	x		
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com			X	
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	VPC000608154				
Postal Code	VOB 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada						
Phone Number	250-425-3196			Phone Number	604-420-8773								

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d C.dubia P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	7-d C. dubia dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	Filtered - F; Field, L; Lab; FL; Field & Lab; N; None	
LC_LCDSSLCC_MNT_2019-01-07_N	LC_LCDSSLCC	WS	N	9-Jan	10:24	G	1				X					1.2	
LC_SLC_MNT_2019-01-07_N	LC_SLC	WS	N	9-Jan	11:43	G	1				X					6.3	
LC_LC3_MNT_2019-01-07_N	LC_LC3	WS	N	9-Jan	11:07	G	1				X					6.4	
LC_LC5_MNT_2019-01-07_N	LC_LC5	WS	N	9-Jan	9:38	G	1				X					0.0	
LC_DCDS_MNT_2019-01-07_N	LC_DCDS	WS	N	9-Jan		G	1				X					0.6	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	K. Cambell/ B.Peachey/D.Tymstra	9-Jan	Tyrone Hamilton Nautilus - Burnaby	Jan. 10/19 @10:00 Q4 - 2018 - Repeat

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) <input checked="" type="checkbox"/>	Kirsten Campbell			January 9, 2019
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				



COC ID: 20190109TOX		TURNAROUND TIME:			RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO		
Facility Name / Job# Elkview Operations		Lab Name Nautilus Environmental		Report Format / Distribution		Excel	PDF	EDD
Job Description Quarterly Toxicity Sampling		Lab Contact Emma Marus		Email 1: bryan.ogden@teck.com		X	X	X
Project Manager Cam Griffin		Email emma@nautilusenvironmental.ca		Email 2: teckcoal@equisonline.com		X	X	X
Email Cameron.griffin@teck.com		Address 8664 Commerce Court		Email 3: kimberley.hackett@teck.com		X	X	X
Address RR#1 HWY#3		Imperial Square Lake City		Email 4: Cameron.Griffin@teck.com		X	X	X
City Sparwood		Province BC		Email 5: Teck.Lab.Results@sharepoint.teck.com		X	X	X
Postal Code V1C 4C3		Country Canada		City Burnaby		Province BC		PO number
Phone Number 1-250-425-8137		Postal Code V5A 4N7		Country Canada				
		Phone Number 604-420-8773						

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - F, Field; L, Lab; FT, Field & Lab; N, None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PLUTERED PRESERVED	Toxicity 96-h rainbow trout (Pass/Fail)	Toxicity 48-h Daphnia magna P/F	96 hr rainbow trout Pass/Fail	48 hr Daphnia Pass/Fail				
EV_OC1_WS_2019_Q1_QRT_N	EV_OC1	WS	N	2019/01/09	9:45	G	1		1							5.6
EV_AQ6_WS_2019_Q1_QRT_N	EV_AQ6	WS	N	2019/01/09	14:50	G	1		1							3.7
EV_MC2_WS_2019-01-09_N	EV_MC2	WS	N	2019/01/09	14:05	G	1				1					4.4
EV_SM1_WS_2019_Q1_QRT_N	EV_SM1	WS	N	2019/01/09	15:45	G	1		1							5.8
									190079	190080					190081	
							Total									4

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME
Toxicity 96-Hr/48-HR = 96 Hr Rainbow Trout pass/fail & 48 Hr Daphnia pass/fail (Daphnia testing to occur at 20 degrees)		Bryan Ogden		9-Jan-19	Tyne Hamilton Nautilus - Burnaby		Jan. 11/19 @10:20
NB OF BOTTLES RETURNED/DESCRIPTION							
Regular (default) X		Sampler's Name		Bryan Ogden	Mobile #		
Priority (2-3 business days) - 50% surcharge		Sampler's Signature			Date/Time		January 9, 2019
Emergency (1 Business Day) - 100% surcharge							
For Emergency <1 Day, ASAP or Weekend - Contact ALS							

COC ID: **WEEKLY_CHRONIC_01162019_1** TURNAROUND TIME: **Regular** RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Nautilus Environmental			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Emma Marus			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com			Email	emma@nautilusenvironmental.ca			Email 2:	teckcoal@equisonline.com			X
Address	PO Box 3000			Address	8664 commerce Court			Email 4:	Don.Sacino@teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 5:	Jay.jones@teck.com	X	X	X
Postal Code	VOB 2G0		Country	Canada	Postal Code	V5A 4N7		Country	Canada	PO number		
Phone Number	1-250-425-7321			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED								Filtered - F: Field, L: Lab, FL: Field & Lab, N: None						
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESERV.	ANALYSE												
CM_MC1_Q4_WS_2019-01-16_N	CM_MC1	WS	n	1/16/2019	10:02	G	1			28-2 Hyaella P/F + EDTA											Temp. (°C)	
																						0.0
CM_MC2_Q4_WS_2019-01-16_N	CM_MC2	WS	n	1/16/2019	10:35	G	2				X	X										0.0
CM_MC3_Q4_WS_2019-01-16_N	CM_MC3	WS	n	1/16/2019	11:08	G	1				X											0.0
											190059	190063										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
Retest for Q4 2018 <i>~Samples arrived slushy</i>						Tyrone Hamilton Nautilus - Burnaby		Jan. 17/19 @ 11:25	
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		SH/DS		Mobile #		Date/Time	
Regular (default) X						250 425 7518			
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge		Sampler's Signature							
For Emergency <1 Day, ASAP or Weekend - Contact ALS								1/16/2019 2:00:00 PM	

COC ID: WEEKLY_CHRONIC_01232019_1		TURNAROUND TIME: Regular		RUSH:							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental		Report Format / Distribution					
Project Manager Jay Jones				Lab Contact Emma Marus		Email 1:	Scott.Holmgren@teck.com	Excel	PDF	EDD	
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com	X	X	X	
Address PO Box 3000				Address 8664 commerce Court		Email 4:	Don.Sacino@teck.com	X	X	X	
City Sparwood		Province BC	City Burnaby		Province BC	Email 5:	Jay.jones@teck.com	X	X	X	
Postal Code V0B 2G0		Country Canada	Postal Code V5A 4N7		Country Canada	PO number					
Phone Number 1-250-425-7321		Phone Number 604-420-8773									
SAMPLE DETAILS						ANALYSIS REQUESTED					
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	<small>Filtered - F: Field, L: Lab, FL: Field & Lab, N: None</small>		
CM_MC1_Q4_WS_2019-01-23_N	CM_MC1	WS	n	1/23/2019		G	1	28-d Hyaella P/F	X		4.3
CM_MC2_Q4_WS_2019-01-23_N	CM_MC2	WS	n	1/23/2019		G	2		X		0.0
CM_MC3_Q4_WS_2019-01-23_N	CM_MC3	WS	n	1/23/2019		G	1		X		3.3
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME		
							Tyronne Hamilton		Jan 24/19 @ 8:53		
							Nautilus - Burnaby				
NB OF BOTTLES RETURNED/DESCRIPTION											
Regular (default) X			Sampler's Name			SH/DS		Mobile #		250 425 7518	
Priority (2-3 business days) - 50% surcharge			Sampler's Signature					Date/Time		1/23/2019 2:00:00 PM	
Emergency (1 Business Day) - 100% surcharge											
For Emergency <1 Day, ASAP or Weekend - Contact ALS											

COC ID:	20190123 Chronic tox			TURNAROUND TIME:		RUSH:						
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	X	X	
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	X	X	
Address	Box 2003			Address	8664 Commerce Court			Email 3:	kirsten.campbell@teck.com	X	X	
	15km North Hwy 43							Email 4:	teckcoal@equisonline.com			X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	VPO00608153			
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	250-425-3196			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED														
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESERV.	ANALYSIS												
LC_LCDSSLCC_WS_2019-01-21_N	LC_LCDSSLCC	WS	N	23-Jan	10:00	G	1			7-d C.dubia P/F												0.0
LC_SLC_WS_2019-01-21_N	LC_SLC	WS	N	23-Jan	10:45	G	1			72-hr P. subcapitata P/F												0.0
LC_LC3_WS_2019-01-21_N	LC_LC3	WS	N	23-Jan	11:30	G	1			30-d embryo EA P/F												0.0
LC_LC5_WS_2019-01-21_N	LC_LC5	WS	N	23-Jan	12:50	G	1			28-d Hyalella P/F												0.0
LC_DCDS_WS_2019-01-21_N	LC_DCDS	WS	N	23-Jan	11:17	G	1			7-d C. dubia dilution series												0.0
										72-hr P. subcapitata dilution series												2.0
										7-d L. minor dilution series												
										7-d embryo dilution series												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME			ACCEPTED BY/AFFILIATION			DATE/TIME		
Please provide preliminary update as results are available <i>Sample times subject to change, see electronic sample times. Thank you</i>			K. Cambell / B. Peachey / D. Tymstra			23-Jan			<i>Tymstra</i> / <i>Hess</i>			Jan 24/19 @ 09:53		
SERVICE REQUEST (rush - subject to availability)									<i>Nautilus - Burnaby</i>					
Regular (default) <input checked="" type="checkbox"/>			Sampler's Name			Kirsten Campbell			Mobile #					
Priority (2-3 business days) - 50% surcharge			Sampler's Signature			<i>Drake Tymstra</i>			Date/Time			January 23, 2019		
Emergency (1 Business Day) - 100% surcharge														
For Emergency <1 Day, ASAP or Weekend - Contact ALS														

COC ID: WEEKLY_CHRONIC_01302019_1		TURNAROUND TIME: Regular		RUSH:						
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO			
Facility Name / Job# Coal Mountain Operations				Lab Name Nautilus Environmental			Report Format / Distribution			
Project Manager Jay Jones				Lab Contact Emma Marus			Excel PDF EDD			
Email Jay.Jones@teck.com				Email emma@nautilusenvironmental.ca			Email 1: Scott.Holmgren@teck.com X X X			
Address PO Box 3000				Address 8664 commerce Court			Email 2: teckcoal@equisonline.com X X X			
City Sparwood Province BC				City Burnaby Province BC			Email 4: Don.Sacino@teck.com X X X			
Postal Code V0B 2G0 Country Canada				Postal Code V5A 4N7 Country Canada			Email 5: Jay.jones@teck.com X X X			
Phone Number 1-250-425-7321				Phone Number 604-420-8773			PO number			
SAMPLE DETAILS					ANALYSIS REQUESTED					
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	28-d Mycelia P/F	Temp (°C)	
CM_MC1_Q4_WS_2019-01-30_N	CM_MC1	WS	n	1/30/2019	11:40	G	1	X	0.0	
CM_MC2_Q4_WS_2019-01-30_N	CM_MC2	WS	n	1/30/2019	11:00	G	2	X	0.0	
CM_MC3_Q4_WS_2019-01-30_N	CM_MC3	WS	n	1/30/2019	10:20	G	1	X	0.0	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME
								Tyronne Hamilton		Jan. 31/19 @ 09:59
								Nautilus - Burnaby		
NB OF BOTTLES RETURNED/DESCRIPTION										
Regular (default) X			Sampler's Name			SH/DS		Mobile #		250 425 7518
Priority (2-3 business days) - 50% surcharge			Sampler's Signature					Date/Time		1/30/2019 2:00:00 PM
Emergency (1 Business Day) - 100% surcharge										
For Emergency <1 Day, ASAP or Weekend - Contact ALS										



COC ID: 20190130 Chronic tox

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental - BC			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact				Email 1:	drake.tymstra@teck.com	x	x	
Email	Chris.Blurton@teck.com			Email	BCinfo@nautilusenvironmental.ca			Email 2:	chris.blurton@teck.com	x	x	
Address	Box 2003 15km North Hwy 43			Address	8664 Commerce Court			Email 3:	kirsten.campbell@teck.com	x	x	
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 4:	teckcoal@equisonline.com			x
Postal Code	V0B 2G0		Country	Canada	Postal Code	V5A 4N7		Country	Canada	PO number	11000608154	
Phone Number	250-425-3196			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7-d C. dubia P/F	72-hr P. subcapitata P/F	30-d embryo EA P/F	28-d Hyalella P/F	7-d C. dubia dilution series	72-hr P. subcapitata dilution series	7-d L. minor dilution series	7-d embryo dilution series	Temp (°C)	
LC_LCDSSLCC_WS_2019-01-21_N	LC_LCDSSLCC	WS	N	30-Jan	11:30	G	1				X					7.4	
LC_SLC_WS_2019-01-21_N	LC_SLC	WS	N	30-Jan	10:00	G	1				X					6.4	
LC_LC3_WS_2019-01-21_N	LC_LC3	WS	N	30-Jan	10:30	G	1				X					6.6	
LC_LC5_WS_2019-01-21_N	LC_LC5	WS	N	30-Jan	1:00	G	1				X					6.6	
LC_DCDS_WS_2019-01-21_N	LC_DCDS	WS	N	30-Jan	12:30	G	1				X					0.0	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Please provide preliminary update as results are available	K. Cambell/D. Tymstra	30-Jan	Tyrene Hamilton Nautilus - Burnaby	Jan. 31/19 @ 09:59
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Kirsten Campbell	Mobile #	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	January 30, 2019
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Sample time may change, use electronic COC

Teck

COC ID: 20190130CRN4		TURNAROUND TIME:				RUSH:										
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO								
Facility Name / Job# Elkview Operations				Lab Name Nautilus Environmental				Report Format / Distribution				Excel	PDF	EDD		
Job Description Chronic Sampling				Lab Contact Emma Marus				Email 1: bryan.ogden@teck.com				X	X	X		
Project Manager Cam Griffin				Email emma@nautilusenvironmental.ca				Email 2: teckcoal@equisonline.com				X	X	X		
Email Cameron.griffin@teck.com				Address 8664 Commerce Court				Email 3: Kimberley.Hackett@teck.com				X	X	X		
Address RR#1 HWY# 3				Imperial Square Lake City				Email 4: Cameron.Griffin@teck.com				X	X	X		
City Sparwood				Province BC	City Burnaby				Province BC	Email 5: Teck.Lab.Results@sharepoint.teck.com				X	X	X
Postal Code VIC 4C3				Country Canada	Postal Code V5A 4N7				Country Canada	PO number VPO00610856						
Phone Number 1-250-425-8137					Phone Number 604-420-8773											

SAMPLE DETAILS								ANALYSIS REQUESTED							Filtered - F, Field - L, Lab - PL, Field & Lab - N, None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Analysis	Toxicity 96-h rainbow trout (Pass/Fail)	Toxicity 48-h Daphnia magna	28-d H. azteca								
EV_HC1_WS_2019-01-30_N	EV_HC1	WS	N	1/30/2019	8:30	G	1				1								3.1
EV_MC2_WS_2019-01-30_N	EV_MC2	WS	N	1/30/2019	9:30	G	1				1								3.1
Total							2												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION Kimberley Hackett	DATE/TIME 30-Jan-19	ACCEPTED BY/AFFILIATION Tyronne Hamilton Nautilus - Burnaby	DATE/TIME Jan. 30/19 @ 09:59
---	---	-------------------------------	--	--

NB OF BOTTLES RETURNED/DESCRIPTION	Regular (default) <input checked="" type="checkbox"/> X	Sampler's Name Kimberley Hackett	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature 	Date/Time January 30, 2019
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: 20181030-1216

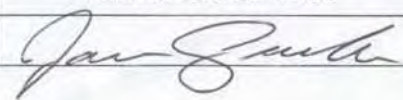
TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABiafo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			Email 6:	teckcoal@equisonline.com			X

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30-d fathhead minnow P/F (10 ug/l Cu Treated)	30-d fathhead minnow P/F (20 ug/l Cu Treated)						
FR_FRABCH_WS_2018-10-30_NP ³⁶ 1819 1819-0344	FR_FRABCH	WS		2018/10/30	09:30	G	5	X	X	2018/10/31					6.1°C
FR_FRCPI_WS_2018-10-30_N 1819-0343	FR_FRCPI	WS		2018/10/30	11:00	G	5	X	X	11:20					7.4°C
FR_UFRI_WS_2018-10-30_N 1819-0345	FR_UFRI	WS		2018/10/30	09:56	G	3	X		Bearpaw contracting J.C. 13x 20L carboys NoS/NoI Good condition					6.4°C

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Chelsea Jensen/Jason Gravelle	30-Oct-18		

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	October 30, 2018
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

COC ID: 20181106-1301

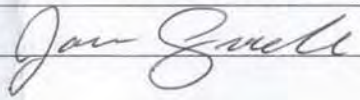
TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
- Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			Email 6:	teckcoal@equionline.com			X

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30-d fathead minnow P/F (10 ug/l Cu Treated)	30-d fathead minnow P/F (20 ug/l Cu Treated)						
FR_FRABCH_MON_2018-11-05_NP 1819-0844	FR_FRABCH	WS		2018/11/06	09:45	G	4	X	X	4.1 ⁰⁰					
FR_FRCP1_MON_2018-11-05_N 1819-0343	FR_FRCP1	WS		2018/11/06	11:35	G	4	X	X	3.7 ⁰⁰					
FR_UFRI_MON_2018-11-05_N 1819-0945	FR_UFRI	WS		2018/11/06	10:00	G	2	X		2.6 ⁰⁰					
<p>2018/11/07 10:00 SC Bear Paw Contracting 10x 20L carboys No S/No I Good condition</p>															

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Chelsea Jensen/Jason Gravelle	6-Nov-18		

SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS	
Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729	
Sampler's Signature		Date/Time	November 6, 2018	

COC ID: 20181113-1322		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	scott.roughead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS
								30-d fathead minnow P/F (10 ug/L CU treated)	30-d fathead minnow P/F (20 ug/L CU treated)							
FR_FRABCH_WS_2018-11-13_NP 1819-0344	FR_FRABCH	WS		2018/11/13	10:00	G	4	X	X	8.10g						
FR_FRCP1_WS_2018-11-13_N 1819-0343	FR_FRCP1	WS		2018/11/13	11:00	G	4	X	X	6.10g						
FR_UFR1_WS_2018-11-13_N 1819-0345	FR_UFR1	WS		2018/11/13	10:29	G	2	X		2.40g						
2018/11/14	Week 3															
10:00																
Bear Paw																
J.C.																
10x 20L Carboys																
No S/No I																
Good condition																

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Chelsea Jensen/Jared Cayenne	13-Nov-18		
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jared Cayenne	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	November 13, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: 20181120-1342


TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jason.gravelle@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	scott.routhead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30-d fathhead minnow P/F (10 ug/L CU treated)	30-d fathhead minnow P/F (20 ug/L CU treated)						
FR_FRABCH_WS_2018-11-20_N_33 1819-0344	FR_FRABCH	WS		2018/11/20	09:39	G	4	X	X	4.5°C					
FR_FRCP1_WS_2018-11-20_N_32 1819-0343	FR_FRCP1	WS		2018/11/20	10:30	G	4	X	X	2.4°C					
FR_UFRI_WS_2018-11-20_N_34 1819-0345	FR_UFRI	WS		2018/11/20	10:03	G	2	X		2.1°C					
2018/11/21 09:15 Bear Paw JC/DK 10x 20L carboys NoS/NoI															

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Good condition	Chelsea Jensen/Jason Gravelle			

SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jason Gravelle	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID:	20181127-1351			TURNAROUND TIME:				RUSH:				
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Nautilus Environmental - AB			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact				Email 1:	neil.macdonald@teck.com	X	X	X
Email	Neil.MacDonald@teck.com			Email	ABinfo@nautilusenvironmental.ca			Email 2:	dylan.begin@teck.com	X	X	X
Address	PO Box 100			Address	#4, 6125 12 Street SE			Email 3:	chelsea.jensen@teck.com	X	X	X
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 4:	jared.cayenne@teck.com	X	X	X
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Email 5:	scott.roughhead@teck.com	X	X	X
Phone Number	1-250-865-5204			Phone Number	403-253-7121			PO number				

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	PRESEV.	ANALYSIS										
											30 day fathead M. (10 ug/L Cu.)	30 day fathead M. (20 ug/L Cu.)								
Week 5 FR_FRABCH_WS_2018-11-27_NP 1819-0344	FR_FRABCH	WS		2018/11/27	09:45	G	4				X	X	5.1°C							
FR_FRCPI_WS_2018-11-27_N 1819-0343	FR_FRCPI	WS		2018/11/27	12:00	G	4				X	X	2.8°C							
FR_UFRI_WS_2018-11-27_N 1819-0345	FR_UFRI	WS		2018/11/27	10:20	G	2				X		3.6°C							
2018/11/28 09:15 Bear Paw J.C./D4 10 x 20L carboys NoS/NoL Good condition																				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
All metals samples must be shipped to ALS Burnaby for analysis	Chelsea Jensen/Jared Cayenne	27-Nov-18		
SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	Chelsea Jensen/Jared Cayenne	Mobile #	250 425 4729
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	November 27, 2018
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

Teck

COC ID:

Q4 Chronic TOX_Hyd

TURNAROUND TIME:

regular

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:			
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com	EQuIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution			
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com			
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com			
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number			

SAMPLE DETAILS

ANALYSIS REQUESTED

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	Please indicate below Filtered, Preserved or both (F, P, F/P)														
									#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A			
GH_FR1_WS_2018-11-06_N	1819-0346 GH_FR1	WS	N	6-Nov-18	9:30	G	4	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	x	x	1.1°C												
GH_ER2_WS_2018-11-06_N	1819-0347 GH_ER2	WS	N	6-Nov-18		G	2	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)	x		5.7°C												
2018/11/07 10:00		1/3																					
Bear Paw Contracting J.C. 6x 20L carboys No S/No Z Good condition																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION

Date Time Accepted By/Affiliation Date Time

SERVICE REQUEST (rush - subject to availability)

Regular (default) X

Priority (2-3 business days) - 50% surcharge

Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name

Jaydon Francis

Mobile #

Sampler's Signature

Date/Time

Teck

COC ID:		Q4 Chronic TOX_Hyd		TURNAROUND TIME:		regular		RUSH:																													
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO																													
Facility Name		Greenhills Operations		Lab Name		Hydroqual Laboratories Ltd		EDD delivery:																													
Project Manager		Leigh Stickney		Lab Contact		Jacklyn Pool		Site:		leigh.stickney@teck.com		EQuIS: GHO																									
Email		leigh.stickney@teck.com		Email				Report Format / Distribution																													
Address		PO Box 5000		Address		#4, 6125 - 12th Street S.E.		Yes		PDF		Yes		Excel																							
City		Edmonton		Province		BC		City		Calgary		Province		AB																							
Postal Code		V0B 1H0		Country		Canada		Postal Code		T2H 2K1		Country		Can																							
Phone Number		250 865 3274		Phone Number		403.253.7121		PO number																													
SAMPLE DETAILS				ANALYSIS REQUESTED																																	
				Please indicate below Filtered, Preserved or both (F, P, F/P)																																	
				<table border="1"> <thead> <tr> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> <th>#N/A</th> </tr> </thead> <tbody> <tr> <td>30 d early life stage fathead minnow P/F (10 ug/l CU Treated)</td> <td>30 d early life stage fathead minnow P/F (20 ug/l CU Treated)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)											
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																									
30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)																																				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.																														
GH_FR1_WS_2018-11-13_N 1819-0346	GH_FR1	WS	N	13-Nov-18	9:55	G	4	x	x	2.906																											
GH_ER2_WS_2018-11-13_N 1819-0347	GH_ER2	WS	N	13-Nov-18		G	2	x		5.606																											
2018/11/14 10:00 Bear Paw J.C 6x 20L carboys NOS/No I Good condition Week 3 1/3				RELINQUISHED BY/AFFILIATION				Date	Time	Accepted By/Affiliation		Date	Time																								
				J. Francis																																	
SERVICE REQUEST (rush - subject to availability)																																					
Regular (default) X				Sampler's Name		J. Francis		Mobile #																													
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				Date/Time																													
Emergency (1 Business Day) - 100% surcharge																																					
For Emergency <1 Day, ASAP or Weekend - Contact ALS																																					

	COC ID:	Q4 Chronic TOX_Hyd	TURNAROUND TIME:	regular	RUSH:
--	---------	---------------------------	------------------	---------	-------

PROJECT/CLIENT INFO			LABORATORY			OTHER INFO			
Facility Name	Greenhills Operations		Lab Name	Hydroqual Laboratories Ltd		EDD delivery:			
Project Manager	Leigh Stickney		Lab Contact	Jacklyn Pool		Site:	leigh.stickney@teck.com	EQuIS: GHO	
Email	leigh.stickney@teck.com		Email			Report Format / Distribution			
Address	PO Box 5000		Address	#4, 6125 - 12th Street S.E.		Yes	PDF	Yes	Excel
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com	
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com	
Phone Number	250 865 3274		Phone Number	403.253.7121		PO number			

SAMPLE DETAILS								ANALYSIS REQUESTED																	
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																	
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A						
GH_FR1_WS_2018-11-13_N	1819-0346 GH_FR1	WS	N	13-Nov-18	9:55	G	4	x	x																
GH_ER2_WS_2018-11-13_N	1819-0347 GH_ER2	WS	N	13-Nov-18		G	2	x																	
	2/3																								

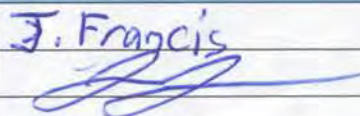
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Francis					

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	J. Francis	Mobile #	250420 7411
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

COC ID:		Q4 Chronic TOX_Hyd		TURNAROUND TIME:		regular		RUSH:					
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name		Greenhills Operations		Lab Name		Hydroqual Laboratories Ltd		EDD delivery:					
Project Manager		Leigh Stickney		Lab Contact		Jacklyn Pool		Site:		leigh.stickney@teck.com		EQuIS: GHO	
Email		leigh.stickney@teck.com		Email				Report Format / Distribution					
Address		PO Box 5000		Address		#4, 6125 - 12th Street S.E.		Yes		PDF		Yes	
City		Elkford		Province		BC		City		Calgary		Province	
Postal Code		V0B 1H0		Country		Canada		Postal Code		T2H 2K1		Country	
Phone Number		250 865 3274		Phone Number		403.253.7121		PO number					

SAMPLE DETAILS								ANALYSIS REQUESTED														
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)														
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
								30 d early life stage fathead minnow P/F (10 ug/L CU Treated)	30 d early life stage fathead minnow P/F (20 ug/L CU Treated)													
GH_FR1_WS_2018-11-13_N	1819-0346	GH_FR1	WS	N	13-Nov-18	G	4	x	x													
GH_ER2_WS_2018-11-13_N	1819-0347	GH_ER2	WS	N	13-Nov-18	G	2	x														
	3/3																					

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Francis					

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	J. Francis
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge		Mobile #	250 420 7941
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	

	COC ID:	Q4 Chronic TOX_Hyd	TURNAROUND TIME:	regular	RUSH:
--	---------	---------------------------	------------------	---------	-------

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:			
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com	EQuIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution			
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel
City	Elkford	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com			
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com			
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number			

SAMPLE DETAILS									ANALYSIS REQUESTED														
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.		Please indicate below Filtered, Preserved or both (F, P, F/P)														
									#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
									30 d early life stage fathead minnow P/F (10 ug/l CU Treated)	30 d early life stage fathead minnow P/F (20 ug/l CU Treated)													
GH_FR1_WS_2018-11-20_N	1819-0346 GH_FR1	WS	N	20-Nov-18	11:11	G	4		x	x													
GH_ER2_WS_2018-11-20_N	1819-0347 GH_ER2	WS	N	20-Nov-18	10:40		2		x														
	2/3																						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default) <input checked="" type="checkbox"/>		Sampler's Name	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: **Q4 Chronic TOX_Hyd** TURNAROUND TIME: regular RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Greenhills Operations			Lab Name	Hydroqual Laboratories Ltd			EDD delivery:			
Project Manager	Leigh Stickney			Lab Contact	Jacklyn Pool			Site:	leigh.stickney@teck.com	EQuIS:	GHO
Email	leigh.stickney@teck.com			Email				Report Format / Distribution			
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Yes	PDF	Yes	Excel
City	Edmonton	Province	BC	City	Calgary	Province	AB	Email 1: leigh.stickney@teck.com			
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: jennifer.kropp@teck.com			
Phone Number	250 865 3274			Phone Number	403.253.7121			PO number			

SAMPLE DETAILS								ANALYSIS REQUESTED																					
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Please indicate below Filtered, Preserved or both (F, P, F/P)																					
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							
								30 d early life stage fathead minnow P/F (10 ug/CU Treated)	30 d early life stage fathead minnow P/F (20 ug/CU Treated)																				
GH_FR1_WS_2018-11-27_N 1819-0346	GH_FR1	WS	N	27-Nov-18	14:16	G	4	x	x	2.9°C																			
GH_ER2_WS_2018-11-27_N 1819-0347	GH_ER2	WS	N	27-Nov-18		G	2	x		4.8°C																			
2018/11/28	1/3																												
09:15																													
Bear Paw																													
J.C./DU																													
6x 20L carboys																													
NoS/NoI																													
Good condition																													
Week 5																													

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	Mobile #
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

COC ID: **WEEKLY_CHRONIC_10302018_2** TURNAROUND TIME: **Regular** RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Jay Jones			Lab Contact	Claudio Quinteros			Email 1:	Scott.Holmgren@teck.com	X	X	X
Email	Jay.Jones@teck.com				Jessica Wang			Email 2:	teckcoal@equisonline.com			X
				Email	claudio@nautilusenvironmental.ca			Email 3:		X	X	X
					jessica@nautilusenvironmental.ca			Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	#4, 6125-12th Street S.E.			Email 5:	Jay.jones@teck.com	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	478075			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FR:	PREP:	ANALYSIS						
CM_MC1_Q4_WS_20181030_N <i>1819-03419</i>	CM_MC1	WS	n	10/30/2018	9:38	G	3			30 d fathead minnow P/F (10 ug/l CU Treated)	5.10C					
CM_MC2_Q4_WS_20181030_N <i>1819-0348</i>	CM_MC2	WS	n	10/30/2018	10:20	G	5			30 d fathead minnow P/F (20 ug/l CU Treated)	4.50C	X				

*2018/10/31
11:20
Bear paw contracting
J.C.
8x 20L carboys
NoS/NoI
Good condition*

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #	Date/Time
Regular (default) X			
Priority (2-3 business days) - 50% surcharge			
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			
	<i>[Signature]</i>		10/30/2018 14:00:00

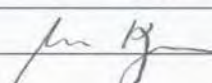
COC ID: WEEKLY_CHRONIC_11062018_2		TURNAROUND TIME: Regular		RUSH:						
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO				
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories		Report Format / Distribution				
Project Manager Jay Jones				Lab Contact Claudio Quinteros		Email 1:	Scott.Holmgren@teck.com	X	X	X
Email Jay.Jones@teck.com				Jessica Wang		Email 2:	teckcoal@equisonline.com			X
				Email claudio@nautilusenvironmental.ca		Email 3:	Jay.jones@teck.com	X	X	X
				Email jessica@nautilusenvironmental.ca		Email 4:	Don.Sacino@teck.com	X	X	X
Address PO Box 3000				Address #4, 6125-12th Street S.E.		Email 5:				
City Sparwood		Province BC	City Calgary		Province AB	PO number 478075				
Postal Code V0B 2G0		Country Canada	Postal Code T2H 2K1		Country Canada					
Phone Number 1-250-425-7321				Phone Number 403-253-7121						

SAMPLE DETAILS									ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, R: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	PH	PRESERV.							
CM_MC1_Q4_WS_20181106_N <i>1819-0348</i>	CM_MC1	WS	n	11/6/2018	10:58	G	2	30 d fathead minnow P/F (10 ug/l CU Treated)									
CM_MC2_Q4_WS_20181106_N <i>1819-0348</i>	CM_MC2	WS	n	11/6/2018	11:52	G	4	30 d fathead minnow P/F (20 ug/l CU Treated)									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION			DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
NB OF BOTTLES RETURNED/DESCRIPTION			SAMPLER'S NAME			SH/DS		MOBILE #		DATE/TIME	
Regular (default) X			Samplers Name			SH/DS		Mobile #		250 425 7518	
Priority (2-3 business days) - 50% surcharge			Samplers Signature <i>Adam Brossis</i>					Date/Time		11/6/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge											
For Emergency <1 Day, ASAP or Weekend - Contact ALS											

COC ID: WEEKLY_CHRONIC_11132018_2		TURNAROUND TIME: Regular		RUSH:							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job# Coal Mountain Operations				Lab Name Hydroqual Laboratories		Report Format / Distribution					
Project Manager Jay Jones				Lab Contact Claudio Quinteros		Email 1:	Scott.Holmgren@teck.com	X	X	X	
Email Jay.Jones@teck.com				Jessica Wang		Email 2:	teckcoal@equisonline.com				
				Email claudio@nautilusenvironmental.ca		Email 3:	Jay.Jones@teck.com	X	X	X	
				Address #4, 6125-12th Street S.E.		Email 4:	Don.Sacino@teck.com	X	X	X	
Address PO Box 3000				City Calgary		Province AB		PO number 478075			
City Sparwood				Province BC		Postal Code T2H 2K1		Country Canada			
Postal Code V0B 2G0				Country Canada		Phone Number 403-253-7121					
Phone Number 1-250-425-7321											

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FR.	ANALYSE	PRESERV.						
CM_MC1_Q4_WS_20181113_N <i>1819-0349</i>	CM_MC1	WS	n	11/13/2018	<i>10:15</i>	G	2		30 d fathhead minnow P/F (10 ug/l CU Treated)							
CM_MC2_Q4_WS_20181113_N <i>1819-0348</i>	CM_MC2	WS	n	11/13/2018	<i>11:00</i>	G	4		30 d fathhead minnow P/F (20 ug/l CU Treated)							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION				DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
NB OF BOTTLES RETURNED/DESCRIPTION				Sampler's Name				SH/DS		Mobile #		250 425 7518	
Regular (default) X													
Priority (2-3 business days) - 50% surcharge													
Emergency (1 Business Day) - 100% surcharge													
For Emergency <1 Day, ASAP or Weekend - Contact ALS				Sampler's Signature				Date/Time		11/13/2018 14:00:00			

COC ID: WEEKLY_CHRONIC_11202018_2		TURNAROUND TIME: Regular		RUSH:								
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO						
Facility Name / Job#	Coal Mountain Operations			Lab Name	Hydroqual Laboratories		Report Format / Distribution					
Project Manager	Jay Jones			Lab Contact	Claudio Quinteros		Email 1:	Scott.Holmgren@teck.com	X	X	X	
Email	Jay.Jones@teck.com				Jessica Wang		Email 2:	teckcoal@equisonline.com	X	X	X	
					Email		claudio@nautilusenvironmental.ca	Email 3:	Jay.jones@teck.com	X	X	X
					Email		jessica@nautilusenvironmental.ca	Email 4:	Don.Sacino@teck.com	X	X	X
Address	PO Box 3000			Address	#4, 6125-12th Street S.E.		Email 5:					
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	478075			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada					
Phone Number	1-250-425-7321			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS
2018/11/21 09:15 Bear Paw JC/pu 6x 20L carboys No S/No I Good condition															
CM_MC1_Q4_WS_20181120_N 1819-0349	CM_MC1	WS	n	11/20/2018		G	2	30 d fathead minnow P/F (10 ug/l CU Treated)							
									0.30C						
CM_MC2_Q4_WS_20181120_N 1819-0348	CM_MC2	WS	n	11/20/2018		G	4	30 d fathead minnow P/F (20 ug/l CU Treated)							
									1.20C	X					

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		SH/DS		Mobile #		250 425 7518	
Regular (default) X									
Priority (2-3 business days) - 50% surcharge		Sampler's Signature				Date/Time		11/20/2018 14:00:00	
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

END OF REPORT

Appendix B-5
Memo: TIE testing for FR_FRCP1 (Fourth
quarter, 2018)

April 29, 2019

Memo: TIE testing for FR_FRCP1 (Fourth quarter, 2018)

<i>To</i>	Cait Good	<i>From</i>	Josh Baker
<i>Affiliation</i>	Teck Coal Ltd.	<i>Tel</i>	604-420-8773
<i>e-mail</i>	Cait.Good@teck.com	<i>e-mail</i>	josh@nautilusenvironmental.ca

Introduction

Nautilus Environmental conducted chronic toxicity tests between October 2018 and January 2019 for Teck Coal Ltd. with water samples collected as part of the quarterly toxicity testing program, including the following tests:

- *Ceriodaphnia dubia* 7-d survival and reproduction,
- *Pseudokirchneriella subcapitata* 72-h growth inhibition,
- *Hyalella azteca* 28-d survival and growth,
- *Pimephales promelas* 32-d survival and growth and
- *Oncorhynchus mykiss* embryo-alevin development.

In the fourth quarter of 2018, the sample identified as FR_FRCP1 demonstrated significant adverse effects for all five species, in comparisons to both laboratory and site controls. Consequently, follow-up testing was performed with *C. dubia* and *P. subcapitata* using remaining volume from FR_FRCP1. These laboratory species were selected based on the smaller volumes required for tests, quicker turnaround for information on toxicity and, in the case of *C. dubia*, it's relatively high degree of sensitivity. This memo report provides an update of the results of these efforts.

Methods

TIE treatments involve physico-chemical manipulations of the sample, followed by toxicity tests on the treated and untreated samples, in order to provide information regarding the cause of toxicity. Treatments were based on general guidance provided by USEPA for TIEs conducted on freshwater samples. The following TIE treatments were performed on the FR_FRCP1 sample:

- **EDTA chelation:** the sample was treated with 5 mg/L EDTA, which is a chelating agent that binds divalent metal cations, such as copper, cadmium, nickel and zinc, and reduces their bioavailability. Thus, a reduction in toxicity following treatment with EDTA indicates

that a metal that can be chelated with EDTA may be responsible for toxicity. This treatment has been previously shown to reduce the effect of divalent metals, found in Teck Coal samples, on *C. dubia* reproduction.

- **pH 10 filtration:** the sample was adjusted to pH 10, allowed to equilibrate for two hours and then filtered through a 0.45-µm filter. This treatment removes a number of inorganic constituents such as a subset of metals, which precipitate as insoluble hydroxides and carbonates. The adjustment was performed with 1M NaOH, and the sample was re-adjusted back to its initial pH with 1M HCl before being tested for toxicity.
- **Solid-phase extraction:** the sample was filtered through solid phase extraction columns and evaluated for toxicity. These treatments remove compounds with specific chemical characteristic from the sample by selective sorption to the column substrate. Columns tested included: C18 (Octadecyl; J.T. Baker) which is designed to remove non-polar organics from the sample and SAX (Strong Anion Exchange; J.T. Baker) which is designed to remove strong anions from the sample. Thus, a reduction of toxicity following C18 or SAX filtration would suggest that the toxicant was either an organic (e.g., PAHs) or a strong anion (e.g., anionic surfactants and flocculents), respectively. A treatment control was conducted in each case by treating and testing clean laboratory water (reconstituted moderately hard water) in the same manner as the sample.
- **Anti-scalant:** An anti-scalant provided by Teck Coal (GE Scaletrol), designed to eliminate the formation of calcite was added to the sample to eliminate potential adverse effects from calcite formation during testing. The addition rate was 5.0 mg/L and an anti-scalant control was prepared with laboratory control water at the same concentration.

Each of four samples collected on a weekly basis between October 30 and November 20 were treated with EDTA. The remaining TIE procedures were conducted on the sample collected on November 6. Dilution series tests were also conducted with *C. dubia* and *P. subcapitata* to determine the magnitude of effect in the FR_FRCP1 sample. Sample collection dates used in the follow-up investigation are provided below.

Sample dates

	October 30, 2018 (Week 1)
Fourth quarter	November 6, 2018 (Week 2)
	November 13, 2018 (Week 3)
	November 20, 2018 (Week 4)

Results and Discussion

C. dubia reproduction in FR_FRCP1 was consistently reduced in the four samples. Addition of EDTA did not reduce toxicity, indicating that toxicity was not caused by divalent cationic metals (Figure 1).

None of the TIE treatments conducted on FR_FRCP1 substantially improved reproduction of *C. dubia* (Figure 2), although a small improvement in reproduction was observed in the pH 10 filtration treatment. Thus, the cause of toxicity did not appear to be an organic, a strong anion, a metal or calcite formation.

Chemical analyses of the site water indicated that sulphate and TDS concentrations in FR_FRCP1 were above thresholds for *C. dubia* reproduction. Sulphate concentrations ranged from 1800 to 2000 mg/L and TDS ranged from 3000 to 3500 mg/L in samples collected during the fourth quarter, which exceed thresholds for toxicity to this species (Elphick et al. 2011). It should be noted that sulphate and its corresponding counter cation (predominantly calcium and magnesium in this case) are major component of TDS, and it is not possible to distinguish whether sulphate, or TDS as a whole is responsible for toxicity in cases where adverse effects due to these constituents are observed.

Based on a comparison to the effect levels presented by Elphick et al. (2011), the cause of reduced reproduction of *C. dubia* in FR_FRCP1 was most likely to have been high concentrations of sulphate and TDS. This conclusion is supported by the similar level of toxicity across the four weekly samples collected during the fourth quarter since sulphate and TDS concentrations were similar across this sampling period, as well as the ineffectiveness of the TIE treatments which would not have reduced sulphate and TDS concentrations.

A dilution series test was conducted with FR_FRCP1 (Week 1 sample) in order to evaluate the magnitude of toxicity present in the sample, and resulted in an IC50 for reproduction of 32%; when calculated based on sulfate concentration, this resulted in an IC50 of 640 mg/L, which is similar to the IC50 of 843 mg/L of sulfate reported by Elphick et al. (2011) for high hardness conditions. It is possible that other toxicants were present in the sample and that contributed to the overall effect; however, all or most of the toxicity can be explained by the concentration of sulphate and/or TDS in the sample, and it was not possible to distinguish whether other toxicants were also present to a lesser extent in the sample.

Of the species tested during the chronic toxicity testing program, the algae (*P. subcapitata*) would be expected to be the least sensitive to effects of sulfate and TDS (Elphick et al. 2011) and so this species was tested in part to determine if there were causes of toxicity present in the sample other than sulphate. A dilution series test, ranging from 1.56% to full strength sample, was conducted using algae; this test did not result in inhibition of algal reproduction below control response, contrary to what was observed in the initial test with FR_FRCP1 and, therefore, no further testing was conducted with this species. These results suggest that the toxicity that was initially observed in the algal test was not likely to have been caused by sulphate or TDS, since this would not be expected to change in the sample during storage.

Based on there being over 1800 mg/L sulphate and 3000 mg/L of TDS in the samples collected during the fourth quarter of 2018, sulphate and/or TDS likely contributed to reduced performance in tests using fathead minnows, rainbow trout and *Hyaella azteca*, although no TIE testing was performed with these species. Additional effort to characterize causes of toxicity may be implemented in 2019 if adverse effects continue to occur with these species.

Figure 1. *C. dubia* reproduction in EDTA treated and untreated FR_FRCP1 samples (mean and standard deviation).

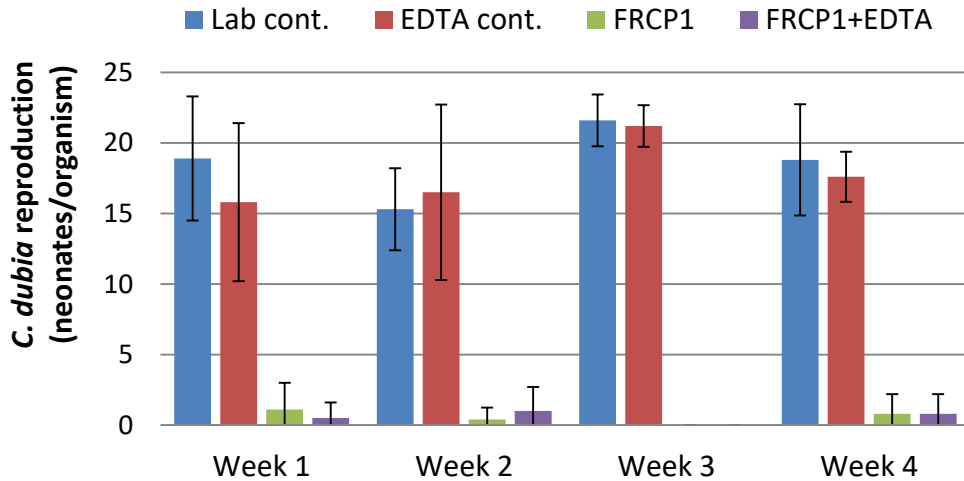
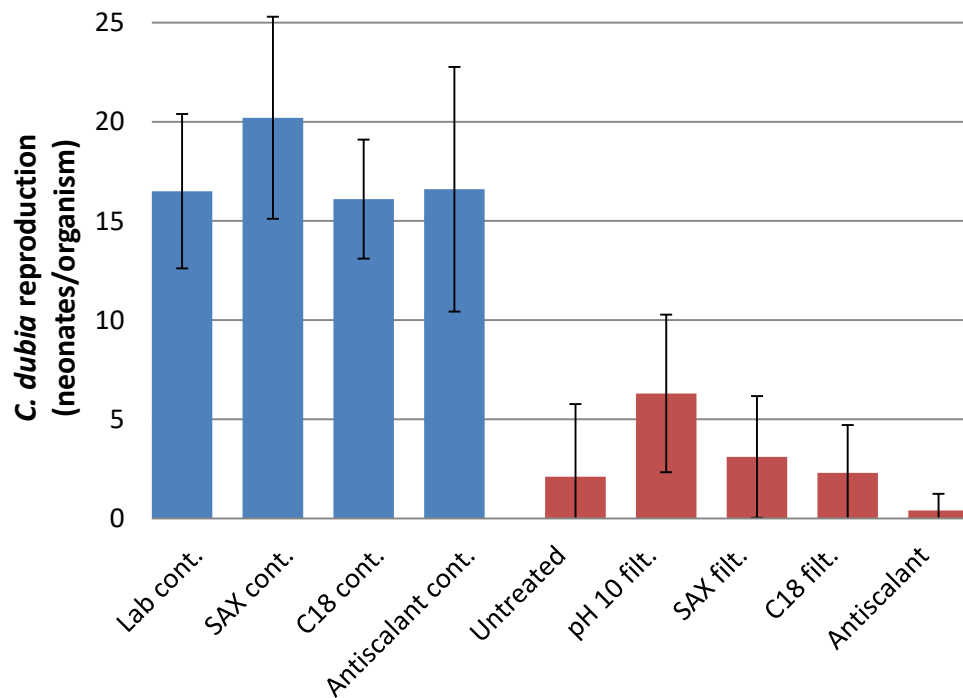


Figure 2. *C. dubia* reproduction in TIE treated and untreated FR_FRCP1 (mean and standard deviation).



Appendix B-6
Memo: TIE testing for CM_MC2 and CM_MC3

April 29, 2019

Memo: TIE testing for samples from CM_MC2 and CM_MC3

<i>To</i>	Cait Good	<i>From</i>	James Elphick
<i>Affiliation</i>	Teck Coal Ltd.	<i>Tel</i>	604-420-8773
<i>e-mail</i>	Cait.Good@teck.com	<i>e-mail</i>	james@nautilusenvironmental.ca

Introduction

Samples collected from CM_MC2 as part of quarterly monitoring of toxicity periodically exhibited toxicity in chronic toxicity tests using *Ceriodaphnia dubia* and *Hyaella azteca*, whereas tests with rainbow trout, fathead minnows and algae have not generally exhibited adverse responses at this location. Consequently, Nautilus Environmental previously conducted a Toxicity Identification Evaluation (TIE) in order to evaluate the cause of toxicity to these species. The results of this TIE identified nickel as the most likely cause of adverse effects in samples from this location to both species.

Once nickel had been identified as a likely cause of toxicity, in subsequent toxicity tests performed with CM_MC2, an EDTA treatment was performed concurrently with tests on the samples with *C. dubia* and *H. azteca*. EDTA is a chelating agent that binds divalent cationic metals and reduces their toxicity. Thus, this treatment was applied to CM_MC2 samples collected quarterly in 2018 in order to confirm that the same cause of toxicity was present in the samples over time. In addition, Teck Coal identified an additional station (CM_MC3) that is downstream of CM_MC2, which was sampled alongside of the quarterly testing program in order to evaluate more mixed conditions further downstream in Michel Creek and to determine the spatial extent of any adverse effects at CM_MC2.

The results of these additional treatments are summarized in this memo.

Methods

TIE treatments involve physico-chemical manipulations of the sample, followed by toxicity tests on the treated and untreated samples, in order to provide information regarding the cause of toxicity. Treatments are based on general guidance provided by USEPA for TIEs conducted on freshwater samples. In this case, divalent metal cations, and in particular nickel, had been

identified as the cause of toxicity. Consequently, the following TIE treatment was performed on the samples, in order to confirm that the same cause of toxicity was present over time:

- **EDTA chelation:** the sample was treated with 5 mg/L EDTA, which is a chelating agent that binds divalent metal cations, such as copper, cadmium, nickel and zinc, and reduces their bioavailability. Thus, a reduction in toxicity following treatment with EDTA indicates that a metal that can be chelated with EDTA may be responsible for toxicity.

Treated and untreated samples were tested concurrently, so that any effect of the treatment could be discerned. A control treatment was also conducted, in which EDTA was added to laboratory control water, in order to ensure that the treatment itself did not produce adverse effects.

Results and Discussion

The results of *C. dubia* reproduction in EDTA treatments conducted on samples from CM_MC2 are shown in Table 1; survival results are not presented here, since survival has not generally been adversely affected with this species. The untreated sample from CM_MC2 exhibited an adverse effect relative to the laboratory control and the upstream reference location, CM_MC1, in each of the four quarters in 2018. Treatment of the sample with EDTA reduced toxicity of each of the four samples, although toxicity was not entirely removed by this treatment in all cases. The effectiveness of the EDTA treatment indicates that divalent metal cations, such as nickel, were a primary contributor to toxicity in the samples.

Samples from CM_MC3 performed better than CM_MC2 in all four quarters; however, in the fourth quarter, there was more than a 50% reduction in reproduction at this station relative to the control and upstream reference station; an EDTA treatment was conducted subsequently on this sample. Reproduction was higher in the EDTA-treated CM_MC3 sample, although the improvement was not statistically significant.

It should be noted that *Ceriodaphnia* are sensitive to EDTA, and it is not uncommon to observe adverse effects from this treatment itself, even when applied at 5 mg/L. In fact, the EDTA control associated with the first quarter sample exhibited an adverse response relative to the control. Furthermore, previous tests conducted by Nautilus Environmental have suggested that EDTA is not always completely effective at removing toxicity of nickel, although the reason for this is not known. Thus, the fact that toxicity was not removed by EDTA treatment in all cases does not mean that toxicity that was present in these samples could not have been caused entirely by a divalent metal, even though toxicity was not substantially improved in all cases. The results from

the EDTA treatment with CM_MC3 were inconclusive in terms of confirming that divalent metal cations were a primary driver of toxicity in the CM_MC3 sample collected in the fourth quarter of 2018.

Results of *H. azteca* tests performed in 2018 are summarized in Table 2 and 3 for survival and growth, respectively. Survival was reduced relative to the control in all four samples from CM_MC2 and, in all cases, treatment with EDTA improved survival. Growth was impaired relative to the laboratory control in three of the four samples from CM_MC2. Treatment with EDTA improved performance of the test organisms in each case, although in the fourth quarter, the treated sample remained lower than the control performance. However, the data indicated that divalent metal cations, such as nickel, were the primary toxicant present in the samples. Tests conducted at CM_MC3 indicated a lower degree of toxicity than was present at CM_MC2; however, performance at this station was lower than the control in both the third and fourth quarters. TIE treatments were not conducted on samples from CM_MC3 using *H. azteca* as a test species.

The results of EDTA treatments on samples from CM_MC2 have been generally consistent with the conclusion that nickel is a cause of toxicity at this location. EDTA treatments will be continued in 2019 concurrently with the quarterly tests at this station, and further efforts will be implemented to optimize the treatment itself and to elucidate the reason why it has not been entirely effective at eliminating toxicity thus far.

Table 1. *Ceriodaphnia dubia* reproduction (number per female, mean \pm SD) in EDTA treatments of samples from Coal Mountain Operations.

Sample date	Treatment	Control	CM_MC1	CM_MC2	CM_MC3
First quarter 2018 sample					
19 Feb, 2018	Untreated	20.0 \pm 3.7	15.4 \pm 3.4	9.5 \pm 3.7	17.3 \pm 4.0
	EDTA-treated	8.4 \pm 5.0	--	11.2 \pm 2.8	--
Second quarter 2018 sample					
30 Apr, 2018	Untreated	17.6 \pm 2.5	17.7 \pm 9.7	7.4 \pm 4.2	12.2 \pm 4.1
	EDTA-treated	18.3 \pm 5.5	--	11.2 \pm 2.8	--
Third quarter 2018 sample					
7 Aug, 2018	Untreated	18.3 \pm 3.7	17.7 \pm 9.7	5.4 \pm 2.1	14.1 \pm 4.0
	EDTA-treated	17.0 \pm 3.2	--	14.4 \pm 3.2	--
Fourth quarter 2018 sample					
30 Oct, 2018	Untreated	18.9 \pm 4.4	23.8 \pm 5.4	0.0 \pm 0.0	3.6 \pm 2.1
	EDTA-treated	15.8 \pm 5.6	--	20.3 \pm 3.6	--
30 Oct, 2018	Untreated	15.3 \pm 2.9	--	--	8.9 \pm 3.5
	EDTA-treated	16.5 \pm 6.2	--	--	10.9 \pm 5.5

Table 2. *Hyalella azteca* survival (% , mean \pm SD) in EDTA treatments of samples from Coal Mountain Operations.

Sample date	Treatment	Control	CM_MC1	CM_MC2	CM_MC3
First quarter 2018 sample					
19 Feb, 2018	Untreated	100 \pm 0	100 \pm 0	36 \pm 36	98 \pm 4
	EDTA-treated	94 \pm 9	--	94 \pm 9	--
Second quarter 2018 sample					
30 Apr, 2018	Untreated	94 \pm 5	96 \pm 6	52 \pm 28	96 \pm 6
	EDTA-treated	98 \pm 4	--	100 \pm 0	--
Third quarter 2018 sample					
7 Aug, 2018	Untreated	88 \pm 8	84 \pm 19	26 \pm 11	68 \pm 33
	EDTA-treated	98 \pm 4	--	90 \pm 10	--
Fourth quarter 2018 sample					
9 Jan, 2019 *	Untreated	94 \pm 9	88 \pm 11	66 \pm 17	76 \pm 23
	EDTA-treated	98 \pm 4	--	78 \pm 18	--

* The initial *Hyalella* test with fourth quarter samples failed to meet control performance criteria, so this test was initiated subsequent to the other fourth quarter tests

Table 3. *Hyalella azteca* growth (mg per amphipod, mean \pm SD) in EDTA treatments of samples from Coal Mountain Operations.

Sample date	Treatment	Control	CM_MC1	CM_MC2	CM_MC3
First quarter 2018 sample					
19 Feb, 2018	Untreated	0.34 \pm 0.06	0.24 \pm 0.04	0.05 \pm 0.02	0.28 \pm 0.23
	EDTA-treated	0.38 \pm 0.05	--	0.33 \pm 0.05	--
Second quarter 2018 sample					
30 Apr, 2018	Untreated	0.34 \pm 0.03	0.43 \pm 0.03	0.33 \pm 0.04	0.44 \pm 0.05
	EDTA-treated	0.36 \pm 0.10	--	0.40 \pm 0.03	--
Third quarter 2018 sample					
7 Aug, 2018	Untreated	0.30 \pm 0.08	0.41 \pm 0.14	0.03 \pm 0.02	0.07 \pm 0.02
	EDTA-treated	0.52 \pm 0.07	--	0.43 \pm 0.12	--
Fourth quarter 2018 sample					
9 Jan, 2019 *	Untreated	0.34 \pm 0.20	0.46 \pm 0.17	0.07 \pm 0.02	0.22 \pm 0.08
	EDTA-treated	0.44 \pm 0.22	--	0.13 \pm 0.07	--

* The initial *Hyalella* test with fourth quarter samples failed to meet control performance criteria, so this test was initiated subsequent to the other fourth quarter tests

Appendix B-7 Summary of 2018 Acute Toxicity Testing

This appendix is included to meet the acute toxicity related reporting requirements of Permit 107517 Section 10.3 (amended 13 October 2017). Laboratory reports for acute toxicity tests conducted in 2018 are provided in Appendix H of Teck 2019¹. Teck has authored this appendix to provide a summary of the results.

Summary of 2018 Acute Toxicity Testing

Two hundred and ninety-four (294) 96-h rainbow trout 100% (single concentration) and 305 48-h *Daphnia magna* (*D. magna*) 100% (single concentration) acute lethality toxicity tests were conducted in 2018 as a requirement of Permit 107517. Of the 305 *D. magna* acute toxicity tests, four (1.3%) exhibited >50% mortality and as such were considered failed test results based on Permit 107517 criteria. All failures occurred at the discharge of Cataract Creek (GH_CC1 – EMS# 0200384). There were no failures of rainbow trout toxicity tests in 2018 (i.e., mortality was ≤50% for all 2018 rainbow trout acute toxicity tests). A summary table of acute toxicity test results is provided in Appendix H of Teck (2019).

In response to the failed toxicity testing results, Teck followed the requirements of Permit 107517 Section 10.2.2 and the Adaptive Management Plan response framework with respect to notification, confirmatory testing (i.e., LC₅₀ follow-up tests), took corrective action where possible, and provided follow-up test information to applicable regulators and KNC when it became available. Teck also completed additional investigative testing (e.g., testing at 10 and 20°C as well as other Toxicity Identification Evaluation [TIE] investigations) to aid in identifying the cause(s) of toxicity.

Teck currently hypothesizes, based on the results of additional investigative studies and recent scientific literature (e.g., Bogart et al. 2016²), that the formation of one or more mineral precipitates (including but not necessarily limited to calcite) was responsible for adverse effects observed in most or all of the failed *D. magna* tests. Evidence supporting this hypothesis includes:

- Laboratory staff noted precipitate consistent with calcite on the surfaces of the test vessels and *D. magna* carapaces during acute toxicity tests in which adverse effects on survival were observed. These observations are consistent with precipitate-related test mortalities in *D. magna* (Bogart et al. 2016).
- In the TIE studies, treatments that reduced precipitate formation, including treatments with antiscalant and treatments that reduced calcium and/or carbonate in solution (i.e., the components of calcite), substantially reduced or eliminated toxicity and precipitate formation.
- *D. magna* acute toxicity tests conducted at 10°C showed reduced toxicity compared to tests run at 20°C per Environment Canada guidelines. Because calcite solubility decreases with increasing temperature, the standard test protocol of warming samples

¹ Teck. 2019. Permit 107517 Annual Water Quality Monitoring Report. 29 March 2019.

² Bogart SJ, S Woodman, D Steinkey, C Meays, GG Pyle. 2016. Rapid changes in water hardness and alkalinity: Calcite formation is lethal to *Daphnia magna*. *Sci Total Environ.* 559:182-191.

to 20°C has the potential to enhance precipitation during the test in samples in which calcium and carbonate are super-saturated at 20°C.

- Treatment of effluent samples with antiscalant during pilot testing for advanced oxidation process at the active water treatment reduced or removed acute toxicity to *D. magna*.
- Tests completed with extended hold times showed reduced toxicity, consistent with giving time for precipitate to form prior to the addition of *D. magna*
- Effluent chemistry and TIE results did not identify other potential causes of toxicity (e.g., metals or Total dissolved solids [TDS] concentrations).

Trace element concentrations in water samples associated with acute toxicity test failures were generally below Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME 1999). In TIE testing, chelation with EDTA (a treatment to remove metal toxicity) did not reduce toxicity but antiscalant treatment reduced or removed toxicity without reducing concentrations of TDS. These results indicated that other trace elements or TDS were not causing the observed toxicity.

As calcite is suspected to be responsible for adverse effects on *D. magna*, it is necessary to understand what factors may favour precipitate formation and determine if these factors are due to laboratory conditions. Additional laboratory tests will help determine which factors may be contributing to observed *D. magna* toxicity and under what conditions toxicity may occur. Because differences in laboratory effluent handling procedures and testing protocols may have contributed to the observed variability in *D. magna* response, Teck is working with its independent laboratories to develop and implement standardized laboratory testing protocols for use during acute toxicity testing.

In addition to laboratory studies, the results of calcite monitoring programs at sites throughout the Elk Valley will support Teck's understanding of the potential for calcite toxicity in future tests and the implications of these results for conditions in the receiving environment. The Fording River South Active Water Treatment Facility is currently under construction and will treat water from Cataract Creek for selenium and nitrate; however, given the toxicity failures associated with precipitate at Cataract Creek, the project has been adjusted to include the addition of antiscalant prior to effluent discharge to the receiving environment. Antiscalant will be used to manage calcite in discharge waters and potential toxicity response associated with precipitation. As active water treatment will not be online until late 2020, Teck is proceeding with planning and permitting antiscalant treatment for Cataract Creek in early 2020; timing based on construction of the intake structures for the active water treatment facility.

APPENDIX C

Water Quality Screening

Table C-3: Water Quality Screening for 2018 Chronic Toxicity Tests at CM_MCI

Parameter	Unit	Guidelines for the protection of aquatic life										Q1										Q2										Q3										Q4									
		30-day mean (BC MOE)		Maximum (BC MOE)		EWQBP Benchmarks		Feb 19	Feb 27 (C. dubia and P. subcapitata)	Mar 06	Mar 13	Mar 20	Feb 27, Mar 6, 13, 20 (H. azteca)	Feb 19, 27, Mar 6, 13, 20 (P. promelas)	Apr 30 (C. dubia and P. subcapitata)	May 08	May 15	May 22	Apr 30, May 8, 15, 22 (H. azteca)	May 29	Jun 05	May 8, 15, 22, 29, Jun 5 (P. promelas and O. mykiss)	Aug 7 (C. dubia and P. subcapitata)	Aug 15	Aug 21	Aug 28	Aug 7, 15, 21, 28 (H. azteca)	Sep 04	Aug 7, 15, 21, 28, Sept 4 (P. promelas)	Oct 30 (C. dubia and P. subcapitata)	Nov 06	Nov 13	Nov 20	Nov 27	Oct 30, Nov 6, 13, 20, 27 (O. mykiss)	Dec 04	Nov 6, 13, 20, 27, Dec 4 (P. promelas)	Jan 09	Jan 16	Jan 23	Jan 30	Jan 9, 16, 23, 30 (H. azteca)									
		Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV										
pH Measured	-	6.5-9.0	6.5-9.0	-	7.8	8.1	7.8	7.7	7.5	7.8	0.03	7.8	0.03	8.6	8.8	8.4	8.7	8.6	0.02	8.3	8.7	8.6	0.03	6.8	8.2	7.0	7.8	7.5	0.09	7.9	7.5	0.08	8.3	8.4	7.4	7.2	7.7	7.8	0.07	8.3	7.8	0.07	8.2	8.3	8.1	8.0	8.2	0.02			
Temperature	°C	-	-	-	1.0	1.1	1.3	1.0	1.3	1.2	0.13	1.1	0.23	0.10	1.3	1.3	2.8	1.3	0.85	2.9	3.2	2.3	0.4	8.2	8.9	7.3	6.6	7.7	0.13	6.6	7.5	0.14	1.3	0.70	0.70	0.40	1.1	0.8	0.45	0.50	0.70	0.04	1.2	1.0	1.7	1.3	1.3	0.23			
Conventional Parameters																																																			
pH	-	6.5-9.0	6.5-9.0	-	7.9	8.3	8.2	8.4	8.2	8.3	0.01	8.2	0.02	8.3	8.2	8.1	8.1	8.2	0.01	7.8	7.9	8.0	0.02	8.4	8.4	8.3	8.0	8.3	0.02	8.6	8.3	0.03	8.2	8.3	8.4	8.3	8.2	8.3	0.01	8.2	8.3	0.01	8.3	8.2	8.1	8.0	8.2	0.02			
Hardness, as CaCO ₃	mg/L	-	-	-	147	163	149	162	149	153	0.04	152	0.04	125	101	88	90	101	0.17	88	95	93	0.06	156	156	141	160	154	0.06	147	152	0.05	140	137	138	137	156	142	0.06	147	145	0.07	148	150	155	159	153	0.03			
Total dissolved solids	mg/L	-	-	-	251	180	185	140	174	0.13	190	0.21	134	114	116	86	113	0.18	98	106	104	0.12	174	174	184	167	175	0.04	177	175	0.04	147	157	163	175	142	153	0.12	157	158	0.07	149	167	170	171	172	0.03				
Total suspended solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.5	9.1	25	8.6	12	0.76	13	3.6	12	0.68	<1.0	<1.0	1.9	<1.0	1.2	0.37	<1.0	1.2	0.34	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Total organic carbon	mg/L	-	-	-	0.83	0.81	0.75	0.88	1.4	0.96	0.2	0.93	0.28	3.4	4.8	4.1	3.2	3.9	0.19	3.4	2.2	3.5	0.28	1.5	0.88	1.1	1.5	1.2	0.24	0.61	1.1	0.35	2.2	2.9	1.4	1.1	0.52	1.7	0.48	1.4	1.5	0.7	1.0	0.78	0.70	0.67	0.79	0.19			
Dissolved organic carbon	mg/L	-	-	-	0.86	0.73	0.78	0.61	1.3	0.89	0.27	0.89	0.24	3.3	4.6	4.0	3.0	3.7	0.19	3.0	2.1	3.3	0.29	1.7	0.89	1.2	1.7	1.4	1.2	0.32	0.68	1.1	0.37	2.1	2.7	1.4	1.2	0.75	1.6	0.7	1.6	0.67	0.66	0.61	0.62	0.67	0.62				
Turbidity	NTU	-	-	-	0.13	0.22	0.18	0.11	0.11	0.16	0.35	0.15	0.32	2.4	11	7.5	4.8	8.3	0.58	5.4	1.5	5.9	0.58	0.24	0.55	1.2	0.37	0.60	0.74	0.16	0.51	0.84	0.29	0.33	0.24	0.26	0.42	0.3	0.23	0.23	0.30	0.16	0.34	0.21	0.31	0.25	0.28	0.21			
Conductivity	µS/cm	-	-	-	296	307	311	311	300	307	0.02	305	0.02	238	197	163	183	193	0.17	162	183	176	0.08	267	283	264	293	277	0.05	264	274	0.05	268	244	322	280	275	278	0.1	272	279	0.1	283	283	278	304	287	0.04			
Acidity To pH 8.3, as CaCO ₃	mg/L	-	-	-	3.9	<1.0	1.4	<1.0	1.2	1.2	0.17	1.7	0.73	<1.0	1.7	1.2	2.9	1.7	0.5	2.1	<1.0	1.8	0.43	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
Bicarbonate alkalinity, as CaCO ₃	mg/L	-	-	-	147	163	176	138	148	156	0.11	154	0.11	111	111	95	89	91	96	0.1	83	100	92	0.07	143	150	145	140	145	0.03	139	143	0.03	131	130	120	135	159	135	0.11	141	137	0.1	140	144	147	150	145	0.03		
Carbonate alkalinity, as CaCO ₃	mg/L	-	-	-	<1.0	10	<1.0	5.6	<1.0	4.4	0.98	3.7	1.09	6.0	<1.0	<1.0	<1.0	2.3	1.13	<1.0	<1.0	<1.0	<1.0	1.8	<1.0	2.2	<1.0	1.5	0.4	7.8	2.7	1.02	<1.0	2.8	5.2	4.0	<1.0	2.8	0.66	<1.0	2.8	0.66	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
Hydroxide alkalinity, as CaCO ₃	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0				
Total alkalinity, as CaCO ₃	mg/L	20 ^(a)	-	-	147	173	176	142	148	160	0.11	157	0.1	117	95	89	91	98	0.13	83	100	92	0.07	145	150	147	140	146	0.03	147	146	0.03	131	132	125	139	159	137	0.1	141	139	0.09	140	144	147	150	145	0.03			
Oxidation-reduction potential	mV	-	-	-	400	331	372	520	386	402	0.2	402	0.18	264	314	322	224	281	0.16	268	276	281	0.14	175	343	419	424	340	0.34	435	359	0.3	412	464	410	412	366	411	0.08	220	372	0.25	425	412	441	415	423	0.03			
Major Ions																																																			
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Calcium	mg/L	-	-	-	41	42	41	44	42	43	0.03	42	0.03	35	29	24	25	28	0.18	24	25	25	0.08	44	44	37	44	42	0.08	40	42	0.07	39	38	38	37	42	39	0.05	43	40	0.06	41	41	43	45	43	0.04			
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	0.74	0.56	0.21	0.55	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
Fluoride	mg/L	-	1.3-1.2 ^(b)	-	0.043	0.055	0.044	0.048	0.081	0.057	0.29	0.054	0.29	0.070	0.056	0.056	0.056	0.059	0.13	<0.02	0.045	0.046	0.33	0.080	0.080	0.075	0.081	0.079	0.03	0.074	0.078	0.04	0.070	0.066	0.070	0.071	0.069	0.03	0.070	0.069	0.02	0.074	0.066	0.074	0.072	0.05					
Magnesium	mg/L	-	-	-	12	11	12	11	12	11	0.06	12	0.06	9.2	7.3	6.5	7.0	7.6	0.15	7.2	6.5	7.2	0.03	11	11	10	12	10	0.03	11	11	10	11	10	11	11	10	11	10	11	10	11	10	11	10	11	10	11	10		
Potassium	mg/L	-	-	-	0.43	0.42	0.46	0.45	0.43	0.45	0.03	0.45	0.03	0.48	0.41	0.36	0.31	0.34	0.13	0.51	0.66	0.54	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57	0.11	0.56	0.57			
Sodium	mg/L	-	-	-	3.1	3.6	3.4	3.7	3.2	3.5	0.07	3.4	0.08	2.4	1.6	1.2	1.2	1.6	0.37	0.96	1.1	1.2	0.18	2.8	3.3	2.9	3.3	3.1	0.08	3.2	3.1	0.07	3.2	2.9	2.8	3.1	3.4	3.1	0.09	3.3	3.3	3.3	3.3	3.4	3.4	3.4	3.4	0.04			
Sulphate	mg/L	309 ^(c)	-	-	19	17	17	17	20	18	0.07	18	0.07	10	6.0	5.3	5.4	6.7	0.36	3.8	5.1	5.1	0.16	13	13	13	13	14	13	0.03	14	13	0.03	14	12	13	15	13.6	0.09	15	14	0.1	16	16	16	16	16</				

Table C-6: Water Quality Screening for 2018 Chronic Toxicity Tests at FR_FRABCH

Parameter	Unit	Guidelines for the protection of aquatic life:				Q4															
		30-day mean (BC MOE)	Maximum (BC MOE)	EWQBP Benchmarks	Oct 30 (C. dubia and P. subcapitata)	Nov 06	Nov 13	Nov 20	Nov 27	Oct 30, Nov 6, 13, 20, 27 (O. mykiss)		Dec 04	Nov 6, 13, 20, 27, Dec 4 (P. promelas)		Jan 09	Jan 16	Jan 23	Jan 30	Jan 9, 16, 23, 30 (H. azteca)		
										Mean	CV		Mean	CV					Mean	CV	
Field Measured																					
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.1	8.0	7.9	8.0	8.0	8.0	0.01	8.2	8.0	0.01	8.1	7.8	8.1	8.1	8.0	0.02	
Temperature	°C	-	-	-	4.7	4.4	2.8	1.0	3.3	3.2	0.46	0.50	2.4	0.68	0.80	0	1.3	0	0.50	1.28	
Conventional Parameters																					
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.2	8.3	8.3	8.3	0.01	8.3	8.3	0.01	8.3	8.2	8.3	8.3	8.3	8.3	0.01	
Hardness, as CaCO ₃	mg/L	-	-	-	626	625	593	599	688	626	0.06	636	628	0.06	655	670	632	712	667	0.05	
Total alkalinity, as CaCO ₃	mg/L	20 ^(b)	-	-	247	241	252	251	246	247	0.02	239	246	0.02	237	247	235	238	239	0.02	
Total dissolved solids	mg/L	-	-	-	788	801	803	809	799	800	0.01	821	807	0.01	856	863	846	839	851	0.01	
Total suspended solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.09	1.3	1.1	0.13	<1.0	<1.0	<1.0	<1.0	<1.0	0	
Total organic carbon	mg/L	-	-	-	0.83	0.88	1.1	0.62	<0.5	0.7	0.3	0.92	0.76	0.31	0.69	<0.5	<0.5	0.64	0.58	0.17	
Dissolved organic carbon	mg/L	-	-	-	0.96	0.82	<0.5	0.68	<0.5	0.7	0.29	0.81	0.66	0.24	0.74	<0.5	<0.5	0.57	0.58	0.2	
Turbidity	NTU	-	-	-	0.43	0.35	0.30	0.21	0.46	0.35	0.29	0.67	0.40	0.44	0.49	0.71	0.34	0.20	0.44	0.5	
Conductivity	µS/cm	-	-	-	1,080	1,030	1,050	1,090	1,060	1,066	0.02	1,030	1,056	0.03	1,090	1,110	1,120	1,100	1,100	0.02	
Acidity To pH 8.3, as CaCO ₃	mg/L	-	-	-	<1.0	2.9	<1.0	2.6	3.4	2.2	0.51	1.4	2.3	0.45	3.3	1.2	<1.0	<1.0	1.6	0.69	
Bicarbonate alkalinity, as CaCO ₃	mg/L	-	-	-	247	241	252	244	246	246	0.02	239	244	0.02	232	247	235	238	238	0.03	
Carbonate alkalinity, as CaCO ₃	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.2	1.2	2.2	1.2	4.6	<1.0	<1.0	<1.0	<1.0	0.95	
Hydroxide alkalinity, as CaCO ₃	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0	<1.0	<1.0	0	<1.0	<1.0	<1.0	<1.0	<1.0	0	
Oxidation-reduction potential	mV	-	-	-	490	346	456	395	444	426	0.13	501	428	0.14	440	362	396	402	400	0.08	
Major Ions																					
Bromide	mg/L	-	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0	<0.25	<0.25	0	<0.25	<0.05	<0.25	<0.25	<0.2	0.5	
Calcium	mg/L	-	-	-	145	144	135	135	150	142	0.05	146	142	0.05	149	146	139	160	149	0.06	
Chloride	mg/L	150	600	-	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	0	<2.5	<2.5	0	<2.5	1.8	<2.5	<2.5	2.3	0.14	
Fluoride	mg/L	-	1.8 - 2.2 ^(h)	-	0.15	0.14	0.15	0.16	0.17	0.16	0.07	0.16	0.16	0.07	0.17	0.14	0.14	0.15	0.15	0.08	
Magnesium	mg/L	-	-	-	64	64	62	64	76	66	0.08	66	66	0.08	69	74	69	76	72	0.05	
Potassium	mg/L	-	-	-	1.9	1.8	1.8	1.8	2.0	1.8	0.05	1.7	1.8	0.07	1.9	1.8	1.9	1.9	1.8	0.03	
Sodium	mg/L	-	-	-	2.7	2.5	2.5	2.5	2.8	2.6	0.06	2.5	2.5	0.06	2.7	2.9	2.7	3.0	2.8	0.05	
Sulphate	mg/L	429 ⁽ⁱ⁾	-	481 ^(j)	324	306	304	321	314	314	0.03	317	312	0.02	331	333	321	334	330	0.02	
Major anion sum	meq/L	-	-	-	13	13	13	13	13	13	0.02	13	13	0.02	13	13	13	13	13	0.02	
Major cation sum	meq/L	-	-	-	13	13	12	12	14	13	0.06	13	13	0.06	13	14	13	14	14	0.05	
Nutrients																					
Nitrate	mg-N/L	3.0	33	15 ^(k)	20 ^{(m), (n)}	19 ^{(m), (n)}	19 ^{(m), (n)}	19 ^{(m), (n)}	19 ^{(m), (n)}	19 ^{(m), (n)}	0.02	18 ^{(m), (n)}	19 ^{(m), (n)}	0.02	20 ^{(m), (n)}	20 ^{(m), (n)}	20 ^{(m), (n)}	21 ^{(m), (n)}	20 ^{(m), (n)}	0.03	
Nitrite	mg-N/L	0.020 - 0.040 ^(l)	0.060 - 0.12 ^(l)	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0053	0.13	<0.005	0.0053	0.13	<0.005	0.0034	0.0062	0.0083	0.0057	0.36	
Total ammonia	mg-N/L	0.31 - 1.2 ^(l)	1.6 - 6.4 ^(l)	-	0.015	0.019	0.019	0.020	0.012	0.017	0.2	0.022	0.018	0.21	0.0082	0.013	0.050	0.027	0.024	0.76	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	0.20	0.49	<0.05	0.27	<0.05	0.21	0.86	0.070	0.19	1.04	<0.05	0.50	<0.05	0.061	0.17	1.35	
Phosphorus	mg-P/L	-	-	-	0.0021	<0.002	0.0028	0.0036	0.0027	0.0026	0.24	0.0037	0.0030	0.24	0.0031	0.0022	0.0033	<0.002	0.0027	0.24	
Ortho-phosphate	mg-P/L	-	-	-	0.0015	0.0016	0.0023	0.0017	0.0032	0.0027	0.34	0.0016	0.0021	0.33	0.0014	0.0019	0.0016	0.0014	0.0016	0.15	
Total Metals																					
Aluminum	mg/L	-	-	-	0.0052	0.0054	<0.003	<0.003	<0.003	0.004	0.32	0.0038	0.0036	0.29	0.0033	0.0052	<0.003	0.0035	0.0038	0.26	
Antimony	mg/L	0.0090	-	-	0.00011	<0.0001	<0.0001	<0.0001	0.00013	0.00011	0.12	<0.0001	0.00011	0.13	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	
Arsenic	mg/L	-	0.0050	-	<0.0001	0.00010	<0.0001	0.00010	0.00015	0.00011	0.2	<0.0001	0.00011	0.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	
Barium	mg/L	1.0	-	-	0.11	0.11	0.11	0.11	0.11	0.11	0.04	0.11	0.11	0.05	0.11	0.11	0.10	0.11	0.11	0.05	
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0	<0.00002	<0.00002	0	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0	
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0	<0.00005	<0.00005	0	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0	
Boron	mg/L	1.2	-	-	0.013	0.012	0.012	0.012	0.012	0.012	0.04	0.012	0.012	0.04	0.012	0.012	0.012	0.012	0.012	0.06	
Cadmium	mg/L	-	-	-	0.00038	0.00034	0.00037	0.00037	0.00039	0.00037	0.04	0.00036	0.00037	0.04	0.00047	0.00047	0.00040	0.00034	0.00042	0.15	
Calcium	mg/L	-	-	-	143	133	138	139	144	139	0.03	149	146	0.04	146	150	146	145	145	0.03	
Chromium	mg/L	0.0010 ^(p)	-	-	0.0012	0.0016	0.0016	0.0014	0.0012	0.0014	0.14	0.0019	0.0015	0.17	0.0022	0.0031	0.0017	0.0037	0.0027	0.33	
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	0.00010	0.00011	0.00010	0.04	0.00011	0.00010	0.05	0.00012	0.00016	0.00014	0.00017	0.00015	0.15	
Copper	mg/L	0.010 ^(q)	0.031 - 0.040 ^(r)	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	0.00054	<0.0005	<0.0005	0.00051	0.04	
Iron	mg/L	-	1.0	-	0.023	0.019	0.015	0.014	0.013	0.017	0.25	0.016	0.015	0.15	0.018	0.033	0.016	0.018	0.021	0.37	
Lithium	mg/L	0.018 - 0.020 ^(s)	0.34 - 0.42 ^(s)	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.14	
Lithium	mg/L	-	-	-	0.036	0.033	0.035	0.034	0.033	0.034	0.04	0.034	0.034	0.03	0.035	0.033	0.032	0.033	0.033	0.04	
Magnesium	mg/L	-	-	-	66	64	67	68	67	68	0.03	67	67	0.03	67	66	67	62	67	0.07	
Manganese	mg/L	1.9 - 2.6 ^(t)	3.4 ^(t)	-	0.0063	0.0052	0.0048	0.0048	0.0045	0.0051	0.13	0.0050	0.0049	0.05	0.0056	0.0054	0.0050	0.0048	0.0052	0.07	
Mercury	mg/L	0.00010	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0	<0.000005	<0.000005	0	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0	
Molybdenum	mg/L	1.0	2.0	-	0.00071	0.00068	0.00072	0.00069	0.00069	0.00070	0.02	0.00070	0.00070	0.02	0.00064	0.00066	0.00063	0.00060	0.00063	0.04	
Nickel	mg/L	0.005 ^(u)	-	-	0.00063	0.00058	0.00054	0.00056	<0.0005	0.0006	0.09	0.00058	0.00055	0.06	0.00060	0.00067	0.00053	0.00056	0.00058	0.1	
Potassium	mg/L	-	-	-	1.7	1.7	1.7	1.7	1.7	1.7	0.03	1.7	1.7	0.04	1.7	1.7	1.7	1.7	1.7	0.02	
Selenium	mg/L	0.020	-	0.071	0.09 ^(v)	0.09 ^(v)	0.09 ^(v)	0.088 ^(v)	0.												

APPENDIX D

Toxicity Testing Data Paired with Response Variables

Appendix D: Concentration-Response Analysis

Table D-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	Mean Survival (Control Normalized)	Mean Reproduction (Control Normalized)	ALKALINITY, TOTAL (As CaCO ₃), lab measured, -N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	111	103	149	<0.003	0.0032	<0.0001	<0.0001	<0.0001	<0.0001	0.077	0.077	<0.0001	<0.0001
2015	Q1	Reference (FR_UFR1)	100	93	149	<0.003	0.0032	<0.0001	<0.0001	<0.0001	<0.0001	0.077	0.077	<0.0001	<0.0001
2015	Q1	Reference (FR_UFR1)	100	102	145	<0.003	0.0059	<0.0001	<0.0001	<0.0001	<0.0001	0.075	0.078	<0.0001	<0.0001
2015	Q2	Reference (FR_UFR1)	100	92	119	0.0092	0.083	<0.0001	<0.0001	0.00012	0.00014	0.042	0.043	<0.0001	<0.0001
2015	Q3	Reference (FR_UFR1)	111	106	159	<0.003	0.0078	<0.0001	<0.0001	0.00011	0.00012	0.076	0.076	<0.0001	<0.0001
2015	Q4	Reference (FR_UFR1)	100	112	146	<0.003	0.0046	<0.0001	<0.0001	<0.0001	0.0001	0.074	0.075	<0.0001	<0.0001
2015	Q2	Reference (GH_ER2)	100	93	157	<0.003	0.076	<0.0001	<0.0001	0.00011	0.00016	0.046	0.048	<0.0001	<0.0001
2015	Q4	Reference (GH_ER2)	100	110	147	<0.003	0.0046	<0.0001	<0.0001	<0.0001	<0.0001	0.047	0.049	<0.0001	<0.0001
2016	Q1	Reference (FR_UFR1)	111	114	138	<0.003	0.0048	<0.0001	<0.0001	<0.0001	<0.0001	0.074	0.073	<0.0001	<0.0001
2016	Q2	Reference (FR_UFR1)	100	98	110	0.015	0.11	<0.0001	<0.0001	0.00011	0.00014	0.04	0.042	<0.0001	<0.0001
2016	Q3	Reference (FR_UFR1)	100	99	160	<0.003	0.013	<0.0001	<0.0001	<0.0001	0.0001	0.074	0.077	<0.0002	<0.0002
2016	Q4	Reference (FR_UFR1)	100	92	141	0.011	0.051	<0.0001	<0.0001	<0.0001	0.00015	0.069	0.064	<0.0002	<0.0002
2016	Q2	Reference (GH_ER2)	90	74	143	0.036	0.2	<0.0001	<0.0001	0.00011	0.00024	0.042	0.044	<0.0001	<0.0001
2016	Q4	Reference (GH_ER2)	100	95	143	<0.003	0.075	<0.0001	<0.0001	<0.0001	<0.0001	0.042	0.048	<0.0002	<0.0002
2017	Q2	Reference (CM_MC1)	100	118	133	0.004	0.02	<0.0001	<0.0001	0.00022	0.0002	0.048	0.046	<0.0002	<0.0002
2017	Q3	Reference (CM_MC1)	100	118	141	0.0026	0.021	<0.0001	<0.0001	0.00022	0.00024	0.05	0.046	<0.0002	<0.0002
2017	Q4	Reference (CM_MC1)	100	101	134	<0.003	0.0086	<0.0001	<0.0001	0.00016	0.00019	0.051	0.051	<0.0002	<0.0002
2017	Q1	Reference (FR_UFR1)	100	131	146	<0.001	0.0046	<0.0001	0.00026	<0.0001	0.00012	0.073	0.073	<0.0002	<0.0002
2017	Q2	Reference (FR_UFR1)	100	104	113	0.009	0.15	<0.0001	<0.0001	0.00016	0.00019	0.053	0.051	<0.0002	<0.0002
2017	Q3	Reference (FR_UFR1)	100	109	148	0.0015	0.0071	<0.0001	0.00011	<0.0001	0.00013	0.068	0.069	<0.0002	<0.0002
2017	Q4	Reference (FR_UFR1)	100	102	138	<0.003	0.0037	<0.0001	<0.0001	<0.0001	0.00011	0.072	0.072	<0.0002	<0.0002
2017	Q2	Reference (GH_ER2)	90	83	153	<0.003	0.077	<0.0001	<0.0001	<0.0001	0.00014	0.05	0.051	<0.0002	<0.0002
2017	Q3	Reference (GH_ER2)	100	122	130	0.0027	0.012	<0.0001	0.00019	0.00011	0.00012	0.043	0.043	<0.0002	<0.0002
2017	Q4	Reference (GH_ER2)	100	97	155	<0.003	0.0061	<0.0001	<0.0001	<0.0001	0.00011	0.049	0.048	<0.0002	<0.0002
2018	Q1	Reference (CM_MC1)	100	77	173	<0.003	<0.003	<0.0001	<0.0001	0.00017	0.00018	0.058	0.053	<0.0002	<0.0002
2018	Q2	Reference (CM_MC1)	100	127	117	0.023	0.14	<0.0001	<0.0001	0.00023	0.00024	0.042	0.039	<0.0002	<0.0002
2018	Q3	Reference (CM_MC1)	80	97	145	<0.003	0.011	<0.0001	<0.0001	0.00018	0.0002	0.055	0.054	<0.0002	<0.0002
2018	Q4	Reference (CM_MC1)	111	126	131	<0.003	0.01	<0.0001	<0.0001	0.00017	0.0002	0.045	0.043	<0.0002	<0.0002
2018	Q1	Reference (FR_UFR1)	100	88	137	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.085	0.088	<0.0002	<0.0002
2018	Q2	Reference (FR_UFR1)	100	101	106	0.022	0.13	<0.0001	<0.0001	0.00012	0.00016	0.042	0.045	<0.0002	<0.0002
2018	Q3	Reference (FR_UFR1)	90	111	152	<0.003	0.0046	<0.0001	<0.0001	0.00011	0.0001	0.076	0.066	<0.0002	<0.0002
2018	Q4	Reference (FR_UFR1)	100	111	150	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.071	0.067	<0.0002	<0.0002
2018	Q1	Reference (GH_ER2)	80	68	153	<0.003	<0.003	<0.0001	<0.0001	<0.0001	0.00013	0.046	0.048	<0.0002	<0.0002
2018	Q3	Reference (GH_ER2)	100	96	140	0.039	0.24	<0.0001	<0.0001	0.00011	0.00025	0.048	0.049	<0.0002	<0.0002
2018	Q4	Reference (GH_ER2)	100	96	132	<0.003	0.64	<0.0001	<0.0001	0.00011	0.00061	0.043	0.054	<0.0002	0.000066
2018	Q2	Reference (GH_ER2)	111	113	146	<0.003	0.031	<0.0001	<0.0001	<0.0001	0.00014	0.05	0.046	<0.0002	<0.0002
2018	Q4	Reference (LC_SLCC)	100	77	126	<0.003	0.012	<0.0001	<0.0001	0.00013	0.0002	0.039	0.035	<0.0002	<0.0002
2018	Q3	Reference (LC_SLCC)	100	107	140	<0.003	0.003	<0.0001	<0.0001	0.00012	0.00011	0.048	0.041	<0.0002	<0.0002
2018	Q4	Reference (LC_SLCC)	111	104	143	<0.003	<0.003	<0.0001	<0.0001	0.00011	0.00015	0.041	0.045	<0.0002	<0.0002
Tests categorized as no adverse response															
2015	Q1	CM MC2	111	87	213	0.0097	0.032	0.00017	0.00019	0.00017	0.00022	0.072	0.072	<0.0001	<0.0001
2015	Q3	CM MC2	111	104	198	<0.003	0.016	0.00018	0.00021	0.00019	0.00021	0.069	0.069	<0.0001	<0.0001
2015	Q1	EV_HC1	100	97	135	0.003	0.009	0.0001	0.0001	0.00013	0.00014	0.041	0.042	0.0001	0.0001
2015	Q2	EV_HC1	100	97	110	0.0032	0.05	0.0001	0.0001	0.00013	0.00016	0.025	0.025	0.0001	0.0001
2015	Q3	EV_HC1	111	123	192	0.0049	0.034	<0.0001	0.00011	0.00017	0.00024	0.058	0.059	<0.0001	<0.0001
2015	Q4	EV_HC1	100	119	195	<0.003	0.0058	<0.0001	0.00012	0.00014	0.00015	0.06	0.063	<0.0001	<0.0001
2015	Q1	EV_MC2	100	96	193	0.0037	0.019	<0.0001	<0.0001	0.00015	0.00018	0.11	0.11	<0.0001	<0.0001
2015	Q2	EV_MC2	100	90	116	<0.007	0.36	<0.0001	0.00011	0.00018	0.00033	0.062	0.067	<0.0001	<0.0001
2015	Q3	EV_MC2	111	114	194	0.0003	0.0085	0.00041	0.00044	0.00016	0.00023	0.1	0.1	<0.0001	<0.0001
2015	Q4	EV_MC2	100	111	193	<0.003	0.0056	0.00035	0.00038	0.00014	0.00019	0.11	0.11	<0.0001	<0.0001
2015	Q2	FR_FRCP1	100	94	147	<0.003	0.073	0.00022	0.00022	<0.0001	0.00015	0.064	0.065	<0.0001	<0.0001
2015	Q3	FR_FRCP1	111	119	198	<0.003	0.022	0.00027	0.00033	0.0001	0.00019	0.076	0.076	<0.0001	<0.0001
2015	Q1	GH_ERC	100	96	155	<0.003	0.028	<0.0001	0.00012	<0.0001	0.00015	0.055	0.056	<0.0001	<0.0001
2015	Q2	GH_ERC	100	91	161	<0.003	0.13	<0.0001	<0.0001	<0.0001	0.00017	0.051	0.051	<0.0001	<0.0001
2015	Q3	GH_ERC	100	103	142	<0.003	0.073	<0.0001	<0.0001	<0.0001	0.00017	0.048	0.049	<0.0001	<0.0001
2015	Q4	GH_ERC	100	120	151	<0.003	0.007	<0.0001	<0.0001	<0.0001	<0.0001	0.058	0.06	<0.0001	<0.0001
2015	Q1	GH_FR1	111	99	202	<0.003	0.0048	0.00014	0.00014	<0.0001	0.00014	0.12	0.13	<0.0001	<0.0001
2015	Q2	GH_FR1	100	103	167	<0.003	0.053	0.00017	0.00017	0.0001	0.00014	0.085	0.087	<0.0001	<0.0001
2015	Q3	GH_FR1	111	114	182	<0.003	0.013	0.00022	0.00025	0.00014	0.0002	0.098	0.10	<0.0001	<0.0001
2015	Q4	GH_FR1	100	124	188	<0.003	0.004	0.00011	0.00015	<0.0001	0.00014	0.12	0.12	<0.0001	<0.0001
2015	Q1	LC_LCDSSLCC	111	98	195	<0.003	0.0052	0.00022	0.00022	0.00011	0.00013	0.096	0.093	<0.0001	<0.0001
2015	Q3	LC_LCDSSLCC	111	107	181	<0.003	0.013	0.00019	0.00026	<0.0001	0.00011	0.06	0.063	<0.0001	<0.0001
2015	Q4	LC_LCDSSLCC	100	85	197	<0.005	<0.015	<0.0005	<0.0005	<0.0005	<0.0005	0.085	0.091	<0.0005	<0.0005
2016	Q1	EV_HC1	111	113	191	<0.003	0.0096	<0.0001	<0.0001	0.00015	0.00016	0.067	0.065	<0.0001	<0.0001
2016	Q3	EV_HC1	100	89	192	0.014	0.073	<0.0001	<0.0001	0.00016	0.00021	0.065	0.066	<0.0002	<0.0002
2016	Q4	EV_HC1	100	88	192	0.0054	0.076	<0.0001	0.0001	0.00015	0.00019	0.06	0.06	<0.0002	<0.0002
2016	Q1	EV_MC2	111	109	179	<0.003	0.031	0.00025	0.00025	0.00013	0.00016	0.11	0.11	<0.0001	<0.0001
2016	Q3	EV_MC2	100	96	204	<0.003	0.0054	0.00021	0.00022	0.00018	0.00018	0.1	0.1	<0.0002	<0.0002
2016	Q1	GH_ERC	100	101	152	<0.003	0.0031	<0.0001	<0.0001	<0.0001	<0.0001	0.067	0.066	<0.0001	<0.0001
2016	Q3	GH_ERC	100	95	144	<0.003	0.021	<0.0001	<0.0001	<0.0001	<0.0001	0.049	0.05	<0.0002	<0.0002
2016	Q4	GH_ERC	100	84	148	<0.003	0.019	<0.0001	<0.0001	<0.0001	0.00012	0.055	0.051	<0.0002	<0.0002

Appendix D: Concentration-Response Analysis

Table D-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADMIUM-D-mg/l	CADMIUM-T-mg/l	CALCIUM-T-mg/l	CARBON, DISSOLVED ORGANIC-D-mg/l	CHLORIDE-D-mg/l	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	0.000011	56	0.84	<1.0	0.00017	0.00017	<0.0001
2015	Q1	Reference (FR_UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	0.000011	56	0.84	<1.0	0.00017	0.00017	<0.0001
2015	Q1	Reference (FR_UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000011	<0.00001	57	<0.5	<1.0	0.00013	0.00015	<0.0001
2015	Q2	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000074	0.000013	38	1.8	<1.0	0.00014	0.00046	<0.0001
2015	Q3	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000057	0.0000083	55	0.75	1.0	0.00013	0.00013	<0.0001
2015	Q4	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.00005	0.0000083	56	0.6	<1.0	0.00011	0.00036	<0.0001
2015	Q2	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.00005	0.000016	48	0.84	1.0	0.00022	0.00037	<0.0001
2015	Q4	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000053	0.0000069	51	0.61	1.2	0.00022	0.00034	<0.0001
2016	Q1	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000054	0.0000062	58	<0.5	1.1	0.00012	<0.0002	<0.0001
2016	Q2	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000062	0.000016	37	2.5	<1.0	0.00011	0.00029	<0.0001
2016	Q3	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000055	0.000011	51	0.86	0.13	<0.0001	0.00018	<0.0001
2016	Q4	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000057	0.0000058	48	1.1	0.18	<0.0001	0.00021	<0.0001
2016	Q2	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000076	0.000025	48	1.4	0.61	0.00017	0.00025	<0.0001
2016	Q4	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	0.0000079	48	0.64	0.36	0.00018	0.00027	<0.0001
2017	Q2	Reference (CM_MCI)	<0.00005	<0.00005	0.013	0.013	<0.05	0.000012	0.000015	36	1.8	<0.5	0.00012	0.00018	<0.0001
2017	Q3	Reference (CM_MCI)	<0.00005	<0.00005	0.018	0.018	<0.05	0.00001	0.000015	36	1.2	<0.5	<0.0001	0.00028	<0.0001
2017	Q4	Reference (CM_MCI)	<0.00005	<0.00005	0.013	0.014	<0.05	0.0000088	0.0000083	41	1.6	<0.5	0.00018	0.00018	<0.0001
2017	Q1	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00001	0.000011	52	0.96	<0.5	<0.0001	0.00011	<0.0001
2017	Q2	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000016	0.000023	31	3.3	<0.5	0.00022	0.0004	<0.0001
2017	Q3	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000008	0.000012	45	1.8	<0.5	<0.0001	0.00028	<0.0001
2017	Q4	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000069	0.00001	50	1.1	<0.5	<0.0001	0.00012	<0.0001
2017	Q2	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000098	0.000019	51	0.83	0.27	0.00021	0.00038	<0.0001
2017	Q3	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000081	0.0000078	40	0.79	<0.5	0.00019	0.00024	<0.0001
2017	Q4	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000056	0.0000074	47	0.81	<0.5	0.00022	0.00026	<0.0001
2018	Q1	Reference (CM_MCI)	<0.00005	<0.00005	0.013	0.014	<0.05	0.0000078	0.0000058	39	0.73	<0.5	0.00013	0.00018	<0.0001
2018	Q2	Reference (CM_MCI)	<0.00005	<0.00005	0.011	0.013	<0.05	0.00001	0.000019	36	3.3	<0.5	0.00013	0.00029	<0.0001
2018	Q3	Reference (CM_MCI)	<0.00005	<0.00005	0.015	0.016	<0.05	0.000012	0.000012	39	1.7	<0.5	0.00021	0.0003	<0.0001
2018	Q4	Reference (CM_MCI)	<0.00005	<0.00005	0.014	0.015	<0.05	0.0000088	0.0000085	38	2.1	<0.5	0.00018	0.00027	<0.0001
2018	Q1	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000062	0.0000096	53	0.5	<0.5	<0.0001	0.00011	<0.0001
2018	Q2	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000011	0.000031	35	2.9	<0.5	0.00011	0.00027	<0.0001
2018	Q3	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.00005	0.000011	48	1.6	<0.5	0.00012	0.00012	<0.0001
2018	Q4	Reference (FR_UFR1)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000055	0.000008	51	0.72	<0.5	0.0001	0.00019	<0.0001
2018	Q1	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000058	0.0000262	45	0.66	0.26	0.00019	0.00025	<0.0001
2018	Q2	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000076	0.000025	48	1.6	<0.5	0.00018	0.00027	<0.0001
2018	Q3	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000099	0.000013	49	0.75	<0.5	0.00021	0.00016	<0.0001
2018	Q4	Reference (GH_ER2)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000055	0.0000097	47	<0.5	<0.5	0.00023	0.00038	<0.0001
2018	Q2	Reference (LC_SLC)	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.00005	0.000015	42	2.3	<0.5	0.00012	0.00015	<0.0001
2018	Q3	Reference (LC_SLC)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000011	0.000014	46	1.2	<0.5	0.00014	0.00016	<0.0001
2018	Q4	Reference (LC_SLC)	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000011	0.000013	49	0.51	<0.5	0.00013	0.00021	<0.0001
Tests categorized as no adverse response															
2015	Q1	CM MC2	<0.0005	<0.0005	0.024	0.025	<0.10	0.000022	0.000023	106	0.93	3.4	0.00019	0.00024	0.00074
2015	Q3	CM MC2	<0.00005	<0.00005	0.027	0.029	<0.10	0.0000099	0.000018	104	0.86	2.1	0.00019	0.00023	0.00026
2015	Q1	EV HC1	0.0005	0.0005	0.01	0.01	0.05	0.000017	0.000016	60	0.82	1.5	0.00014	0.00018	0.0001
2015	Q2	EV HC1	0.00005	0.00005	0.01	0.01	0.05	0.000013	0.000021	47	1.1	1.3	0.00013	0.00021	0.0001
2015	Q3	EV HC1	<0.00005	<0.00005	<0.01	0.011	<0.05	0.000017	0.000025	75	1.1	1.4	0.00015	0.00024	<0.0001
2015	Q4	EV HC1	<0.00005	<0.00005	<0.01	0.01	<0.25	0.000013	0.000018	93	0.63	1.8	0.00013	0.00022	<0.0001
2015	Q1	EV MC2	<0.0005	<0.0005	0.014	0.016	<0.05	0.000055	0.000044	91	1.7	1.1	0.00012	<0.0002	<0.0001
2015	Q2	EV MC2	<0.00005	<0.00005	<0.01	0.01	<0.05	0.000018	0.000064	44	1.9	2.9	0.0002	0.0007	<0.0001
2015	Q3	EV MC2	<0.00005	<0.00005	0.016	0.018	<0.10	0.000049	0.000056	87	1.0	9.6	0.00013	0.00019	<0.0001
2015	Q4	EV MC2	<0.00005	<0.00005	0.016	0.016	<0.25	0.000037	0.000047	102	0.6	8.7	0.00012	0.00015	<0.0001
2015	Q2	FR FRCP1	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00003	0.00005	73	1.6	1.2	<0.0001	0.00028	<0.0001
2015	Q3	FR FRCP1	<0.00005	<0.00005	0.013	0.014	<0.10	0.000038	0.000047	109	0.93	1.5	0.0001	0.00017	<0.0001
2015	Q1	GH ERC	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	<0.00001	55	0.64	<1	0.00029	0.00034	<0.0001
2015	Q2	GH ERC	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000017	0.000022	53	0.96	<1	0.00017	0.00019	<0.0001
2015	Q3	GH ERC	<0.00005	<0.00005	0.012	0.013	<0.05	0.0000059	0.000013	49	<0.5	1.7	0.00019	0.00037	<0.0001
2015	Q4	GH ERC	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.00005	0.0000073	58	<0.5	<1.2	0.00022	0.00026	<0.0001
2015	Q1	GH FR1	<0.0005	<0.0005	0.012	0.01	<0.10	0.000021	0.000024	114	1.1	2.6	0.00021	0.00015	<0.0001
2015	Q2	GH FR1	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000021	0.000035	81	1.4	1.4	<0.0001	0.0002	<0.0001
2015	Q3	GH FR1	<0.00005	<0.00005	0.01	0.011	<0.05	0.000019	0.000021	90	0.87	1.6	0.00012	0.00015	<0.0001
2015	Q4	GH FR1	<0.00005	<0.00005	<0.01	0.011	<0.25	0.000015	0.000024	106	<0.5	1.7	0.00012	0.00013	<0.0001
2015	Q1	LC LCDSSLCC	<0.0005	<0.0005	0.013	0.014	<0.10	0.000086	0.000011	123	1.1	2.7	0.00016	0.00021	<0.0001
2015	Q3	LC LCDSSLCC	<0.00005	<0.00005	0.012	0.013	<0.10	0.00025	0.00026	92	0.83	2.0	0.00011	0.0002	<0.0001

Appendix D: Concentration-Response Analysis

Table D-1: *C. dubia* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	COBAL-T-mg/l	CONDUCTIVITY, LAB-N-us/cm	COPPER-D-mg/l	COPPER-T-mg/l	FLUORIDE-D-mg/l	Hardness, Total or Dissolved CaCO ₃ -N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	<0.0001	367	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.00005	<0.00005	0.0019	0.0016	15
2015	Q1	Reference (FR_UFR1)	<0.0001	367	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.00005	<0.00005	0.0019	0.0016	15
2015	Q1	Reference (FR_UFR1)	<0.0001	363	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0017	14
2015	Q2	Reference (FR_UFR1)	<0.0001	245	<0.0005	<0.0005	0.15	129	<0.01	0.052	<0.00005	<0.00005	<0.0010	0.0012	9.2
2015	Q3	Reference (FR_UFR1)	<0.0001	342	<0.0005	<0.0005	0.15	188	<0.01	<0.01	0.000055	<0.00005	0.002	0.002	13
2015	Q4	Reference (FR_UFR1)	<0.0001	354	<0.0005	<0.0005	0.16	190	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0015	14
2015	Q2	Reference (GH_ER2)	<0.0001	303	<0.0005	<0.0005	0.15	160	<0.01	0.066	<0.00005	<0.00005	0.0017	0.0016	11
2015	Q4	Reference (GH_ER2)	<0.0001	314	<0.0005	<0.0005	0.16	170	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0018	11
2016	Q1	Reference (FR_UFR1)	<0.0001	358	<0.0005	<0.0005	0.16	202	<0.01	<0.01	<0.00005	<0.00005	0.0014	0.0015	15
2016	Q2	Reference (FR_UFR1)	<0.0001	233	<0.0005	<0.0005	0.15	126	<0.01	0.075	<0.00005	0.00006	0.0011	0.0013	9.8
2016	Q3	Reference (FR_UFR1)	<0.0001	338	<0.0005	<0.0005	0.17	177	<0.01	0.013	<0.00005	<0.00005	0.0017	0.0018	14
2016	Q4	Reference (FR_UFR1)	<0.0001	330	<0.0005	<0.0005	0.16	177	<0.01	0.022	<0.00005	<0.00005	0.0015	0.0018	12
2016	Q2	Reference (GH_ER2)	<0.0001	289	<0.0005	<0.0005	0.16	163	<0.01	0.23	<0.00005	0.00013	0.002	0.0021	11
2016	Q4	Reference (GH_ER2)	<0.0001	297	<0.0005	<0.0005	0.17	163	<0.01	0.013	<0.00005	<0.00005	0.0019	0.0017	9.8
2017	Q2	Reference (CM_MC1)	<0.0001	267	<0.0002	<0.0005	0.052	134	<0.01	0.021	<0.00005	<0.00005	0.0041	0.0042	10
2017	Q3	Reference (CM_MC1)	<0.0001	265	<0.0002	<0.0005	0.054	138	<0.01	0.033	<0.00005	<0.00005	0.0044	0.0045	9.5
2017	Q4	Reference (CM_MC1)	<0.0001	280	<0.0005	<0.0005	0.055	144	<0.01	<0.01	<0.00005	<0.00005	0.0045	0.0046	11
2017	Q1	Reference (FR_UFR1)	<0.0001	341	<0.0002	<0.0005	0.14	185	<0.01	<0.01	<0.00005	<0.00005	0.0013	0.0014	14
2017	Q2	Reference (FR_UFR1)	<0.0001	239	0.0004	0.00067	0.11	121	0.054	0.13	<0.00005	0.000092	0.0011	0.0012	8.7
2017	Q3	Reference (FR_UFR1)	<0.0001	319	<0.0002	<0.0005	0.14	159	<0.01	0.011	<0.00005	<0.00005	0.0015	0.0015	13
2017	Q4	Reference (FR_UFR1)	<0.0001	333	<0.0005	<0.0005	0.11	185	<0.01	<0.01	<0.00005	<0.00005	0.0019	0.0017	14
2017	Q2	Reference (GH_ER2)	<0.0001	321	<0.0005	<0.0005	0.16	177	<0.01	0.074	<0.00005	0.000061	0.0019	0.002	12
2017	Q3	Reference (GH_ER2)	<0.0001	276	<0.0002	<0.0005	0.14	137	<0.01	0.02	<0.00005	<0.00005	0.0017	0.0015	9.6
2017	Q4	Reference (GH_ER2)	<0.0001	282	<0.0005	<0.0005	0.13	161	<0.01	<0.01	<0.00005	<0.00005	0.0021	0.002	11
2018	Q1	Reference (CM_MC1)	<0.0001	307	<0.0005	<0.0005	0.055	153	<0.01	<0.01	<0.00005	<0.00005	0.0047	0.0048	11
2018	Q2	Reference (CM_MC1)	<0.0001	238	<0.0005	0.00056	0.07	125	0.024	0.11	<0.00005	0.000073	0.0037	0.0041	9.2
2018	Q3	Reference (CM_MC1)	<0.0001	267	<0.0005	<0.0005	0.08	156	<0.01	0.011	<0.00005	<0.00005	0.0045	0.0048	10
2018	Q4	Reference (CM_MC1)	<0.0001	268	<0.0005	<0.0005	0.07	140	<0.01	<0.01	<0.00005	<0.00005	0.0046	0.0045	11
2018	Q1	Reference (FR_UFR1)	<0.0001	371	<0.0005	<0.0005	0.11	198	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0014	14
2018	Q2	Reference (FR_UFR1)	<0.0001	235	<0.0005	0.00056	0.14	123	0.014	0.13	<0.00005	0.00013	0.0011	0.0013	9.5
2018	Q3	Reference (FR_UFR1)	<0.0001	325	<0.0005	<0.0005	0.18	183	<0.01	<0.01	<0.00005	<0.00005	0.0018	0.0018	13
2018	Q4	Reference (FR_UFR1)	<0.0001	347	<0.0005	<0.0005	0.15	187	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0017	14
2018	Q1	Reference (GH_ER2)	<0.0001	327	<0.0005	<0.0005	0.16	170	<0.01	<0.01	<0.00005	<0.00005	0.0013	0.0017	11
2018	Q2	Reference (GH_ER2)	0.00012	294	<0.0005	0.00077	0.17	164	<0.01	0.14	<0.00005	<0.00005	0.0017	0.002	11
2018	Q3	Reference (GH_ER2)	0.00051	270	<0.0005	0.0012	0.17	148	<0.01	0.99	<0.00005	0.00084	0.0018	0.0024	11
2018	Q4	Reference (GH_ER2)	<0.0001	306	<0.0005	<0.0005	0.17	167	<0.01	0.037	<0.00005	<0.00005	0.0019	0.002	11
2018	Q2	Reference (LC_SLC)	<0.0001	299	<0.0005	<0.0005	0.3	163	<0.01	0.012	<0.00005	<0.00005	0.003	0.0029	12
2018	Q3	Reference (LC_SLC)	<0.0001	350	<0.0005	<0.0005	0.34	211	<0.01	<0.01	<0.00005	<0.00005	0.0029	0.003	15
2018	Q4	Reference (LC_SLC)	<0.0001	369	<0.0005	<0.0005	0.37	191	<0.01	<0.01	<0.00005	<0.00005	0.0033	0.0036	16
Tests categorized as no adverse response															
2015	Q1	CM MC2	0.00079	826	<0.0005	<0.0005	0.14	445	<0.01	0.031	<0.00005	<0.00005	0.011	0.011	46
2015	Q3	CM MC2	0.00034	802	<0.0005	<0.0005	0.12	458	<0.01	0.022	<0.00005	<0.00005	0.013	0.014	51
2015	Q1	EV_HC1	0.0001	453	0.0005	0.0005	0.15	274	0.01	0.013	0.00005	0.00005	0.0047	0.0047	31
2015	Q2	EV_HC1	0.0001	350	0.0005	0.0005	0.13	205	0.01	0.051	0.00005	0.000056	0.0044	0.0042	21
2015	Q3	EV_HC1	<0.0001	625	<0.0005	<0.0005	0.21	373	<0.01	0.027	<0.00005	<0.00005	0.0069	0.0068	41
2015	Q4	EV_HC1	<0.0001	732	<0.0005	<0.0005	0.2	431	<0.01	<0.01	<0.00005	<0.00005	0.0069	0.0067	50
2015	Q1	EV_MC2	<0.0001	665	0.0012	0.00076	0.15	381	<0.01	0.024	<0.00005	<0.00005	0.015	0.015	33
2015	Q2	EV_MC2	0.00022	299	<0.0005	0.00073	0.12	159	<0.01	0.39	<0.00005	0.00028	0.0054	0.0052	13
2015	Q3	EV_MC2	<0.0001	686	<0.0005	<0.0005	0.18	384	<0.01	0.018	<0.00005	<0.00005	0.022	0.021	35
2015	Q4	EV_MC2	<0.0001	733	<0.0005	<0.0005	0.16	415	<0.01	0.014	<0.00005	<0.00005	0.023	0.022	39
2015	Q2	FR_FRCP1	0.00012	573	<0.0005	<0.0005	0.2	302	<0.01	0.11	<0.00005	0.00014	0.019	0.018	29
2015	Q3	FR_FRCP1	<0.0001	815	<0.0005	<0.0005	0.2	471	<0.01	0.033	<0.00005	<0.00005	0.03	0.031	51
2015	Q1	GH_ERC	<0.0001	345	<0.0005	<0.0005	0.15	191	<0.01	0.036	<0.00005	0.0002	0.0019	0.002	13
2015	Q2	GH_ERC	<0.0001	338	<0.0005	<0.0005	0.15	179	<0.01	0.15	<0.00005	0.00011	0.0022	0.0023	12
2015	Q3	GH_ERC	<0.0001	284	<0.0005	<0.0005	0.18	160	<0.01	0.088	<0.00005	0.00077	0.0017	0.002	11
2015	Q4	GH_ERC	<0.0001	355	<0.0005	<0.0005	0.16	190	<0.01	<0.01	<0.00005	<0.00005	0.002	0.0021	13
2015	Q1	GH_FR1	<0.0001	851	<0.0005	<0.0005	0.18	475	<0.01	<0.01	<0.00005	<0.00005	0.016	0.016	49
2015	Q2	GH_FR1	<0.0001	814	<0.0005	<0.0005	0.17	332	<0.01	0.07	<0.00005	0.00063	0.014	0.014	34
2015	Q3	GH_FR1	<0.0001	857	<0.0005	<0.0005	0.18	374	<0.01	0.016	<0.00005	<0.00005	0.015	0.015	37
2015	Q4	GH_FR1	<0.0001	760	<0.0005	<0.0005	0.16	436	<0.01	<0.01	<0.00005	<0.00005	0.017	0.017	43
2015	Q1	LC_LCDSSLCC	<0.0001	940	<0.0005	<0.0005	0.24	536	<0.01	<0.01	<0.00005	<0.00005	0.031	0.031	53
2015	Q3	LC_LCDSSLCC	<0.0001	660	<0.0005	<0.0005	0.24	355	<0.01	<0.01	<0.00005	<0.00005	0.021	0.023	34
2015	Q4	LC_LCDSSLCC	<0.0005	770	<0.0010	<0.0025	0.18	499	<0.05	<0.05	<0.00025	<0.00025	0.036	0.036	54
2016	Q1	EV_HC1	<0.0001	745	<0.0005	<0.0005	0.21	443	<0.01	<0.02	<0.00005	<0.00005	0.0066	0.0065	51
2016	Q3	EV_HC1	<0.0001	652	<0.0										

Appendix D: Concentration-Response Analysis

Table D-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	MANGANESE-D-mg/l	MANGANESE-T-mg/l	MERCURY-D-mg/l	MERCURY-T-mg/l	MOLYBDENUM-D-mg/l	MOLYBDENUM-T-mg/l	NICKEL-D-mg/l	NICKEL-T-mg/l	NITRATE NITROGEN (NO3) AS N-N-mg/l	NITRITE NITROGEN (NO2) AS N-N-mg/l	NITROGEN, AMMONIA (AS N)-mg/l	ORTHO-PHOSPHATE-N-mg/l	pH, LAB-N-ph units
Reference															
2015	Q1	Reference (FR_UFR1)	0.000054	0.00018	<0.00001	<0.00001	0.00053	0.00054	<0.0005	<0.0005	0.13	<0.0010	<0.005	0.0032	8.4
2015	Q1	Reference (FR_UFR1)	0.000054	0.00018	<0.00001	<0.00001	0.00053	0.00054	<0.0005	<0.0005	0.13	<0.0010	<0.005	0.0032	8.4
2015	Q1	Reference (FR_UFR1)	0.00017	0.00037	<0.00001	<0.00001	0.00056	0.00055	<0.0005	<0.0005	0.13	<0.0010	<0.005	0.0027	8.3
2015	Q2	Reference (FR_UFR1)	0.00064	0.0025	<0.00005	<0.00005	0.00052	0.00062	<0.0005	<0.0005	0.066	<0.0010	<0.005	0.0042	8.4
2015	Q3	Reference (FR_UFR1)	0.00062	0.0015	<0.00005	<0.00005	0.00068	0.00068	<0.0005	<0.0005	0.019	<0.0010	<0.005	0.0029	8.4
2015	Q4	Reference (FR_UFR1)	0.0001	0.00031	<0.00005	<0.00005	0.00065	0.00059	<0.0005	<0.0005	0.022	<0.0010	<0.005	0.0017	8.4
2015	Q2	Reference (GH_ER2)	0.0033	0.0059	<0.00005	<0.00005	0.00092	0.00094	<0.0005	<0.0005	0.086	<0.0010	<0.005	<0.0010	8.3
2015	Q4	Reference (GH_ER2)	0.0021	0.0027	<0.00005	<0.00005	0.001	0.0010	<0.0005	<0.0005	0.078	<0.0010	<0.005	0.0015	8.3
2016	Q1	Reference (FR_UFR1)	0.0002	0.00034	<0.00005	<0.0000050	0.00058	0.00056	<0.0005	<0.0005	0.17	<0.0010	<0.005	0.0032	8.3
2016	Q2	Reference (FR_UFR1)	0.00045	0.0021	<0.00005	<0.000014	0.00061	0.00062	<0.0005	<0.0005	0.034	<0.0010	<0.005	0.0041	8.3
2016	Q3	Reference (FR_UFR1)	0.00027	0.0011	<0.00005	<0.0000050	0.00063	0.00063	<0.0005	<0.0005	0.057	<0.0010	<0.005	0.0031	8.2
2016	Q4	Reference (FR_UFR1)	0.00027	0.00073	<0.00005	<0.0000058	0.00057	0.00056	<0.0005	<0.0005	0.1	<0.0010	<0.005	0.0023	8.3
2016	Q2	Reference (GH_ER2)	0.0018	0.012	<0.00005	<0.0000098	0.00091	0.00093	<0.0005	<0.0005	0.005	<0.0010	<0.005	0.0011	8.2
2016	Q4	Reference (GH_ER2)	0.0012	0.0021	<0.00005	<0.000005	0.00097	0.00098	<0.0005	<0.0005	0.071	<0.0010	<0.005	<0.0010	8.3
2017	Q2	Reference (CM_MCI)	0.00015	0.00057	<0.00005	<0.000011	0.00074	0.0008	<0.0005	<0.0005	0.012	<0.001	<0.005	0.0029	8.2
2017	Q3	Reference (CM_MCI)	<0.0001	0.001	<0.00005	<0.0000067	0.00088	0.00085	<0.0005	<0.0005	0.012	<0.001	0.0067	0.005	8.2
2017	Q4	Reference (CM_MCI)	0.00012	0.00035	<0.00005	<0.0000059	0.0009	0.00087	<0.0005	<0.0005	0.015	<0.001	<0.005	0.0035	8.3
2017	Q1	Reference (FR_UFR1)	<0.0001	0.00027	<0.00005	<0.000005	0.00062	0.00062	<0.0005	<0.0005	0.22	<0.001	<0.005	0.0049	8.3
2017	Q2	Reference (FR_UFR1)	0.0012	0.0035	<0.00005	<0.0000031	0.00048	0.0005	0.00052	0.00069	0.098	<0.001	0.011	0.0087	8.3
2017	Q3	Reference (FR_UFR1)	0.00036	0.0011	<0.00005	<0.000005	0.00064	0.00068	<0.0005	<0.0005	0.011	<0.001	0.01	0.0027	8.4
2017	Q4	Reference (FR_UFR1)	<0.0001	0.00056	<0.00005	<0.000005	0.00055	0.00054	<0.0005	<0.0005	0.0094	0.0011	<0.005	0.0016	8.4
2017	Q2	Reference (GH_ER2)	0.00095	0.0054	<0.00005	<0.0000082	0.00094	0.00095	<0.0005	<0.0005	0.12	<0.001	<0.005	<0.001	8.4
2017	Q3	Reference (GH_ER2)	0.0021	0.0031	<0.00005	<0.000006	0.00096	0.00098	<0.0005	<0.0005	0.037	<0.001	0.0069	0.001	8.4
2017	Q4	Reference (GH_ER2)	0.00061	0.0016	<0.00005	<0.000005	0.0011	0.0011	<0.0005	<0.0005	0.037	<0.001	0.0089	<0.001	8.4
2018	Q1	Reference (CM_MCI)	<0.0001	0.00014	<0.00005	<0.000005	0.00087	0.00086	<0.0005	<0.0005	0.04	<0.001	<0.005	0.0036	8.3
2018	Q2	Reference (CM_MCI)	0.00035	0.0026	<0.00005	<0.00001	0.00071	0.00072	<0.0005	<0.0005	0.018	<0.001	<0.005	0.0069	8.3
2018	Q3	Reference (CM_MCI)	0.00015	0.0006	<0.00005	<0.000005	0.00094	0.0009	<0.0005	<0.0005	0.019	<0.001	0.024	0.0041	8.4
2018	Q4	Reference (CM_MCI)	<0.0001	0.00027	<0.00005	<0.0000063	0.00089	0.00093	<0.0005	<0.0005	0.0088	<0.001	0.0081	0.0042	8.2
2018	Q1	Reference (FR_UFR1)	<0.0001	0.00024	<0.00005	<0.000005	0.00058	0.00055	<0.0005	<0.0005	0.2	<0.001	0.0099	0.0029	8.4
2018	Q2	Reference (FR_UFR1)	0.00039	0.00076	<0.00005	<0.0000026	0.0006	0.00053	<0.0005	0.00062	0.13	<0.001	0.0067	0.0079	8.3
2018	Q3	Reference (FR_UFR1)	0.00031	0.00067	<0.00005	<0.000005	0.00064	0.00068	<0.0005	<0.0005	0.024	<0.001	0.056	<0.001	8.4
2018	Q4	Reference (FR_UFR1)	0.0001	0.00026	<0.00005	<0.000005	0.00059	0.00061	<0.0005	<0.0005	0.032	<0.001	0.026	0.0023	8.4
2018	Q1	Reference (GH_ER2)	0.0013	0.0015	<0.00005	<0.000005	0.0009	0.0010	<0.0005	<0.0005	0.1	<0.001	<0.005	<0.001	8.2
2018	Q2	Reference (GH_ER2)	0.00023	0.0012	<0.00005	<0.000005	0.00097	0.00098	<0.0005	<0.0005	0.005	<0.001	<0.005	0.0015	8.3
2018	Q3	Reference (GH_ER2)	<0.0001	0.0006	<0.00005	<0.0000078	0.0011	0.00087	<0.0005	<0.0005	0.023	<0.001	0.014	<0.001	8.2
2018	Q4	Reference (GH_ER2)	0.00039	0.0027	<0.00005	<0.000005	0.001	0.001	<0.0005	<0.0005	0.054	<0.001	0.014	0.0022	8.3
2018	Q2	Reference (LC_SLC)	<0.0001	0.00073	<0.00005	<0.0000064	0.00082	0.00079	<0.0005	<0.0005	0.13	<0.001	0.01	0.001	8.4
2018	Q3	Reference (LC_SLC)	<0.0001	0.00017	<0.00005	<0.000005	0.0013	0.0012	<0.0005	<0.0005	0.089	<0.001	0.026	<0.001	8.4
2018	Q4	Reference (LC_SLC)	<0.0001	0.00012	<0.00005	<0.000005	0.0012	0.0013	<0.0005	<0.0005	0.13	<0.001	0.023	0.0027	8.3
Tests categorized as no adverse response															
2015	Q1	CM MC2	0.0046	0.0064	<0.00001	<0.00001	0.001	0.0011	0.0095	0.0097	2.4	0.012	0.0055	0.001	8.4
2015	Q3	CM MC2	0.0018	0.0032	<0.00005	<0.00005	0.001	0.0011	0.013	0.013	2.5	0.0088	<0.005	<0.0010	8.4
2015	Q1	EV HC1	0.001	0.0015	0.00001	0.00001	0.00063	0.00065	0.0006	0.00064	0.8	0.001	0.005	0.0035	7.4
2015	Q2	EV HC1	0.00053	0.0016	0.00005	0.00005	0.0005	0.00048	0.00075	0.00083	0.57	0.001	0.0084	0.0031	7.5
2015	Q3	EV HC1	0.0028	0.0051	<0.00005	<0.00005	0.00092	0.00092	0.00079	0.00079	0.87	0.0011	<0.005	0.004	8.4
2015	Q4	EV HC1	0.0018	0.002	<0.00005	<0.000005	0.00097	0.00098	0.00066	0.00069	1.2	<0.005	<0.005	0.0058	8.4
2015	Q1	EV MC2	0.0024	0.0022	<0.00001	<0.00001	0.00079	0.00078	0.0007	0.00052	3.2	0.0013	<0.005	<0.0010	8.3
2015	Q2	EV MC2	0.0003	0.001	<0.00005	<0.00005	0.00059	0.00054	0.00077	0.0014	0.81	<0.0010	<0.005	<0.0010	8.1
2015	Q3	EV MC2	0.00067	0.002	<0.00005	<0.00005	0.00022	0.00022	0.0047	0.0048	5.7	0.0027	0.01	0.0027	8.1
2015	Q4	EV MC2	0.0013	0.0018	<0.00005	<0.000005	0.002	0.0021	0.0039	0.0041	5.9	<0.005	<0.005	0.0035	8.2
2015	Q2	FR FRCP1	0.0032	0.012	<0.00005	<0.000005	0.0013	0.0013	0.002	0.0024	7.4	0.0056	0.0095	0.0014	8.4
2015	Q3	FR FRCP1	0.0031	0.0089	<0.00005	<0.00005	0.0015	0.0015	0.0041	0.0043	8.2	0.0049	<0.005	<0.0010	8.4
2015	Q1	GH ERC	0.0035	0.0026	<0.00001	<0.00001	0.00092	0.00099	<0.0005	<0.0005	0.44	<0.0010	<0.005	<0.0010	8.3
2015	Q2	GH ERC	0.00072	0.0017	<0.00005	<0.00005	0.00096	0.00097	<0.0005	<0.0005	0.31	<0.0010	<0.005	<0.0010	8.4
2015	Q3	GH ERC	0.00058	0.0018	<0.00005	<0.00005	0.00095	0.00095	<0.0005	<0.0005	0.17	<0.0010	<0.005	<0.0010	8.3
2015	Q4	GH ERC	0.00063	0.0013	<0.00005	<0.00005	0.00099	0.0011	<0.0005	<0.0005	0.46	<0.0010	<0.005	0.0018	8.3
2015	Q1	GH FR1	0.0017	0.0021	<0.00001	<0.00001	0.00098	0.00098	0.0022	0.0023	13	0.0039	<0.005	<0.0010	8.3
2015	Q2	GH FR1	0.0011	0.0044	<0.00005	<0.00005	0.0011	0.0011	0.0019	0.002	7.5	0.0028	<0.005	<0.0010	8.4
2015	Q3	GH FR1	0.00089	0.0023	<0.00005	<0.00005	0.00099	0.0010	0.0016	0.0017	9.1	0.0046	0.0071	<0.0010	8.3
2015	Q4	GH FR1	0.0011	0.0016	<0.00005	<0.00005	0.0009	0.00099	0.0012	0.0012	10	<0.005	<0.005	<0.0010	8.4
2015	Q1	LC LCDSSLCC	0.00074	0.00021	<0.00001	<0.00001	0.0017	0.0017	0.0036	0.0036	15				

Appendix D: Concentration-Response Analysis

Table D-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	PHOSPHORUS-N- mg/l	POTASSIUM-T- mg/l	SELENIUM-D- mg/l	SELENIUM-T-mg/l	SILVER-D-mg/l	SILVER-T-mg/l	SODIUM-T-mg/l	STRONTIUM-D- mg/l	STRONTIUM-T- mg/l	SULFATE (AS SO4)-D-mg/l	THALLIUM-D-mg/l	THALLIUM-T-mg/l	TIN-D-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	0.0042	0.4	0.00069	0.00073	<0.00001	<0.00001	0.77	0.088	0.091	47	<0.00001	<0.00001	<0.0001
2015	Q1	Reference (FR_UFR1)	0.0042	0.4	0.00069	0.00073	<0.00001	<0.00001	0.77	0.088	0.091	47	<0.00001	<0.00001	<0.0001
2015	Q1	Reference (FR_UFR1)	0.0035	0.42	0.00076	0.00073	<0.00001	<0.00001	0.72	0.089	0.092	46	<0.00001	<0.00001	<0.0001
2015	Q2	Reference (FR_UFR1)	0.01	0.37	0.00048	0.00049	<0.00001	<0.00001	0.56	0.061	0.066	15	<0.00001	0.00001	<0.0001
2015	Q3	Reference (FR_UFR1)	0.0054	0.52	0.00047	0.00043	<0.00001	<0.00001	0.69	0.093	0.093	32	<0.00001	<0.00001	<0.0001
2015	Q4	Reference (FR_UFR1)	0.0022	0.42	0.00069	0.00062	<0.00001	<0.00001	0.69	0.095	0.091	48	<0.00001	<0.00001	<0.0001
2015	Q2	Reference (GH_ER2)	0.008	0.37	0.00079	0.00087	<0.00001	<0.00001	0.73	0.2	0.21	18	<0.00001	<0.00001	<0.0001
2015	Q4	Reference (GH_ER2)	<0.002	0.35	0.00072	0.00078	<0.00001	<0.00001	0.67	0.21	0.22	22	<0.00001	<0.00001	<0.0001
2016	Q1	Reference (FR_UFR1)	0.0036	0.37	0.0008	0.00078	<0.00001	<0.00001	0.68	0.089	0.09	50	<0.00001	<0.00001	<0.0001
2016	Q2	Reference (FR_UFR1)	0.0078	0.34	0.00052	0.00055	<0.00001	<0.00001	0.63	0.063	0.065	13	<0.00001	<0.00001	<0.0001
2016	Q3	Reference (FR_UFR1)	0.0038	0.47	0.00056	0.00063	<0.00001	<0.00001	0.68	0.095	0.098	35	<0.00001	<0.00001	<0.0001
2016	Q4	Reference (FR_UFR1)	0.0028	0.38	0.00069	0.00068	<0.00001	<0.00001	0.7	0.093	0.095	40	<0.00001	<0.00001	<0.0001
2016	Q2	Reference (GH_ER2)	0.016	0.48	0.00083	0.00083	<0.00001	<0.00001	0.75	0.2	0.2	17	<0.00001	<0.00001	<0.0001
2016	Q4	Reference (GH_ER2)	<0.002	0.36	0.00087	0.00081	<0.00001	<0.00001	0.81	0.24	0.24	23	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (CM_MCI)	0.0094	0.43	0.00029	0.00025	<0.00001	<0.00001	2.7	0.14	0.14	11	<0.00001	<0.00001	<0.0001
2017	Q3	Reference (CM_MCI)	0.06	0.45	0.00019	0.00024	<0.00001	<0.00001	2.0	0.14	0.13	13	<0.00001	<0.00001	<0.0001
2017	Q4	Reference (CM_MCI)	0.0045	0.49	0.00019	0.00019	<0.00001	<0.00001	2.9	0.16	0.16	13	<0.00001	<0.00001	<0.0001
2017	Q1	Reference (FR_UFR1)	0.0071	0.38	0.0012	0.0010	<0.00001	<0.00001	0.77	0.097	0.097	45	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (FR_UFR1)	0.02	0.38	0.0007	0.0006	<0.00001	<0.00001	0.6002	0.064	0.062	22	<0.00001	<0.00001	0.00011
2017	Q3	Reference (FR_UFR1)	0.0078	0.48	0.0006	0.00059	<0.00001	<0.00001	0.69	0.088	0.09	32	<0.00001	<0.00001	<0.0001
2017	Q4	Reference (FR_UFR1)	0.0023	0.4	0.00058	0.00055	<0.00001	<0.00001	0.72	0.1	0.095	44	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (GH_ER2)	0.0058	0.41	0.00086	0.00098	<0.00001	<0.00001	0.73	0.21	0.21	21	<0.00001	<0.00001	<0.0001
2017	Q3	Reference (GH_ER2)	0.0059	0.38	0.00067	0.00064	<0.00001	<0.00001	0.6	0.19	0.19	15	<0.00001	<0.00001	0.00011
2017	Q4	Reference (GH_ER2)	<0.002	0.38	0.00089	0.00087	<0.00001	<0.00001	0.7	0.21	0.21	18	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (CM_MCI)	0.0046	0.45	0.00027	0.00029	<0.00001	<0.00001	3.5	0.16	0.17	17	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (CM_MCI)	0.016	0.55	0.00024	0.00028	<0.00001	<0.00001	2.4	0.13	0.12	10	<0.00001	0.00011	<0.0001
2018	Q3	Reference (CM_MCI)	0.0091	0.5	0.00018	0.00022	<0.00001	<0.00001	2.6	0.15	0.14	13	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (CM_MCI)	0.0037	0.42	0.00022	0.00023	<0.00001	<0.00001	3.2	0.13	0.13	14	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (FR_UFR1)	0.0038	0.37	0.00091	0.00098	<0.00001	<0.00001	0.67	0.099	0.093	49	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (FR_UFR1)	0.027	0.42	0.0008	0.00072	<0.00001	<0.00001	0.56	0.072	0.066	16	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (FR_UFR1)	0.0095	0.45	0.0006	0.00062	<0.00001	<0.00001	0.67	0.1	0.095	35	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (FR_UFR1)	<0.002	0.38	0.00073	0.00069	<0.00001	<0.00001	0.69	0.097	0.097	44	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (GH_ER2)	<0.002	0.3	0.00093	0.00092	<0.00001	<0.00001	0.72	0.2	0.22	23	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (GH_ER2)	0.008	0.4	0.00081	0.00081	<0.00001	<0.00001	0.75	0.24	0.24	19	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (GH_ER2)	0.0088	0.37	0.00069	0.00071	<0.00001	<0.00001	0.64	0.21	0.21	16	<0.00001	<0.00028	<0.0001
2018	Q4	Reference (GH_ER2)	<0.002	0.37	0.00091	0.00084	<0.00001	<0.00001	0.72	0.21	0.21	21	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (LC_SLC)	0.005	0.35	0.00087	0.00078	<0.00001	<0.00001	0.81	0.13	0.12	25	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (LC_SLC)	0.0043	0.36	0.0012	0.0013	<0.00001	<0.00001	0.8	0.16	0.14	48	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (LC_SLC)	0.0026	0.39	0.0017	0.0015	<0.00001	<0.00001	0.89	0.16	0.16	57	<0.00001	<0.00001	<0.0001
Tests categorized as no adverse response															
2015	Q1	CM MC2	0.005	1.4	0.0059	0.006	<0.00001	<0.00001	10	0.29	0.3	249	0.000014	<0.00001	<0.0001
2015	Q3	CM MC2	0.003	1.5	0.0062	0.0064	<0.00001	<0.00001	8.7	0.27	0.29	249	0.000014	0.000019	<0.0001
2015	Q1	EV_HC1	0.0047	0.62	0.022	0.022	<0.00001	0.00001	1.2	0.085	0.087	130	0.00001	0.00001	0.0001
2015	Q2	EV_HC1	0.0081	0.55	0.019	0.018	<0.00001	0.00001	0.82	0.062	0.061	79	0.00001	0.00001	0.0001
2015	Q3	EV_HC1	0.0082	0.99	0.029	0.028	<0.00001	<0.00001	1.5	0.11	0.11	165	<0.00001	<0.00001	<0.0001
2015	Q4	EV_HC1	0.0057	0.9	0.033	0.037	<0.00001	<0.00001	1.7	0.13	0.13	218	<0.00001	<0.00001	<0.0001
2015	Q1	EV_MC2	0.0047	1.2	0.024	0.022	<0.00001	<0.00001	5.7	0.19	0.2	147	<0.00001	<0.00001	0.00018
2015	Q2	EV_MC2	0.037	0.67	0.0052	0.005	<0.00001	0.000017	2.1	0.1	0.093	41	0.000011	0.000025	<0.0001
2015	Q3	EV_MC2	0.0052	1.5	0.023	0.023	<0.00001	<0.00001	4.6	0.21	0.21	169	0.000013	0.000014	<0.0001
2015	Q4	EV_MC2	0.0036	1.3	0.024	0.025	<0.00001	<0.00001	4.8	0.23	0.23	183	<0.00001	<0.00001	<0.0001
2015	Q2	FR_FRCP1	0.018	1.2	0.03	0.03	<0.00001	<0.00001	1.2	0.11	0.11	126	<0.00001	<0.00001	<0.0001
2015	Q3	FR_FRCP1	0.0027	1.8	0.057	0.057	<0.00001	<0.00001	1.6	0.13	0.13	234	<0.00001	<0.00001	<0.0001
2015	Q1	GH_ERC	0.0043	0.37	0.0019	0.0019	<0.00001	<0.00001	0.95	0.2	0.21	30	<0.00001	<0.00001	<0.0001
2015	Q2	GH_ERC	0.016	0.41	0.0018	0.0018	<0.00001	<0.00001	0.97	0.21	0.21	25	<0.00001	<0.00001	<0.0001
2015	Q3	GH_ERC	0.0071	0.42	0.0011	0.0012	<0.00001	<0.00001	0.74	0.19	0.2	20	<0.00001	<0.00001	<0.0001
2015	Q4	GH_ERC	<0.002	0.39	0.0015	0.0016	<0.00001	<0.00001	0.94	0.22	0.23	37	<0.00001	<0.00001	<0.0001
2015	Q1	GH_FR1	0.0036	1.2	0.051	0.052	<0.00001	<0.00001	2.4	0.16	0.16	233	<0.00001	<0.00001	<0.0001
2015	Q2	GH_FR1	0.01	1.1	0.031	0.032	<0.00001	<0.00001	1.7	0.12	0.12	136	<0.00001	<0.00001	<0.0001
2015	Q3	GH_FR1	0.0036	1.2	0.035	0.036	<0.00001	<0.00001	1.8	0.13	0.13	154	<0.00001	<0.00001	<0.0001
2015	Q4	GH_FR1	<0.002	1.2	0.04	0.039	<0.00001	<0.00001	2.2	0.14	0.15	189	<0.00001	<0.00001	<0.0001
2015	Q1	LC_LCDSSLCC	0.0029	1.2	0.072	0.071	<0.00001	<0.00001	5.9	0.23	0.23	283	<0.00001	<0.00001	<0.0001
2015	Q3	LC_LCDSSLCC	0.0029	1.1	0.037	0.04	<0.00001	<0.00001	3.9	0.16	0.17	157	<0.00001	<0.00001	<0.0001
2015	Q4	LC_LCDSSLCC	<0.005	1.4	0.052	0.054	<0.00005	<0.00005	6.2	0.21	0.22	237	<0.00005	<0.00005	

Appendix D: Concentration-Response Analysis

Table D-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	TIN-T-mg/l	TITANIUM-D-mg/l	TITANIUM-T-mg/l	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	TOTAL KJELDAHL NITROGEN-N-mg/l	TOTAL ORGANIC CARBON-T-mg/l	TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	TURBIDITY, LAB-N-ntu	URANIUM-D-mg/l	URANIUM-T-mg/l	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	229	<0.05	0.69	<1.0	0.13	0.00047	0.00047	<0.0010	<0.0010	<0.003
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	229	<0.05	0.69	<1.0	0.13	0.00047	0.00047	<0.0010	<0.0010	<0.003
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	<0.05	<0.5	<1.0	0.33	0.00047	0.00047	<0.0010	<0.0010	<0.003
2015	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	147	0.1	2.1	2.4	1.5	0.00031	0.00033	<0.0005	<0.0005	<0.003
2015	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	211	0.08	1.0	1.1	0.2	0.00042	0.00042	<0.0005	<0.0005	<0.003
2015	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	215	0.095	0.6	<1.0	0.26	0.00047	0.00044	<0.0005	<0.0005	<0.003
2015	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	191	0.067	1.8	4.4	3.9	0.00079	0.00078	<0.0005	0.00051	<0.003
2015	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	171	<0.05	<0.5	<1.0	0.26	0.00071	0.00072	<0.0005	<0.0005	<0.003
2016	Q1	Reference (FR_UFR1)	<0.0001	0.011	0.011	244	<0.05	<0.5	<1.0	0.17	0.0005	0.00049	<0.0005	<0.0005	<0.003
2016	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	135	0.086	2.8	1.9	1.6	0.00032	0.00033	<0.0005	0.00051	<0.003
2016	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	0.077	0.92	1.2	0.22	0.00042	0.00044	<0.0005	<0.0005	<0.003
2016	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	204	0.069	1.1	<1.0	0.85	0.00044	0.00046	<0.0005	<0.0005	<0.003
2016	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	174	0.077	2.2	15	4.7	0.00076	0.00079	<0.0005	0.001	<0.003
2016	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	167	<0.05	0.62	<1.0	0.38	0.00076	0.00079	<0.0005	<0.0005	<0.003
2017	Q2	Reference (CM_MCI)	<0.0001	<0.01	<0.01	148	0.098	1.9	<1.0	0.41	0.00018	0.0002	<0.0005	<0.0005	<0.001
2017	Q3	Reference (CM_MCI)	<0.0001	<0.01	<0.01	162	0.1	1.2	<1.0	0.37	0.0002	0.00019	<0.0005	<0.0005	<0.001
2017	Q4	Reference (CM_MCI)	<0.0001	<0.01	<0.01	166	<0.2	1.4	2.4	1.3	0.00023	0.00023	<0.0005	<0.0005	<0.003
2017	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	194	<0.05	1.0	<1.0	0.25	0.00046	0.00048	<0.0005	<0.0005	<0.001
2017	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	143	0.18	3.7	4.4	4.7	0.00035	0.00034	0.00053	0.001	0.0013
2017	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	164	0.078	2.7	1.1	0.36	0.00037	0.00038	<0.0005	<0.0005	<0.001
2017	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	221	<0.05	1.0	1.2	0.45	0.00051	0.00045	<0.0005	<0.0005	<0.003
2017	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	180	0.068	1.1	6.2	3.8	0.00079	0.00079	<0.0005	0.00061	<0.003
2017	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	148	0.12	0.91	1.4	0.81	0.00053	0.00058	<0.0005	<0.0005	<0.001
2017	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	174	<0.05	0.91	<1.0	0.38	0.00077	0.00072	<0.0005	<0.0005	<0.003
2018	Q1	Reference (CM_MCI)	<0.0001	<0.01	<0.01	162	<0.2	0.81	<1.0	0.22	0.00024	0.00024	<0.0005	<0.0005	<0.003
2018	Q2	Reference (CM_MCI)	<0.0001	<0.01	<0.01	134	0.092	3.4	4.5	2.4	0.00018	0.0002	<0.0005	<0.0005	<0.001
2018	Q3	Reference (CM_MCI)	<0.0001	<0.01	<0.01	174	0.052	1.5	<1.0	0.24	0.00023	0.00023	<0.0005	<0.0005	<0.001
2018	Q4	Reference (CM_MCI)	<0.0001	<0.01	<0.01	127	0.091	2.2	<1.0	0.29	0.00025	0.00023	<0.0005	<0.0005	<0.001
2018	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	216	0.064	0.59	<1.0	0.14	0.00054	0.00049	<0.0005	<0.0005	<0.003
2018	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	114	0.13	3.0	7.4	3.8	0.00033	0.00035	<0.0005	0.00065	<0.001
2018	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	0.24	2.4	<1.0	0.22	0.00045	0.00043	<0.0005	<0.0005	<0.001
2018	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	195	0.079	0.66	<1.0	0.19	0.00053	0.0005	<0.0005	<0.0005	<0.001
2018	Q1	Reference (GH_ER2)	<0.0001	<0.01	<0.01	186	<0.05	<0.5	<1.0	0.13	0.00077	0.00079	<0.0005	<0.0005	<0.003
2018	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	166	0.2	1.7	14	14	0.00076	0.00079	<0.0005	0.0013	<0.001
2018	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	179	<0.05	1.6	6.9	6.1	0.00064	0.00061	<0.0005	0.00031	<0.001
2018	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	168	0.24	<0.5	<1.0	0.28	0.00077	0.00077	<0.0005	<0.0005	<0.001
2018	Q2	Reference (LC_SLC)	<0.0001	<0.01	<0.01	176	0.13	2.1	1.6	0.63	0.001	0.0011	<0.0005	<0.0005	0.0015
2018	Q3	Reference (LC_SLC)	<0.0001	<0.01	<0.01	233	<0.05	1.9	<1.0	0.13	0.0016	0.0016	<0.0005	<0.0005	0.0025
2018	Q4	Reference (LC_SLC)	<0.0001	<0.01	<0.01	214	<0.05	0.65	<1.0	0.27	0.0018	0.0019	<0.0005	<0.0005	0.0015
Tests categorized as no adverse response															
2015	Q1	CM MC2	<0.0001	<0.01	<0.01	551	<0.05	0.82	1.7	0.53	0.0022	0.0023	<0.0010	<0.0010	<0.003
2015	Q3	CM MC2	<0.0001	<0.01	<0.01	626	0.1	0.75	1.2	0.61	0.0024	0.0025	<0.0005	<0.0005	<0.003
2015	Q1	EV_HC1	0.0001	0.011	0.011	325	0.05	0.84	1.0	0.24	0.0017	0.0017	0.001	0.001	0.003
2015	Q2	EV_HC1	0.0001	0.01	0.01	233	0.13	1.4	2.6	1.2	0.0012	0.0012	0.0005	0.0005	0.003
2015	Q3	EV_HC1	<0.0001	<0.01	<0.01	479	0.073	1.6	2.3	0.77	0.0023	0.0023	<0.0005	<0.0005	<0.003
2015	Q4	EV_HC1	<0.0001	<0.01	<0.01	529	0.096	0.74	<1	0.29	0.0026	0.0027	<0.0005	<0.0005	<0.003
2015	Q1	EV_MC2	<0.0001	0.014	0.013	438	0.13	1.2	1.2	0.31	0.0013	0.0012	<0.0010	<0.0010	0.0041
2015	Q2	EV_MC2	<0.0001	<0.01	<0.01	195	0.28	2.5	23	4.7	0.00051	0.00048	<0.0005	0.0016	<0.003
2015	Q3	EV_MC2	<0.0001	<0.01	<0.01	477	0.16	0.83	1.2	0.34	0.0019	0.0019	<0.0005	<0.0005	<0.003
2015	Q4	EV_MC2	<0.0001	<0.01	<0.01	492	0.14	0.7	1.0	0.36	0.0019	0.0019	<0.0005	<0.0005	<0.003
2015	Q2	FR_FRCP1	<0.0001	<0.01	<0.01	372	<0.05	2.2	7.7	2.0	0.0015	0.0016	<0.0005	0.00054	<0.003
2015	Q3	FR_FRCP1	<0.0001	<0.01	<0.01	566	0.14	0.93	2.6	0.47	0.0027	0.0028	<0.0005	<0.0005	<0.003
2015	Q1	GH_ERC	<0.0001	<0.01	<0.01	203	<0.05	0.5	2.6	0.41	0.00081	0.00084	<0.0010	<0.0010	<0.003
2015	Q2	GH_ERC	<0.0001	<0.01	<0.01	203	0.12	1.3	7.0	1.6	0.00083	0.00084	<0.0005	0.0007	<0.003
2015	Q3	GH_ERC	0.00016	<0.01	<0.01	179	<0.05	0.79	5.1	1.3	0.00065	0.00071	<0.0005	0.00058	<0.003
2015	Q4	GH_ERC	<0.0001	<0.01	<0.01	214	<0.05	0.52	<1	0.26	0.00077	0.00081	<0.0005	<0.0005	<0.003
2015	Q1	GH_FR1	<0.0001	0.011	0.011	621	<0.05	1.1	<1	0.18	0.0022	0.0022	<0.0010	<0.0010	<0.003
2015	Q2	GH_FR1	<0.0001	<0.01	<0.01	398	<0.05	1.6	3.6	2.2	0.0016	0.0016	<0.0005	<0.0005	<0.003
2015	Q3	GH_FR1	0.00015	<0.01	<0.01	473	<0.05	0.86	1.2	0.33	0.0018	0.0018	<0.0005	<0.0005	<0.003
2015	Q4	GH_FR1	<0.0001	<0.01	<0.01	520	0.091	0.57	<1	0.3	0.0019	0.0019	<0.0005	<0.0005	<0.003
2015	Q1	LC_LCDSSLCC	<0.0001	0.014	0.013	690	<0.05	0.9	<1	0.29	0.0039	0.004	<0.0010	<0.0010	0.0038
2015	Q3	LC_LCDSSLCC	<0.0001	<0.01	<0.01	447	0.12	0.64	1.4	<0.35	0.0026	0.0028	<0.0005	<0.0005	0.0092
2015	Q4	LC_LCDSSLCC	<0.0005	<0.01	<0.01	565	<0.05	0.99	<1.0	0.29	0.0038	0.004	<0.0025	<0.0025	0.0081
2016	Q1	EV_HC1	<0.0001	0.015	0.015	504	0.081	1.0	<1.0	0.25	0.0027	0.0028	<0.0005	<0.0005	<0.003
2016	Q3	EV_HC1	<0.0001	<0.01	<0.01	496	0.096	1.5	2.7	2.6	0.0023	0.0023	<0.0		

Appendix D: Concentration-Response Analysis

Table D-1: *C. dubia* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	ZINC-T-mg/l	ΣTU-WQGs	ΣTU-WQGs/Benc hmarks	PCA Factor 1 (2015 to 2018)	PCA Factor 2 (2015 to 2018)	PCA Factor 3 (2015 to 2018)	PCA Factor 4 (2015 to 2018)	PCA Factor 1 (2018)	PCA Factor 2 (2018)	PCA Factor 3 (2018)	PCA Factor 4 (2018)
Reference													
2015	Q1	Reference (FR_UFR1)	<0.003	2.8	2.8	-5.5	-2.6	-5.2	0.00	-	-	-	-
2015	Q1	Reference (FR_UFR1)	<0.003	2.8	2.8	-5.5	-2.6	-5.2	0.00	-	-	-	-
2015	Q1	Reference (FR_UFR1)	<0.003	2.7	2.7	-5.4	-2.7	-4.9	0.06	-	-	-	-
2015	Q2	Reference (FR_UFR1)	<0.003	2.7	2.7	-7.7	1.8	-0.68	0.55	-	-	-	-
2015	Q3	Reference (FR_UFR1)	<0.003	2.2	2.2	-5.6	-2.1	-1.3	-0.23	-	-	-	-
2015	Q4	Reference (FR_UFR1)	<0.003	2.4	2.4	-5.9	-2.7	-1.7	-0.27	-	-	-	-
2015	Q2	Reference (GH_ER2)	<0.003	2.5	2.5	-5.1	0.81	-0.48	-0.95	-	-	-	-
2015	Q4	Reference (GH_ER2)	<0.003	2.4	2.4	-5.1	-2.4	-1.6	-1.9	-	-	-	-
2016	Q1	Reference (FR_UFR1)	<0.003	1.9	1.8	-5.8	-3.2	-1.9	0.058	-	-	-	-
2016	Q2	Reference (FR_UFR1)	<0.003	2.3	2.3	-8.2	2.1	-0.48	0.69	-	-	-	-
2016	Q3	Reference (FR_UFR1)	<0.003	1.2	1.2	-6.1	-2.2	-0.24	-0.23	-	-	-	-
2016	Q4	Reference (FR_UFR1)	<0.003	1.4	1.4	-6.5	-0.97	-0.079	-0.11	-	-	-	-
2016	Q2	Reference (GH_ER2)	<0.003	2.6	2.6	-5.1	3.4	-0.067	0.048	-	-	-	-
2016	Q4	Reference (GH_ER2)	<0.003	1.7	1.7	-5.4	-2.2	-0.62	-2.4	-	-	-	-
2017	Q2	Reference (CM_MCI)	<0.003	1.2	1.2	-4.9	0.62	0.63	-2.8	-	-	-	-
2017	Q3	Reference (CM_MCI)	<0.003	1.2	1.2	-6.5	1.1	1.2	-2.9	-	-	-	-
2017	Q4	Reference (CM_MCI)	<0.003	1.1	1.1	-6.1	-0.1	0.21	-3.0	-	-	-	-
2017	Q1	Reference (FR_UFR1)	<0.003	1.1	1.1	-5.6	-2.7	0.2	-0.41	-	-	-	-
2017	Q2	Reference (FR_UFR1)	<0.003	3.7	3.7	-7.5	6.9	-1.2	0.99	-	-	-	-
2017	Q3	Reference (FR_UFR1)	<0.003	1.3	1.3	-6.4	-0.95	0.98	-0.64	-	-	-	-
2017	Q4	Reference (FR_UFR1)	<0.003	1.1	1.1	-6.2	-2.6	-0.34	-0.65	-	-	-	-
2017	Q2	Reference (GH_ER2)	<0.003	1.5	1.5	-5.0	0.52	0.39	-1.1	-	-	-	-
2017	Q3	Reference (GH_ER2)	<0.003	1.3	1.3	-5.8	-0.81	0.66	-2.5	-	-	-	-
2017	Q4	Reference (GH_ER2)	<0.003	1.2	1.2	-5.2	-2.2	-0.29	-2.5	-	-	-	-
2018	Q1	Reference (CM_MCI)	<0.003	1.1	1.1	-5.5	-1.7	-0.13	-3.2	-5.0	-2.4	-0.6	-2.1
2018	Q2	Reference (CM_MCI)	<0.003	1.9	1.9	-7.1	4.6	0.52	-1.4	-6.4	3.3	-1.2	-2.3
2018	Q3	Reference (CM_MCI)	0.0047	1.3	1.3	-5.8	0.22	0.26	-3.4	-5.4	-0.84	0.04	-2.7
2018	Q4	Reference (CM_MCI)	<0.003	1.2	1.2	-6.5	0.002	0.041	-3.3	-5.9	-1.0	-0.76	-3.0
2018	Q1	Reference (FR_UFR1)	<0.003	1.1	1.1	-5.9	-3.4	-0.57	-0.65	-5.7	-3.3	-0.99	0.59
2018	Q2	Reference (FR_UFR1)	<0.003	2.1	2.1	-7.8	4.4	0.79	1.3	-7.2	3.5	-1.3	0.03
2018	Q3	Reference (FR_UFR1)	<0.003	1.2	1.2	-5.7	-1.5	0.71	-1.0	-5.4	-1.9	-0.51	-0.04
2018	Q4	Reference (FR_UFR1)	<0.003	1.2	1.2	-6.1	-3.0	-0.21	-1.1	-5.8	-3.1	-0.78	0.139
2018	Q1	Reference (GH_ER2)	<0.003	1.3	1.3	-5.3	-2.8	-0.71	-2.4	-5.1	-3.1	-0.71	-1.6
2018	Q2	Reference (GH_ER2)	0.0038	2.5	2.5	-4.9	4.9	1.1	0.04	-4.6	3.6	-0.15	-0.52
2018	Q3	Reference (GH_ER2)	0.0075	4.3	4.3	-8.0	0.44	-0.49	-4.3	6.9	-0.27	-1.7	-1.7
2018	Q4	Reference (GH_ER2)	<0.003	1.4	1.4	-5.3	-1.4	0.071	-2.3	-4.9	-2.0	-0.5	-1.7
2018	Q2	Reference (LC_SLC)	<0.003	1.3	1.3	-5.4	-0.46	0.27	-0.79	-5.1	-0.91	-0.78	-0.62
2018	Q3	Reference (LC_SLC)	0.0036	1.4	1.4	-4.1	-2.3	-0.33	-1.1	-4.0	-2.5	-0.55	-0.3
2018	Q4	Reference (LC_SLC)	<0.003	1.6	1.6	-4.0	-2.9	-0.52	-1.2	-3.9	-3.0	-0.64	-0.3
Tests categorized as no adverse response													
2015	Q1	CM MC2	0.0032	6.7	6.1	4.2	0.25	-2.5	-2.8	-	-	-	-
2015	Q3	CM MC2	<0.003	6.6	5.8	4.0	-0.66	0.24	-3.1	-	-	-	-
2015	Q1	EV HC1	0.003	3.3	3.2	-2.5	-1.5	-5.0	1.8	-	-	-	-
2015	Q2	EV HC1	0.003	2.7	2.7	-4.6	0.75	-1.1	1.8	-	-	-	-
2015	Q3	EV HC1	<0.003	3.2	3.0	-0.63	-0.143	-0.29	2.1	-	-	-	-
2015	Q4	EV HC1	<0.003	3.1	2.8	0.34	-2.7	-0.46	1.9	-	-	-	-
2015	Q1	EV MC2	<0.003	4.3	3.8	1.9	-0.74	-5.3	1.9	-	-	-	-
2015	Q2	EV MC2	0.0041	3.9	3.9	-3.6	7.1	-0.69	1.8	-	-	-	-
2015	Q3	EV MC2	0.0031	5.6	4.7	4.4	-1.2	0.18	-0.011	-	-	-	-
2015	Q4	EV MC2	<0.003	5.1	4.0	4.3	-2.6	0.33	0.48	-	-	-	-
2015	Q2	FR FRCP1	<0.003	5.9	4.2	0.69	1.4	1.0	3.0	-	-	-	-
2015	Q3	FR FRCP1	<0.003	6.7	4.6	3.8	-1.7	0.58	2.3	-	-	-	-
2015	Q1	GH ERC	0.0041	3.1	3.1	-4.0	-0.27	-4.7	-0.89	-	-	-	-
2015	Q2	GH ERC	<0.003	2.9	2.9	-4.3	1.7	-0.24	0.02	-	-	-	-
2015	Q3	GH ERC	<0.003	2.6	2.6	-4.9	0.72	-1.6	-0.9	-	-	-	-
2015	Q4	GH ERC	<0.003	2.5	2.5	-4.3	-0.7	-1.7	-1.5	-	-	-	-
2015	Q1	GH FR1	<0.003	8.1	4.7	2.6	-3.0	-3.9	2.0	-	-	-	-
2015	Q2	GH FR1	<0.003	5.6	3.8	0.42	-0.37	0.41	2.7	-	-	-	-
2015	Q3	GH FR1	<0.003	6.1	3.9	1.5	-2.1	-0.96	1.5	-	-	-	-
2015	Q4	GH FR1	<0.003	6.4	3.8	1.6	-4.0	-0.54	2.0	-	-	-	-
2015	Q1	LC LCDSSLCC	0.0039	9.6	5.6	4.9	-3.0	-4.4	2.2	-	-	-	-
2015	Q3	LC LCDSSLCC	0.011	6.7	5.1	3.0	-2.0	-0.56	2.2	-	-	-	-
2015	Q4	LC LCDSSLCC	<0.015	13	10.0	12	9.8	-20	-5.7	-	-	-	-
2016	Q1	EV HC1	<0.003	3.1	2.8	0.7	-2.7	-1.3	2.7	-	-	-	-
2016	Q3	EV HC1	<0.003	2.5	2.4	-0.53	0.88	1.2	2.2	-	-	-	-
2016	Q4	EV HC1	<0.003	2.6	2.4	0.01	-0.14	1.1	2.3	-	-	-	-
2016	Q1	EV MC2	<0.003	4.5	3.6	3.4	-2.4	-0.57	1.8	-	-	-	-
2016	Q3	EV MC2	0.0031	4.4	3.3	4.0	-2.2	1.0	0.29	-	-	-	-
2016	Q1	GH ERC	<0.003	2.7	2.6	-3.6	-3.5	-2.4	-1.01	-	-	-	-
2016	Q3	GH ERC	<0.003	1.3	1.4	-5.3	-1.8	-0.38	-1.8	-	-	-	-
2016	Q4	GH ERC	<0.003	2.0	2.0	-4.6	-1.4	-0.32	-1.7	-	-	-	-
2016	Q1	GH FR1	<0.003	7.4	3.9	2.2	-4.6	-1.7	3.2	-	-	-	-
2016	Q3	GH FR1	<0.003	5.3	2.9	1.3	-3.0	0.93	2.1	-	-	-	-
2016	Q4	GH FR1	<0.003	5.6	3.4	2.0	-2.7	0.87	2.0	-	-	-	-
2016	Q1	LC LCDSSLCC	0.0034	7.4	4.4	5.9	-3.9	-0.75	2.6	-	-	-	-
2016	Q3	LC LCDSSLCC	0.0075	5.9	3.9	4.0	-3.0	0.64	1.4	-	-	-	-
2016	Q4	LC LCDSSLCC	0.0078	5.2	3.5	3.5	-2.1	1.1	1.7	-	-	-	-
2017	Q1	EV HC1	<0.003	2.3	2.1	-0.4	-1.9	0.41	1.6	-	-	-	-
2017	Q3	EV HC1	<0.003	2.1	1.9	-0.73	-1.4	0.66	1.5	-	-	-	-
2017	Q4	EV HC1	<0.003	2.1	1.9	-0.86	-1.7	0.9	1.15	-	-	-	-
2017	Q2	EV MC2	<0.003	2.8	2.9	-2.0	5.8	2.1	1.5	-	-	-	-
2017	Q3	EV MC2	<0.003	2.6	2.2	1.4	-1.5	1.7	0.39	-	-	-	-
2017	Q4	EV MC2	<0.003	2.5	2.2	0.0826	-1.4	0.59	-0.36	-	-	-	-
2017	Q1	GH ERC	<0.003	1.4	1.4	-4.4	-3.4	-1.2	-2.0	-	-	-	-
2017	Q2	GH ERC	<0.003	1.8	1.8	-3.9	0.92	0.48	-0.47	-	-	-	-
2017	Q3	GH ERC	<0.003	1.4	1.4	-5.2	0.12	1.2	-1.5	-	-	-	-
2017	Q4	GH ERC	<0.003	1.4	1.4	-4.7	-2.3	-0.25	-2.0	-	-	-	-
2017	Q1	GH FR1	<0.003	6.5	3.0	1.7	-3.9	0.7	2.0	-	-	-	-
2017	Q2	GH FR1	0.0072	7.5	5.8	3.5	8.7	1.0	4.6	-	-	-	-
2017	Q4	GH FR1	<0.003	5.8	3.0	1.8	-2.7	1.5	1.9	-	-	-	-
2017	Q2	LC LCDSSLCC	0.012	8.3	4.5	5.8	-1.2	2.3	1.5	-	-	-	-
2017	Q3	LC LCDSSLCC	0.0098	6.8	4.5	4.7	-1.5	0.97	1.2	-	-	-	-
2017	Q4	LC LCDSSLCC	0.0076	6.6	4.2	4.8	-1.8	1.3	1.2	-	-	-	-
2018	Q1	CM MC3	<0.003	2.0	1.9	-1.6	-2.4	-0.18	-1.3	-1.7	-2.7	-0.39	-0.22
2018	Q2	EV HC1	<0.003	2.2	2.0	0.166	-2.5	0.73	1.1	-0.23	-2.4	-0.07	2.5
2018	Q3	EV HC1	<0.003	2.1	2.0	-0.6	-2.6	1.6	2.2	-2.8	1.9	-0.68	1.9
2018	Q4	EV HC1	<0.003	2.2	2.0	-0.07	-0.95	1.4	0.88	-0.46	-1.3	0.34	1.9
2018	Q1	EV HC1	<0.003	2.3	2.1	0.12	-1.1	0.87	1.6	-0.28	-1.1	-0.156	2.2
2018	Q2	EV MC2	0.0056	5	5	-0.903	1.1	0.52	3.0	-1.06	9.6	-0.17	1.6
2018	Q3	EV MC2	<0.003	4.2	3.6	4.8	-0.22	1.9	-1.1	4.1	-0.78	2.1	0.86
2018	Q4	EV MC2	<0.003	3.3	3.1	2.0	-1.4	1.4	0.24	1.4	-1.4	1.0	1.6
2018	Q1	FR FRABCH	<0.003	8.9	3.5	3.3	-3.5	1.5	2.3	2.6	-3.1	0.33	4.2
2018	Q3	GH ERC	<0.003	1	2	-4.8	-1.9	-0.86	-1.25	-4.5	-2.3	-1.4	-1.13
2018	Q4	GH ERC	<0.003	2	2	-5.2	-0.099	-0.1	-1.17	-5.0	-0.86	-0.55	-1.26
2018	Q1	GH FR1	<0.003	2	2	-4.7	0.61	-0.15	-0.96	-4.7	-0.24	0.005	-0.82
2018	Q2	GH FR1	<0.003	6.1	3.7	2.3	-3.9	0.78					

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	Mean Cell Yield (x 10 ⁶ cells/mL) (Mean)	ALKALINITY, TOTAL (As CaCO ₃) lab measured-N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIIUM-D-mg/l	BARIIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l
Reference														
2015	Q1	Reference (FR_UFR1)	108	149	<0.003	0.0032	<0.0001	<0.0001	<0.0001	<0.0001	0.077	0.077	<0.0001	<0.0001
2015	Q1	Reference (FR_UFR1)	111	149	<0.003	0.0032	<0.0001	<0.0001	<0.0001	<0.0001	0.077	0.077	<0.0001	<0.0001
2015	Q1	Reference (FR_UFR1)	106	145	<0.003	0.0059	<0.0001	<0.0001	<0.0001	<0.0001	0.075	0.078	<0.0001	<0.0001
2015	Q2	Reference (FR_UFR1)	122	119	0.0092	0.083	<0.0001	<0.0001	0.00012	0.00014	0.042	0.043	<0.0001	<0.0001
2015	Q2	Reference (FR_UFR1)	125	159	<0.003	0.0078	<0.0001	<0.0001	0.00011	0.00012	0.076	0.076	<0.0001	<0.0001
2015	Q4	Reference (FR_UFR1)	122	146	<0.003	0.0046	<0.0001	<0.0001	<0.0001	0.0001	0.074	0.075	<0.0001	<0.0001
2015	Q2	Reference (GH_ER2)	102	157	<0.003	0.076	<0.0001	<0.0001	0.00011	0.00016	0.048	0.048	<0.0001	<0.0001
2015	Q4	Reference (GH_ER2)	132	147	<0.003	0.0046	<0.0001	<0.0001	<0.0001	<0.0001	0.047	0.049	<0.0001	<0.0001
2016	Q1	Reference (FR_UFR1)	135	138	<0.003	0.0048	<0.0001	<0.0001	<0.0001	<0.0001	0.074	0.073	<0.0001	<0.0001
2016	Q2	Reference (FR_UFR1)	108	110	0.015	0.11	<0.0001	<0.0001	0.00011	0.00014	0.04	0.042	<0.0001	<0.0001
2016	Q3	Reference (FR_UFR1)	121	160	<0.003	0.013	<0.0001	<0.0001	<0.0001	0.0001	0.074	0.077	<0.0002	<0.0002
2016	Q4	Reference (FR_UFR1)	154	141	0.011	0.051	<0.0001	<0.0001	<0.0001	0.00015	0.069	0.064	<0.0002	<0.0002
2016	Q2	Reference (GH_ER2)	99	143	0.0036	0.2	<0.0001	<0.0001	0.00011	0.00024	0.042	0.044	<0.0001	<0.0001
2016	Q4	Reference (GH_ER2)	152	143	<0.003	0.0075	<0.0001	<0.0001	<0.0001	<0.0001	0.042	0.038	<0.0002	<0.0002
2017	Q2	Reference (CM_MC1)	170	133	0.004	0.02	<0.0001	<0.0001	0.00022	0.0002	0.048	0.046	<0.0002	<0.0002
2017	Q3	Reference (CM_MC1)	151	141	0.0026	0.021	<0.0001	<0.0001	0.00022	0.00024	0.05	0.046	<0.0002	<0.0002
2017	Q4	Reference (CM_MC1)	111	134	<0.003	0.0086	<0.0001	<0.0001	0.00016	0.00019	0.051	0.051	<0.0002	<0.0002
2017	Q1	Reference (FR_UFR1)	154	146	<0.001	0.0046	<0.0001	<0.0001	0.00028	<0.0001	0.073	0.073	<0.0002	<0.0002
2017	Q2	Reference (FR_UFR1)	141	113	0.089	0.15	<0.0001	<0.0001	0.00015	0.00019	0.053	0.051	<0.0002	<0.0002
2017	Q3	Reference (FR_UFR1)	161	148	0.0015	0.0071	<0.0001	<0.0001	0.00013	0.00013	0.068	0.069	<0.0002	<0.0002
2017	Q4	Reference (FR_UFR1)	108	138	<0.003	0.0037	<0.0001	<0.0001	<0.0001	0.00011	0.072	0.072	<0.0002	<0.0002
2017	Q2	Reference (GH_ER2)	148	153	<0.003	0.077	<0.0001	<0.0001	<0.0001	0.00014	0.05	0.051	<0.0002	<0.0002
2017	Q3	Reference (GH_ER2)	158	130	0.0027	0.012	<0.0001	0.00019	0.00011	0.00012	0.043	0.043	<0.0002	<0.0002
2017	Q4	Reference (GH_ER2)	110	155	<0.003	0.0061	<0.0001	<0.0001	<0.0001	0.00011	0.049	0.048	<0.0002	<0.0002
2018	Q1	Reference (CM_MC1)	157	173	<0.003	<0.003	<0.0001	<0.0001	0.00017	0.00018	0.058	0.053	<0.0002	<0.0002
2018	Q2	Reference (CM_MC1)	145	117	0.023	0.14	<0.0001	<0.0001	0.00023	0.00024	0.042	0.039	<0.0002	<0.0002
2018	Q3	Reference (CM_MC1)	100	145	<0.003	0.011	<0.0001	<0.0001	0.00018	0.0002	0.055	0.054	<0.0002	<0.0002
2018	Q4	Reference (CM_MC1)	111	131	<0.003	0.01	<0.0001	<0.0001	0.00017	0.0002	0.045	0.043	<0.0002	<0.0002
2018	Q1	Reference (FR_UFR1)	167	137	<0.003	<0.003	<0.0001	<0.0001	0.00018	0.00021	0.085	0.068	<0.0002	<0.0002
2018	Q2	Reference (FR_UFR1)	75	106	0.022	0.13	<0.0001	<0.0001	0.00012	0.00016	0.042	0.045	<0.0002	<0.0002
2018	Q3	Reference (FR_UFR1)	100	152	<0.003	0.0046	<0.0001	<0.0001	0.00011	0.0001	0.076	0.066	<0.0002	<0.0002
2018	Q4	Reference (FR_UFR1)	109	150	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.071	0.067	<0.0002	<0.0002
2018	Q1	Reference (GH_ER2)	158	153	<0.003	<0.003	<0.0001	<0.0001	<0.0001	0.00013	0.046	0.048	<0.0002	<0.0002
2018	Q2	Reference (GH_ER2)	123	140	0.0039	0.24	<0.0001	<0.0001	0.00011	0.00025	0.048	0.049	<0.0002	<0.0002
2018	Q3	Reference (GH_ER2)	105	134	<0.003	0.64	<0.0001	<0.0001	0.00011	0.00061	0.043	0.054	<0.0002	0.000066
2018	Q4	Reference (GH_ER2)	105	146	<0.003	0.031	<0.0001	<0.0001	<0.0001	0.00014	0.05	0.046	<0.0002	<0.0002
2018	Q2	Reference (LC_SLC)	148	126	<0.003	0.012	<0.0001	<0.0001	0.00013	0.0002	0.039	0.035	<0.0002	<0.0002
2018	Q3	Reference (LC_SLC)	106	140	<0.003	0.003	<0.0001	<0.0001	0.00012	0.00011	0.048	0.041	<0.0002	<0.0002
2018	Q4	Reference (LC_SLC)	110	143	<0.003	<0.003	<0.0001	<0.0001	0.00011	0.00015	0.041	0.045	<0.0002	<0.0002
Tests categorized as no adverse response														
2015	Q1	EV_MC2	101	213	0.0097	0.032	0.00017	0.00019	0.00017	0.00022	0.072	0.072	<0.0001	<0.0001
2015	Q2	EV_HC1	140	110	0.0032	0.05	0.0001	0.0001	0.00013	0.00016	0.025	0.025	<0.0001	<0.0001
2015	Q3	EV_HC1	134	192	0.0049	0.034	<0.0001	0.00011	0.00017	0.00024	0.058	0.059	<0.0001	<0.0001
2015	Q4	EV_HC1	129	195	<0.003	0.0058	<0.0001	0.00012	0.00014	0.00015	0.06	0.063	<0.0001	<0.0001
2015	Q1	EV_MC2	141	193	0.0037	0.019	<0.0001	<0.0001	0.00015	0.00018	0.11	0.11	<0.0001	<0.0001
2015	Q4	EV_MC2	136	193	<0.003	0.0056	0.00035	0.00038	0.00014	0.00019	0.11	0.11	<0.0001	<0.0001
2015	Q2	FR_FRCP1	140	147	<0.003	0.073	0.00022	0.00022	<0.0001	0.00015	0.064	0.065	<0.0001	<0.0001
2015	Q3	FR_FRCP1	127	198	<0.003	0.022	0.00027	0.00033	0.0001	0.00019	0.076	0.076	<0.0001	<0.0001
2015	Q1	GH_ERC	108	155	<0.003	0.028	<0.0001	0.00012	<0.0001	0.00015	0.055	0.056	<0.0001	<0.0001
2015	Q2	GH_ERC	131	161	<0.003	0.13	<0.0001	<0.0001	<0.0001	0.00017	0.05	0.051	<0.0001	<0.0001
2015	Q3	GH_ERC	129	142	<0.003	0.03	<0.0001	<0.0001	<0.0001	0.00017	0.048	0.049	<0.0001	<0.0001
2015	Q4	GH_ERC	147	147	<0.003	0.007	<0.0001	<0.0001	<0.0001	0.00018	0.08	0.081	<0.0001	<0.0001
2015	Q1	GH_FR1	97	202	<0.003	0.0048	0.00014	0.00014	<0.0001	0.00014	0.12	0.13	<0.0001	<0.0001
2015	Q2	GH_FR1	125	167	<0.003	0.053	0.00017	0.00017	<0.0001	0.00014	0.085	0.087	<0.0001	<0.0001
2015	Q4	GH_FR1	153	188	<0.003	0.004	0.00011	0.00015	<0.0001	0.00014	0.12	0.12	<0.0001	<0.0001
2015	Q1	LC_LCDSSLLC	117	195	<0.003	0.0052	0.00022	0.00022	0.00011	0.00013	0.096	0.093	<0.0001	<0.0001
2016	Q2	CM_MC2	156	165	0.0088	0.15	0.00014	0.00016	0.00017	0.00026	0.054	0.057	<0.0002	<0.0002
2016	Q4	EV_HC1	114	179	0.0046	0.15	<0.0001	0.00013	0.00013	0.00024	0.038	0.04	<0.0001	<0.0001
2016	Q3	EV_HC1	121	192	0.014	0.073	<0.0001	<0.0001	0.00016	0.00021	0.065	0.066	<0.0002	<0.0002
2016	Q4	EV_HC1	158	192	0.0054	0.076	<0.0001	0.0001	0.00015	0.00019	0.06	0.06	<0.0002	<0.0002
2016	Q1	EV_MC2	130	179	<0.003	0.031	0.00025	0.00025	0.00013	0.00016	0.11	0.11	<0.0001	<0.0001
2016	Q2	EV_MC2	112	98	0.018	0.42	<0.0001	0.0002	0.00017	0.00037	0.058	0.063	<0.0001	<0.0001
2016	Q3	EV_MC2	120	204	<0.003	0.0054	0.00023	0.00023	<0.0001	0.0002	0.095	0.053	<0.0002	<0.0002
2016	Q4	EV_MC2	166	122	0.023	0.081	<0.0001	0.00011	0.00019	0.00027	0.074	0.081	<0.0002	<0.0002
2016	Q3	FR_FRCP1	125	198	<0.003	0.014	0.0002	0.00022	<0.0001	0.00012	0.071	0.073	<0.0002	<0.0002
2016	Q1	GH_ERC	130	152	<0.003	0.0031	<0.0001	<0.0001	<0.0001	<0.0001	0.067	0.066	<0.0001	<0.0001
2016	Q2	GH_ERC	104	146	0.0045	0.31	<0.0001	0.00011	<0.0001	0.0003	0.051	0.053	<0.0001	<0.0001
2016	Q3	GH_ERC	121	144										

Appendix D: Concentration-Response Analysis

Table D-2: P. subcapita Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADMIUM-D-mg/l	CADMIUM-T-mg/l	CALCIUM-T-mg/l	CARBON, DISSOLVED ORGANIC-D-mg/l	CHLORIDE-D-mg/l	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l
Reference															
2015	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	0.000011	56	0.84	<1.0	0.00017	0.00017	<0.0001
2015	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	0.000011	56	0.84	<1.0	0.00017	0.00017	<0.0001
2015	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000011	<0.00001	57	<0.5	<1.0	0.00013	0.00015	<0.0001
2015	Q2	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000074	0.000013	38	1.8	<1.0	0.00014	0.00046	<0.0001
2015	Q3	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000057	0.000083	55	0.75	<1.0	0.00013	0.00013	<0.0001
2015	Q4	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000083	56	0.6	<1.0	0.00011	0.00036	<0.0001
2015	Q2	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000016	48	0.84	1.0	0.00022	0.00037	<0.0001
2015	Q4	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000053	0.000069	51	0.61	1.2	0.00022	0.00034	<0.0001
2016	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000054	0.000062	58	<0.5	1.1	0.00012	<0.0002	<0.0001
2016	Q2	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000062	0.000016	37	2.5	<0.1	0.00011	0.00029	<0.0001
2016	Q3	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000055	0.000011	51	0.86	0.13	<0.0001	0.00018	<0.0001
2016	Q4	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000057	0.000058	48	1.1	0.18	<0.0001	0.00021	<0.0001
2016	Q2	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000076	0.000025	48	1.4	0.61	0.00017	0.00062	<0.0001
2016	Q4	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000079	48	0.64	0.36	0.00021	0.00024	<0.0001
2017	Q2	Reference (CM MC1)	<0.0005	<0.0005	0.013	0.013	<0.05	0.000012	0.000015	36	1.8	<0.5	0.00012	0.00018	<0.0001
2017	Q3	Reference (CM MC1)	<0.0005	<0.0005	0.018	0.018	<0.05	0.00001	0.000015	36	1.2	<0.5	<0.0001	0.00028	<0.0001
2017	Q4	Reference (CM MC1)	<0.0005	<0.0005	0.013	0.014	<0.05	0.000068	0.000083	41	1.6	<0.5	0.00018	0.00018	<0.0001
2017	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.00001	0.000011	52	0.96	<0.5	<0.0001	0.00011	<0.0001
2017	Q2	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000016	0.000023	31	3.3	<0.5	0.00022	0.0004	<0.0001
2017	Q3	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000008	0.000012	45	1.8	<0.5	<0.0001	0.00028	<0.0001
2017	Q4	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000069	0.00001	50	1.1	<0.5	<0.0001	0.00012	<0.0001
2017	Q2	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000098	0.000019	51	0.83	0.27	0.00021	0.00038	<0.0001
2017	Q3	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000081	0.000078	40	0.79	<0.5	0.00019	0.00024	<0.0001
2017	Q4	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000056	0.000074	47	0.81	<0.5	0.00022	0.00026	<0.0001
2018	Q1	Reference (CM MC1)	<0.0005	<0.0005	0.013	0.014	<0.05	0.000078	0.000058	39	0.73	<0.5	0.00013	0.00018	<0.0001
2018	Q2	Reference (CM MC1)	<0.0005	<0.0005	0.011	0.013	<0.05	0.00001	0.000019	36	3.3	<0.5	0.00013	0.00029	<0.0001
2018	Q3	Reference (CM MC1)	<0.0005	<0.0005	0.015	0.016	<0.05	0.000012	0.000012	39	1.7	<0.5	0.00021	0.0003	<0.0001
2018	Q4	Reference (CM MC1)	<0.0005	<0.0005	0.014	0.015	<0.05	0.000068	0.000085	38	2.1	<0.5	0.00018	0.00027	<0.0001
2018	Q1	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000062	0.000068	53	0.5	<0.5	<0.0001	0.00011	<0.0001
2018	Q2	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000031	35	2.9	<0.5	0.00011	0.00027	<0.0001
2018	Q3	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000011	48	1.6	<0.5	0.00012	0.00012	<0.0001
2018	Q4	Reference (FR UFR1)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000008	51	0.72	<0.5	0.0001	0.00019	<0.0001
2018	Q1	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000058	0.000062	45	0.66	0.26	0.00019	0.00025	<0.0001
2018	Q2	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000086	0.000043	46	1.6	<0.5	0.00018	0.00074	<0.0001
2018	Q3	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000009	0.000013	49	1.5	<0.5	0.00021	0.00016	<0.0001
2018	Q4	Reference (GH ER2)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000055	0.000097	47	<0.5	<0.5	0.00023	0.00038	<0.0001
2018	Q2	Reference (LC SLIC)	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000015	42	2.3	<0.5	0.00012	0.00015	<0.0001
2018	Q3	Reference (LC SLIC)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000011	0.000014	46	1.2	<0.5	0.00014	0.00016	<0.0001
2018	Q4	Reference (LC SLIC)	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000011	0.000013	49	0.51	<0.5	0.00013	0.00021	<0.0001
Tests categorized as no adverse response															
2017	Q1	CM MC2	<0.0005	<0.0005	0.024	0.025	<0.1	0.000022	0.000023	106	0.93	3.4	0.00019	0.00024	0.00074
2015	Q2	EV HC1	0.0005	0.0005	0.01	0.01	0.05	0.000013	0.000021	47	1.1	1.3	0.00013	0.00021	0.0001
2015	Q3	EV HC1	<0.0005	<0.0005	<0.01	0.011	<0.05	0.000017	0.000025	75	1.1	1.4	0.00015	0.00024	<0.0001
2015	Q4	EV HC1	<0.0005	<0.0005	<0.01	0.01	<0.25	0.000013	0.000018	93	0.63	1.8	0.00013	0.00022	<0.0001
2015	Q1	EV MC2	<0.0005	<0.0005	0.014	0.016	<0.05	0.000055	0.000044	91	1.7	1.1	0.00012	<0.0004	<0.0001
2015	Q4	EV MC2	<0.0005	<0.0005	0.016	0.016	<0.25	0.000037	0.000047	102	0.6	8.7	0.00012	0.00015	<0.0001
2015	Q2	FR FRCP1	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.00003	0.00005	73	1.6	1.2	<0.0001	0.00028	<0.0001
2015	Q3	FR FRCP1	<0.0005	<0.0005	0.013	0.014	<0.1	0.000038	0.000047	109	0.93	1.5	0.0001	0.00017	<0.0001
2015	Q1	GH ERC	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00001	<0.00001	55	0.64	<1.0	0.00029	0.00034	<0.0001
2015	Q2	GH ERC	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000007	0.000022	53	0.96	<1.0	0.00017	0.00054	<0.0001
2015	Q3	GH ERC	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000059	0.000016	49	0.75	<1.0	0.00019	0.00037	<0.0001
2015	Q4	GH ERC	<0.0005	<0.0005	<0.01	<0.01	<0.05	<0.00005	0.000013	59	1.2	<0.5	0.00012	0.00036	<0.0001
2015	Q1	GH FR1	<0.0005	<0.0005	0.012	0.012	<0.1	0.000021	0.000024	114	1.1	2.6	0.00021	0.00015	<0.0001
2015	Q2	GH FR1	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000021	0.000035	81	1.4	1.4	<0.0001	0.0002	<0.0001
2015	Q4	GH FR1	<0.0005	<0.0005	<0.01	0.011	<0.25	0.000015	0.000024	106	<0.5	1.7	0.00012	0.00013	<0.0001
2015	Q1	LC LCDSSLCC	<0.0005	<0.0005	0.013	0.014	<0.1	0.000086	0.000011	123	1.1	2.7	0.00016	0.00021	<0.0001
2016	Q2	CM MC2	<0.0005	<0.0005	0.018	0.02	<0.05	0.000013	0.000016	79	2.3	2.1	0.00017	0.00035	0.00085
2016	Q4	EV HC1	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000027	0.000047	72	1.9	0.79	0.00011	0.00031	<0.0001
2016	Q3	EV HC1	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000016	0.000027	81	0.95	1.1	0.00016	0.00025	<0.0001
2016	Q4	EV HC1	<0.0005	<0.0005	<0.01	<0.01	<0.25	0.000019	0.000024	82	1.4	1.3	0.00014	0.00023	<0.0001
2016	Q1	EV MC2	<0.0005	<0.0005	0.013	0.013	<0.25	0.000035	0.000036	94	0.85	9.2	0.00013	0.00018	<0.0001
2016	Q2	EV MC2	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000038	0.000078	37	2.6	1.2	0.00014	0.00076	<0.0001
2016	Q3	EV MC2	<0.0005	<0.0005	0.012	0.013	<0.25	0.000066	0.00						

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	COBAL-T-mg/l	CONDUCTIVITY, LAB-N-us/cm	COPPER-D-mg/l	COPPER-T-mg/l	FLUORIDE-D-mg/l	Hardness, Total or Dissolved CaCO3-N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l
Reference															
2015	Q1	Reference (FR UFR1)	<0.0001	367	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.0005	<0.0005	0.0019	0.0016	15
2015	Q1	Reference (FR UFR1)	<0.0001	367	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.0005	<0.0005	0.0019	0.0016	15
2015	Q1	Reference (FR UFR1)	<0.0001	353	<0.0005	<0.0005	0.14	197	<0.01	<0.01	<0.0005	<0.0005	0.0015	0.0017	14
2015	Q2	Reference (FR UFR1)	<0.0001	245	<0.0005	<0.0005	0.15	129	<0.01	0.052	<0.0005	<0.0005	<0.001	0.0012	9.2
2015	Q2	Reference (FR UFR1)	<0.0001	342	<0.0005	<0.0005	0.15	188	<0.01	<0.01	0.00055	<0.0005	0.002	0.002	13
2015	Q4	Reference (FR UFR1)	<0.0001	354	<0.0005	<0.0005	0.16	190	<0.01	<0.01	<0.0005	<0.0005	0.0015	0.0015	14
2015	Q2	Reference (GH ER2)	<0.0001	303	<0.0005	<0.0005	0.15	160	<0.01	0.066	<0.0005	<0.0005	0.0017	0.0016	11
2015	Q4	Reference (GH ER2)	<0.0001	314	<0.0005	<0.0005	0.16	170	<0.01	<0.01	<0.0005	<0.0005	0.0016	0.0018	11
2016	Q1	Reference (FR UFR1)	<0.0001	358	<0.0005	<0.0005	0.16	202	<0.01	<0.01	<0.0005	<0.0005	0.0014	0.0015	15
2016	Q2	Reference (FR UFR1)	<0.0001	233	<0.0005	<0.0005	0.15	126	<0.01	0.075	<0.0005	0.0006	0.0011	0.0013	9.8
2016	Q3	Reference (FR UFR1)	<0.0001	338	<0.0005	<0.0005	0.17	177	<0.01	0.013	<0.0005	<0.0005	0.0017	0.0018	14
2016	Q4	Reference (FR UFR1)	<0.0001	330	<0.0005	<0.0005	0.16	177	<0.01	0.022	<0.0005	<0.0005	0.0015	0.0018	12
2016	Q2	Reference (GH ER2)	<0.0001	289	<0.0005	<0.0005	0.16	163	<0.01	0.23	<0.0005	0.0013	0.002	0.0021	11
2016	Q4	Reference (GH ER2)	<0.0001	297	<0.0005	<0.0005	0.17	163	<0.01	0.013	<0.0005	<0.0005	0.0019	0.0017	9.6
2017	Q2	Reference (CM MC1)	<0.0001	267	<0.0002	<0.0005	0.052	134	<0.01	0.021	<0.0005	<0.0005	0.0041	0.0042	10
2017	Q3	Reference (CM MC1)	<0.0001	265	<0.0002	<0.0005	0.054	138	<0.01	0.033	<0.0005	<0.0005	0.0044	0.0045	9.5
2017	Q4	Reference (CM MC1)	<0.0001	280	<0.0005	<0.0005	0.055	144	<0.01	<0.01	<0.0005	<0.0005	0.0045	0.0046	11
2017	Q1	Reference (FR UFR1)	<0.0001	341	<0.0002	<0.0005	0.14	185	<0.01	<0.01	<0.0005	<0.0005	0.0013	0.0014	14
2017	Q2	Reference (FR UFR1)	<0.0001	239	0.0004	0.00067	0.11	121	0.054	0.13	<0.0005	0.00052	0.0011	0.0012	8.7
2017	Q3	Reference (FR UFR1)	<0.0001	319	<0.0002	<0.0005	0.14	159	<0.01	0.011	<0.0005	<0.0005	0.0015	0.0015	13
2017	Q4	Reference (FR UFR1)	<0.0001	333	<0.0005	<0.0005	0.11	185	<0.01	<0.01	<0.0005	<0.0005	0.0019	0.0017	14
2017	Q2	Reference (GH ER2)	<0.0001	321	<0.0005	<0.0005	0.16	177	<0.01	0.074	<0.0005	0.00061	0.0019	0.002	12
2017	Q3	Reference (GH ER2)	<0.0001	276	<0.0002	<0.0005	0.14	137	<0.01	0.02	<0.0005	<0.0005	0.0017	0.0015	9.6
2017	Q4	Reference (GH ER2)	<0.0001	282	<0.0005	<0.0005	0.13	161	<0.01	<0.01	<0.0005	<0.0005	0.0021	0.002	11
2018	Q1	Reference (CM MC1)	<0.0001	307	<0.0005	<0.0005	0.055	153	<0.01	<0.01	<0.0005	<0.0005	0.0047	0.0048	11
2018	Q2	Reference (CM MC1)	<0.0001	238	<0.0005	0.00056	0.07	125	0.024	0.11	<0.0005	0.00073	0.0037	0.0041	9.2
2018	Q3	Reference (CM MC1)	<0.0001	267	<0.0005	<0.0005	0.08	156	<0.01	0.011	<0.0005	<0.0005	0.0045	0.0048	10
2018	Q4	Reference (CM MC1)	<0.0001	268	<0.0005	<0.0005	0.07	140	<0.01	<0.01	<0.0005	<0.0005	0.0046	0.0045	11
2018	Q1	Reference (FR UFR1)	<0.0001	371	<0.0005	<0.0005	0.11	198	<0.01	<0.01	<0.0005	<0.0005	0.0015	0.0014	14
2018	Q2	Reference (FR UFR1)	<0.0001	235	<0.0005	0.00056	0.14	123	0.014	0.13	<0.0005	0.00013	0.0011	0.0013	9.5
2018	Q3	Reference (FR UFR1)	<0.0001	325	<0.0005	<0.0005	0.18	183	<0.01	<0.01	<0.0005	<0.0005	0.0018	0.0018	13
2018	Q4	Reference (FR UFR1)	<0.0001	347	<0.0005	<0.0005	0.15	187	<0.01	<0.01	<0.0005	<0.0005	0.0016	0.0017	14
2018	Q1	Reference (GH ER2)	<0.0001	327	<0.0005	<0.0005	0.16	170	<0.01	<0.01	<0.0005	<0.0005	0.0013	0.0017	11
2018	Q2	Reference (GH ER2)	0.00012	304	<0.0005	0.00077	0.16	164	<0.01	0.34	<0.0005	0.00017	0.002	0.0023	12
2018	Q3	Reference (GH ER2)	0.00051	270	<0.0005	0.0012	0.17	148	<0.01	0.99	<0.0005	0.00084	0.0018	0.0024	11
2018	Q4	Reference (GH ER2)	<0.0001	306	<0.0005	<0.0005	0.17	167	<0.01	0.037	<0.0005	<0.0005	0.0019	0.002	11
2018	Q2	Reference (LC SLC)	<0.0001	299	<0.0005	<0.0005	0.3	163	<0.01	0.012	<0.0005	<0.0005	0.003	0.0029	12
2018	Q3	Reference (LC SLC)	<0.0001	350	<0.0005	<0.0005	0.34	211	<0.01	<0.01	<0.0005	<0.0005	0.0029	0.003	15
2018	Q4	Reference (LC SLC)	<0.0001	369	<0.0005	<0.0005	0.37	191	<0.01	<0.01	<0.0005	<0.0005	0.0033	0.0036	16
Tests categorized as no adverse response															
2015	Q1	EV MC2	0.00079	826	<0.0005	<0.0005	0.14	445	<0.01	0.031	<0.0005	<0.0005	0.011	0.011	46
2015	Q2	EV HC1	0.0001	350	0.0005	0.0005	0.13	205	0.01	0.051	0.0005	0.00056	0.0044	0.0042	21
2015	Q3	EV HC1	<0.0001	625	<0.0005	<0.0005	0.21	373	<0.01	0.027	<0.0005	<0.0005	0.0069	0.0068	41
2015	Q4	EV HC1	<0.0001	732	<0.0005	<0.0005	0.2	431	<0.01	<0.01	<0.0005	<0.0005	0.0069	0.0067	50
2015	Q1	EV MC2	<0.0001	665	0.0012	0.00076	0.15	381	<0.01	0.024	<0.0005	<0.0005	0.015	0.015	33
2015	Q4	EV MC2	<0.0001	733	<0.0005	<0.0005	0.16	415	<0.01	0.014	<0.0005	<0.0005	0.023	0.022	39
2015	Q2	FR FRCP1	0.00012	573	<0.0005	<0.0005	0.2	302	<0.01	0.11	<0.0005	0.00014	0.019	0.018	29
2015	Q3	FR FRCP1	<0.0001	815	<0.0005	<0.0005	0.2	471	<0.01	0.033	<0.0005	<0.0005	0.03	0.031	51
2015	Q1	GH ERC	<0.0001	345	<0.0005	<0.0005	0.15	191	<0.01	0.036	<0.0005	0.0002	0.0019	0.002	13
2015	Q2	GH ERC	<0.0001	338	<0.0005	<0.0005	0.15	179	<0.01	0.15	<0.0005	0.00011	0.0022	0.0023	12
2015	Q3	GH ERC	<0.0001	284	<0.0005	<0.0005	0.16	160	<0.01	0.088	<0.0005	0.00007	0.0017	0.002	11
2015	Q4	GH MC2	<0.0001	359	<0.0005	<0.0005	0.17	177	<0.01	0.16	<0.0005	<0.0005	0.018	0.017	17
2015	Q1	GH FR1	<0.0001	851	<0.0005	<0.0005	0.18	475	<0.01	<0.01	<0.0005	<0.0005	0.016	0.015	49
2015	Q2	GH FR1	<0.0001	614	<0.0005	<0.0005	0.17	332	<0.01	0.07	<0.0005	0.00063	0.014	0.014	34
2015	Q4	GH FR1	<0.0001	760	<0.0005	<0.0005	0.16	436	<0.01	<0.01	<0.0005	<0.0005	0.017	0.017	43
2015	Q1	LC LCDSLLC	<0.0001	940	<0.0005	<0.0005	0.24	536	<0.01	<0.01	<0.0005	<0.0005	0.031	0.031	53
2016	Q4	CM MC2	0.0011	622	<0.0005	<0.0005	0.11	328	<0.01	0.15	<0.0005	0.00098	0.01	0.01	33
2016	Q2	EV HC1	<0.0001	547	<0.0005	<0.0005	0.19	306	<0.01	0.14	<0.0005	0.00095	0.0064	0.0068	33
2016	Q3	EV HC1	<0.0001	652	<0.0005	<0.0005	0.23	368	<0.01	0.063	<0.0005	0.00076	0.0084	0.0083	44
2016	Q4	EV HC1	<0.0001	668	<0.0005	<0.0005	0.2	386	<0.01	0.058	<0.0005	<0.0005	0.0077	0.0081	46
2016	Q1	EV MC2	<0.0001	700	<0.0005	<0.0005	0.15	395	<0.01	0.038	<0.0005	0.00053	0.018	0.018	37
2016	Q2	EV MC2	0.00027	266	<0.0005	<0.0005	0.11	141	0.012	0.46	<0.0005	0.00039	0.0052	0.0056	11
2016	Q3	EV MC2	<0.0001	793	<0.0005	<0.0005	0.17	435	<0.01	0.01	<0.0005	<0.0005	0.021	0.021	42
2016	Q4	EV MC2	0.00013	999	<0.0005	0.00065	0.12	529	0.023	0.13	<0.0005	0.00012	0.0084	0.0088	55
2016	Q3	FR FRCP1	<0.0001	874	<0.0005	<0.0005	0.22	455	<0.01	0.032	<0.0005	<0.0005	0.032	0.032	48
2016	Q1	GH ERC	<0.0001	419	<0.0005	<0.0005	0.16	231	<0.01	<0.01	<0.0005	<0.0005	0.0023	0.0025	16
2016	Q2	GH ERC	0.00015	342	<0.0005	0.00065	0.16	185	<0.01	0.38	<0.0005	0.00022	0.0021	0.0025	13
2016	Q3	GH ERC	<0.0001	317	<0.0005	<0.0005	0.18	161	<0.01	0.024	<0.0005	<0.0005	0.0024	0.0024	11
2016	Q4	GH ERC	<0.0001	327	<0.0005	0.00054	0.16	186	<0.01	0.028	<0.0005	<0.0005	0.0026	0.0022	12
2016	Q3	GH FR1	<0.0001	732	<0.0005	<0.0005	0.2	379	<0.01	0.016	<0.0005	<0.0005	0.017	0.017	40
2016	Q4	GH FR1	<0.0001	735	<0.0005	<0.0005	0.16	411	<0.01	0.022	<0.0005	<0.0005	0.017	0.017	44
2016	Q1	LC LCDSLLC	<0.0001	1010	<0.0005	<0.0005	0.24	572	<0.01	<0.01	<0.0005	<0.0005	0.037	0.038	

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	MANGANESE-D- mg/l	MANGANESE-T- mg/l	MERCURY-D- mg/l	MERCURY-T- mg/l	MOLYBDENUM- D-mg/l	MOLYBDENUM- T-mg/l	NICKEL-D-mg/l	NICKEL-T-mg/l	NITRATE NITROGEN (NO ₃), AS N-N- mg/l	NITRITE NITROGEN (NO ₂), AS N-N- mg/l	NITROGEN, AMMONIA (AS N) N-mg/l	ORTHO- PHOSPHATE-N- mg/l	pH, LAB-N-ph units	
Reference																
2015	Q1	Reference (FR UFR1)	0.000054	0.00018	<0.00001	<0.00001	0.00053	0.00054	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0032	8.4	
2015	Q1	Reference (FR UFR1)	0.000054	0.00018	<0.00001	<0.00001	0.00053	0.00054	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0032	8.4	
2015	Q1	Reference (FR UFR1)	0.00017	0.00037	<0.00001	<0.00001	0.00056	0.00055	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0027	8.3	
2015	Q2	Reference (FR UFR1)	0.00064	0.0025	<0.00005	<0.00005	0.00052	0.00062	<0.0005	<0.0005	0.066	<0.001	<0.005	0.0042	8.4	
2015	Q2	Reference (FR UFR1)	0.00062	0.0015	<0.00005	<0.00005	0.00058	0.00068	<0.0005	<0.0005	0.019	<0.001	<0.005	0.0029	8.4	
2015	Q4	Reference (FR UFR1)	0.0001	0.00031	<0.00005	<0.00005	0.00059	0.00059	<0.0005	<0.0005	0.022	<0.001	<0.005	0.0017	8.4	
2015	Q2	Reference (GH ER2)	0.0033	0.0059	<0.00005	<0.00005	0.00092	0.00094	<0.0005	<0.0005	0.086	<0.001	<0.005	<0.001	8.3	
2015	Q4	Reference (GH ER2)	0.0021	0.0027	<0.00005	<0.00005	0.001	0.0010	<0.0005	<0.0005	0.078	<0.001	<0.005	0.0015	8.3	
2016	Q1	Reference (FR UFR1)	0.0002	0.00034	<0.00005	<0.000005	0.00058	0.00056	<0.0005	<0.0005	0.17	<0.001	<0.005	0.0032	8.3	
2016	Q2	Reference (FR UFR1)	0.00045	0.0021	<0.00005	0.0000014	0.00061	0.00062	<0.0005	<0.0005	0.034	<0.001	<0.005	0.0041	8.3	
2016	Q3	Reference (FR UFR1)	0.00027	0.0011	<0.00005	<0.000005	0.00063	0.00063	<0.0005	<0.0005	0.057	<0.001	<0.005	0.0031	8.2	
2016	Q4	Reference (FR UFR1)	0.00027	0.00073	<0.00005	0.0000056	0.00057	0.00056	<0.0005	<0.0005	0.1	<0.001	<0.005	0.0023	8.3	
2016	Q2	Reference (GH ER2)	0.0018	0.012	<0.00005	0.0000098	0.00091	0.00093	<0.0005	<0.0005	0.12	<0.001	<0.005	0.0011	8.2	
2016	Q4	Reference (GH ER2)	0.0012	0.0021	<0.00005	<0.000005	0.00097	0.001	<0.0005	<0.0005	0.071	<0.001	<0.005	<0.001	8.3	
2017	Q2	Reference (CM MC1)	0.00015	0.00057	<0.00005	0.0000011	0.00074	0.0008	<0.0005	<0.0005	0.012	<0.001	<0.005	0.0029	8.2	
2017	Q3	Reference (CM MC1)	<0.0001	0.001	<0.00005	0.0000067	0.00088	0.00085	<0.0005	<0.0005	0.012	<0.001	<0.005	0.005	8.2	
2017	Q4	Reference (CM MC1)	0.00012	0.00035	<0.00005	0.0000059	0.0009	0.00087	<0.0005	<0.0005	0.015	<0.001	<0.005	0.0035	8.3	
2017	Q1	Reference (FR UFR1)	<0.0001	0.00027	<0.00005	<0.000005	0.00062	0.00062	<0.0005	<0.0005	0.22	<0.001	<0.005	0.0049	8.3	
2017	Q2	Reference (FR UFR1)	0.0012	0.0035	<0.00005	0.0000031	0.00048	0.0005	0.00052	0.00069	0.098	<0.001	0.011	0.0087	8.3	
2017	Q3	Reference (FR UFR1)	0.00036	0.0011	<0.00005	<0.000005	0.00064	0.00068	<0.0005	<0.0005	0.011	<0.001	0.01	0.0027	8.4	
2017	Q4	Reference (FR UFR1)	<0.0001	0.00056	<0.00005	<0.000005	0.00055	0.00054	<0.0005	<0.0005	0.094	0.011	<0.005	0.0016	8.4	
2017	Q2	Reference (GH ER2)	0.00095	0.0054	<0.00005	0.0000082	0.00094	0.00095	<0.0005	<0.0005	0.12	<0.001	<0.005	<0.001	8.4	
2017	Q3	Reference (GH ER2)	0.0021	0.0031	<0.00005	0.0000006	0.00096	0.00098	<0.0005	<0.0005	0.037	<0.001	0.0069	0.001	8.4	
2017	Q4	Reference (GH ER2)	0.00061	0.0016	<0.00005	<0.000005	0.0011	0.0011	<0.0005	<0.0005	0.037	<0.001	0.0089	<0.001	8.4	
2018	Q1	Reference (CM MC1)	<0.0001	0.00014	<0.00005	<0.000005	0.00087	0.00096	<0.0005	<0.0005	0.04	<0.001	<0.005	0.0036	8.3	
2018	Q2	Reference (CM MC1)	0.00035	0.0026	<0.00005	0.000002	0.00071	0.00072	<0.0005	<0.0005	0.018	<0.001	<0.005	0.0069	8.3	
2018	Q3	Reference (CM MC1)	0.00015	0.0006	<0.00005	<0.000005	0.00094	0.0009	<0.0005	<0.0005	0.019	<0.001	0.024	0.0041	8.4	
2018	Q4	Reference (CM MC1)	<0.0001	0.00027	<0.00005	0.0000063	0.00089	0.00093	<0.0005	<0.0005	0.0088	<0.001	0.0081	0.0042	8.2	
2018	Q1	Reference (FR UFR1)	<0.0001	0.00024	<0.00005	<0.000005	0.00058	0.00056	<0.0005	<0.0005	0.2	<0.001	0.0089	0.0029	8.4	
2018	Q2	Reference (FR UFR1)	0.00039	0.0076	<0.00005	0.0000026	0.0006	0.00063	<0.0005	<0.0005	0.062	0.13	<0.001	0.0067	0.0079	8.3
2018	Q3	Reference (FR UFR1)	0.00031	0.00067	<0.00005	<0.000005	0.00064	0.00068	<0.0005	<0.0005	0.024	<0.001	0.056	<0.001	8.4	
2018	Q4	Reference (FR UFR1)	0.0001	0.00026	<0.00005	<0.000005	0.00059	0.00061	<0.0005	<0.0005	0.032	<0.001	0.028	0.0023	8.4	
2018	Q1	Reference (GH ER2)	0.0013	0.0015	<0.00005	<0.000005	0.0009	0.0010	<0.0005	<0.0005	0.1	<0.001	<0.005	<0.001	8.2	
2018	Q2	Reference (GH ER2)	0.00023	0.0012	<0.00005	0.000002	0.00095	0.00096	<0.0005	<0.0005	0.085	0.15	<0.001	0.015	8.5	
2018	Q3	Reference (GH ER2)	<0.0001	0.06	<0.00005	0.0000076	0.0011	0.00087	<0.0005	0.02	0.023	<0.001	0.014	<0.001	8.2	
2018	Q4	Reference (GH ER2)	0.00039	0.0027	<0.00005	<0.000005	0.001	0.001	<0.0005	<0.0005	0.054	<0.001	0.014	0.0022	8.3	
2018	Q2	Reference (LC SLC)	<0.0001	0.00073	<0.00005	0.0000064	0.00082	0.00079	<0.0005	<0.0005	0.13	<0.001	0.01	0.001	8.4	
2018	Q3	Reference (LC SLC)	<0.0001	0.00017	<0.00005	<0.000005	0.0013	0.0012	<0.0005	<0.0005	0.089	<0.001	0.026	<0.001	8.4	
2018	Q4	Reference (LC SLC)	<0.0001	0.00012	<0.00005	<0.000005	0.0012	0.0013	<0.0005	<0.0005	0.13	<0.001	0.023	0.0027	8.3	
Tests categorized as no adverse response																
2015	Q1	EV MC2	0.0046	0.0064	<0.00001	<0.00001	0.001	0.0011	0.0095	0.0097	2.4	0.012	0.0055	0.0001	8.4	
2015	Q2	EV HC1	0.00053	0.0016	0.00005	0.00005	0.0005	0.00048	0.00075	0.00083	0.57	0.001	0.0084	0.0031	7.5	
2015	Q3	EV HC1	0.0028	0.0051	<0.00005	<0.00005	0.00092	0.00092	0.00079	0.00079	0.87	0.011	<0.005	0.004	8.4	
2015	Q4	EV HC1	0.0018	0.002	<0.000005	<0.000005	0.00097	0.00098	0.00066	0.00069	1.2	<0.005	<0.005	0.0058	8.4	
2015	Q1	EV MC2	0.0024	0.0022	<0.00001	<0.00001	0.00079	0.00078	0.0007	0.00052	3.2	0.0013	<0.005	<0.001	8.3	
2015	Q4	EV MC2	0.0013	0.0018	<0.000005	<0.000005	0.002	0.0021	0.0039	0.0041	5.9	<0.005	<0.005	0.0035	8.2	
2015	Q2	FR FRCP1	0.0032	0.012	<0.00005	<0.000005	0.0013	0.0013	0.002	0.0024	7.4	0.0056	0.0095	0.0014	8.4	
2015	Q3	FR FRCP1	0.0031	0.0069	<0.00005	<0.000005	0.0015	0.0015	0.0041	0.0043	8.2	0.0049	<0.005	<0.001	8.4	
2015	Q1	GH ERC	0.00035	0.0026	<0.00001	<0.00001	0.00092	0.00099	<0.0005	<0.0005	0.44	<0.001	<0.005	<0.001	8.3	
2015	Q2	GH ERC	0.00072	0.0081	<0.00005	<0.000005	0.00095	0.00097	<0.0005	<0.0005	0.31	<0.001	<0.005	<0.001	8.4	
2015	Q3	GH ERC	0.00058	0.0078	<0.00005	<0.000005	0.00095	0.00097	<0.0005	<0.0005	0.1	<0.001	<0.005	<0.001	8.3	
2015	Q4	GH MC3	<0.0001	0.00024	<0.00005	<0.000005	0.0014	0.0015	<0.0005	<0.0005	0.46	<0.001	0.008	0.0018	8.4	
2015	Q1	GH FR1	0.0017	0.0021	<0.00001	<0.00001	0.00095	0.00098	0.0022	0.0023	13	0.0039	<0.005	<0.001	8.3	
2015	Q2	GH FR1	0.0011	0.0044	<0.00005	<0.000005	0.0011	0.0011	0.0019	0.002	7.5	0.0028	<0.005	<0.001	8.4	
2015	Q4	GH FR1	0.0011	0.0016	<0.00005	<0.000005	0.0009	0.00099	0.0012	0.0012	10	<0.005	<0.005	<0.001	8.4	
2015	Q1	LC LCDSSLCC	0.000074	0.00021	<0.00001	<0.00001	0.0017	0.0017	0.0036	0.0036	15	0.003	<0.005	<0.001	8.3	
2016	Q4	CM MC2	0.0062	0.014	<0.00005	0.0000012	0.00097	0.00098	0.0073	0.0083	1.8	0.01	0.0076	0.0016	8.3	
2016	Q2	EV HC1	0.00048	0.0037	0.0000062	0.0000077	0.00074	0.00077	0.00097	0.0012	0.82	<0.001	<0.005	0.0054	8.3	
2016	Q3	EV HC1	0.0054	0.0081	<0.000005	0.0000012	0.00092	0.00091	0.00074	0.0009	0.84	0.0016	0.0088	0.0064	8.3	
2016	Q4	EV HC1	0.0021	0.0033	<0.000005	0.0000085	0.00091	0.00093	0.00073	0.00087	1.0	<0.005	<0.005	0.0061	8.4	
2016	Q1	EV MC2	0.0012	0.0021	<0.000005	<0.000005	0.0015	0.0015	0.0025	0.0026	5.1	<0.005	<0.005	<0.001	8.1	
2016	Q2	EV MC2	0.00014	0.013	0.0000015	0.0000018	0.00064	0.00069	0.0014	0.0022	0.78	<0.005	<0.005	0.0013	8.1	
2016	Q3	EV MC2	0.0009	0.014	<0.000005	0.0000065	0.0012	0.0012	0.0024	0.0024	6.5	<0.005	0.0073	0.004	8.1	
2016	Q4	EV MC2	0.001	0.0044	0.0000016	0.0000016	0.00096	0.00096	0.00078	0.0012	1.2	0.001	0.008	0.0081	8.2	
2016	Q3	FR FRCP1	0.0045	0.0074	<0.000005	<0.000005	0.0013	0.0013	0.0049	0.0052	12	<0.005	<0.005	0.0011	8.4	
2016	Q1	GH ERC	0.00026	0.00034	<0.00005	<0.000005	0.00094	0.00092	<0.0005	<0.0005	0.76	<0.001	<0.005	<0.001	8.2	
2016	Q2	GH ERC	0.0013	0.018	<0.00005	0.0000016	0.00091	0.00092	<0.0005	0.						

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	PHOSPHORUS-N mg/l	POTASSIUM-T mg/l	SELENIUM-D mg/l	SELENIUM-T mg/l	SILVER-D-mg/l	SILVER-T-mg/l	SODIUM-T-mg/l	STRONTIUM-D mg/l	STRONTIUM-T mg/l	SULFATE (AS SO4)-D-mg/l	THALLIUM-D mg/l	THALLIUM-T mg/l	TIN-D-mg/l
Reference															
2015	Q1	Reference (FR UFR1)	0.0042	0.4	0.0069	0.00073	<0.00001	<0.00001	0.77	0.088	0.091	47	<0.00001	<0.00001	<0.0001
2015	Q1	Reference (FR UFR1)	0.0042	0.4	0.0069	0.00073	<0.00001	<0.00001	0.77	0.088	0.091	47	<0.00001	<0.00001	<0.0001
2015	Q1	Reference (FR UFR1)	0.0035	0.42	0.0076	0.00073	<0.00001	<0.00001	0.72	0.089	0.092	46	<0.00001	<0.00001	<0.0001
2015	Q2	Reference (FR UFR1)	0.01	0.37	0.0048	0.00049	<0.00001	<0.00001	0.56	0.061	0.066	15	<0.00001	0.0001	<0.0001
2015	Q2	Reference (FR UFR1)	0.0054	0.52	0.0047	0.00043	<0.00001	<0.00001	0.69	0.093	0.093	32	<0.00001	<0.00001	<0.0001
2015	Q4	Reference (FR UFR1)	0.0022	0.42	0.0069	0.00062	<0.00001	<0.00001	0.69	0.095	0.091	48	<0.00001	<0.00001	<0.0001
2015	Q2	Reference (GH ER2)	0.008	0.37	0.0079	0.00087	<0.00001	<0.00001	0.73	0.2	0.21	18	<0.00001	<0.00001	<0.0001
2015	Q4	Reference (GH ER2)	<0.002	0.35	0.0072	0.00078	<0.00001	<0.00001	0.67	0.21	0.22	22	<0.00001	<0.00001	<0.0001
2016	Q1	Reference (FR UFR1)	0.0036	0.37	0.0008	0.00078	<0.00001	<0.00001	0.68	0.089	0.09	50	<0.00001	<0.00001	<0.0001
2016	Q2	Reference (FR UFR1)	0.0078	0.34	0.0052	0.00055	<0.00001	<0.00001	0.63	0.063	0.065	13	<0.00001	<0.00001	<0.0001
2016	Q3	Reference (FR UFR1)	0.0038	0.47	0.0056	0.00063	<0.00001	<0.00001	0.68	0.095	0.098	35	<0.00001	<0.00001	<0.0001
2016	Q4	Reference (FR UFR1)	0.0028	0.38	0.0069	0.00068	<0.00001	<0.00001	0.7	0.093	0.095	40	<0.00001	<0.00001	<0.0001
2016	Q2	Reference (GH ER2)	0.016	0.46	0.0083	0.00083	<0.00001	<0.00001	0.75	0.2	0.2	17	<0.00001	<0.00001	<0.0001
2016	Q4	Reference (GH ER2)	<0.002	0.36	0.0087	0.00083	<0.00001	<0.00001	0.61	0.24	0.24	23	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (CM MC1)	0.0094	0.43	0.0029	0.00025	<0.00001	<0.00001	2.7	0.14	0.14	11	<0.00001	<0.00001	<0.0001
2017	Q3	Reference (CM MC1)	0.06	0.45	0.0019	0.00024	<0.00001	<0.00001	2.0	0.14	0.13	13	<0.00001	<0.00001	<0.0001
2017	Q4	Reference (CM MC1)	0.0345	0.49	0.0019	0.00019	<0.00001	<0.00001	2.9	0.16	0.16	13	<0.00001	<0.00001	<0.0001
2017	Q1	Reference (FR UFR1)	0.0071	0.38	0.0012	0.0010	<0.00001	<0.00001	0.77	0.097	0.097	45	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (FR UFR1)	0.02	0.38	0.0007	0.0006	<0.00001	0.00002	0.62	0.084	0.082	22	<0.00001	<0.00001	0.00011
2017	Q3	Reference (FR UFR1)	0.0078	0.48	0.0006	0.00059	<0.00001	<0.00001	0.69	0.088	0.09	32	<0.00001	<0.00001	<0.0001
2017	Q4	Reference (FR UFR1)	0.0023	0.4	0.0058	0.00055	<0.00001	<0.00001	0.72	0.1	0.095	44	<0.00001	<0.00001	<0.0001
2017	Q2	Reference (GH ER2)	0.0058	0.41	0.0086	0.00098	<0.00001	<0.00001	0.73	0.21	0.21	21	<0.00001	<0.00001	<0.0001
2017	Q3	Reference (GH ER2)	0.0059	0.38	0.0067	0.00064	<0.00001	<0.00001	0.6	0.19	0.19	15	<0.00001	<0.00001	0.00011
2017	Q4	Reference (GH ER2)	<0.002	0.38	0.0089	0.00087	<0.00001	<0.00001	0.7	0.21	0.21	18	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (CM MC1)	0.0046	0.45	0.0027	0.00029	<0.00001	<0.00001	3.5	0.16	0.17	17	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (CM MC1)	0.016	0.5	0.0024	0.00028	<0.00001	<0.00001	2.4	0.13	0.12	10	<0.00001	0.00011	<0.0001
2018	Q3	Reference (CM MC1)	0.0091	0.5	0.0018	0.00022	<0.00001	<0.00001	2.6	0.15	0.14	13	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (CM MC1)	0.0337	0.42	0.0022	0.00023	<0.00001	<0.00001	3.2	0.13	0.13	14	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (FR UFR1)	0.0038	0.37	0.0051	0.00038	<0.00001	<0.00001	0.67	0.089	0.093	49	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (FR UFR1)	0.027	0.42	0.0008	0.00072	<0.00001	<0.00001	0.56	0.072	0.068	16	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (FR UFR1)	0.0095	0.45	0.0006	0.00062	<0.00001	<0.00001	0.67	0.1	0.095	35	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (FR UFR1)	<0.002	0.36	0.0073	0.00069	<0.00001	<0.00001	0.69	0.097	0.097	44	<0.00001	<0.00001	<0.0001
2018	Q1	Reference (GH ER2)	<0.002	0.3	0.0093	0.00092	<0.00001	<0.00001	0.72	0.2	0.22	23	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (GH ER2)	0.026	0.54	0.001	0.00091	<0.00001	<0.00001	0.76	0.2	0.2	19	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (GH ER2)	0.0086	0.6	0.0069	0.00071	<0.00001	0.00014	0.64	0.21	0.21	16	<0.00001	0.00028	<0.0001
2018	Q4	Reference (GH ER2)	<0.002	0.37	0.0091	0.00084	<0.00001	<0.00001	0.72	0.21	0.21	21	<0.00001	<0.00001	<0.0001
2018	Q2	Reference (LC SLIC)	0.005	0.35	0.0087	0.00078	<0.00001	<0.00001	0.81	0.13	0.12	25	<0.00001	<0.00001	<0.0001
2018	Q3	Reference (LC SLIC)	0.0043	0.36	0.0012	0.00013	<0.00001	<0.00001	0.8	0.16	0.14	48	<0.00001	<0.00001	<0.0001
2018	Q4	Reference (LC SLIC)	0.0026	0.39	0.0017	0.00015	<0.00001	<0.00001	0.89	0.16	0.16	57	<0.00001	<0.00001	<0.0001
Tests categorized as no adverse response															
2017	Q1	CM MC2	0.005	1.4	0.0059	0.006	<0.00001	<0.00001	10	0.29	0.3	249	0.00014	<0.00001	<0.0001
2015	Q2	EV HC1	0.0081	0.65	0.019	0.018	<0.00001	<0.00001	0.82	0.062	0.061	79	0.0001	0.0001	0.0001
2015	Q3	EV HC1	0.0082	0.99	0.029	0.028	<0.00001	<0.00001	1.5	0.11	0.11	165	<0.00001	<0.00001	<0.0001
2015	Q4	EV HC1	0.0057	0.9	0.033	0.037	<0.00001	<0.00001	1.7	0.13	0.13	218	<0.00001	<0.00001	<0.0001
2015	Q1	EV MC2	0.0047	1.2	0.024	0.022	<0.00001	<0.00001	5.7	0.19	0.2	147	<0.00001	<0.00001	0.00018
2015	Q4	EV MC2	0.0036	1.3	0.024	0.025	<0.00001	<0.00001	4.8	0.23	0.23	183	<0.00001	<0.00001	<0.0001
2015	Q2	FR FRCP1	0.018	1.2	0.03	0.03	<0.00001	<0.00001	1.2	0.11	0.11	126	<0.00001	<0.00001	<0.0001
2015	Q3	FR FRCP1	0.0027	1.8	0.057	0.057	<0.00001	<0.00001	1.6	0.13	0.13	234	<0.00001	<0.00001	<0.0001
2015	Q1	GH ERC	0.0043	0.37	0.0019	0.0019	<0.00001	<0.00001	0.95	0.2	0.21	30	<0.00001	<0.00001	<0.0001
2015	Q2	GH ERC	0.016	0.41	0.0017	0.0018	<0.00001	<0.00001	0.97	0.21	0.21	25	<0.00001	<0.00001	<0.0001
2015	Q3	GH ERC	0.0077	0.42	0.0011	0.0012	<0.00001	<0.00001	0.74	0.19	0.2	20	<0.00001	<0.00001	<0.0001
2015	Q4	GH ERC	<0.002	0.39	0.0015	0.0016	<0.00001	<0.00001	0.74	0.19	0.2	20	<0.00001	<0.00001	<0.0001
2015	Q1	GH FR1	0.0036	1.2	0.051	0.052	<0.00001	<0.00001	2.4	0.16	0.16	233	<0.00001	<0.00001	<0.0001
2015	Q2	GH FR1	0.01	1.1	0.031	0.032	<0.00001	<0.00001	1.7	0.12	0.12	136	<0.00001	<0.00001	<0.0001
2015	Q4	GH FR1	<0.002	1.2	0.04	0.039	<0.00001	<0.00001	2.2	0.14	0.15	189	<0.00001	<0.00001	<0.0001
2015	Q1	LC LCDSLLCC	0.0029	1.2	0.072	0.071	<0.00001	<0.00001	5.9	0.23	0.23	283	<0.00001	<0.00001	<0.0001
2016	Q2	CM MC2	0.0063	1.3	0.0041	0.0044	<0.00001	<0.00001	6.7	0.22	0.22	178	0.0001	0.00017	<0.0001
2016	Q4	EV HC1	0.01	0.87	0.031	0.031	<0.00001	<0.00001	1.3	0.096	0.099	120	<0.00001	0.00014	<0.0001
2016	Q3	EV HC1	0.012	0.98	0.031	0.032	<0.00001	<0.00001	1.6	0.12	0.12	176	<0.00001	<0.00001	<0.0001
2016	Q4	EV HC1	0.0079	1.0	0.032	0.032	<0.00001	<0.00001	1.9	0.13	0.13	193	<0.00001	<0.00001	<0.0001
2016	Q1	EV MC2	0.0023	1.1	0.022	0.021	<0.00001	<0.00001	4.9	0.2	0.21	174	<0.00001	0.0001	<0.0001
2016	Q2	EV MC2	0.039	0.64	0.0036	0.0033	<0.00001	<0.00017	1.7	0.088	0.092	36	<0.00001	0.00023	<0.0001
2016	Q3	EV MC2	0.0052	1.6	0.026	0.026	<0.00001	<0.00001	6.6	0.23	0.24	214	0.00011	0.00012	<0.0001
2016	Q4	EV MC2	0												

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	TIN-T-mg/l	TITANIUM-D-mg/l	TITANIUM-T-mg/l	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	TOTAL KJELDAHL NITROGEN-N-mg/l	TOTAL ORGANIC CARBON-T-mg/l	TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	TURBIDITY, LAB-N-ntu	URANIUM-D-mg/l	URANIUM-T-mg/l	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l
Reference															
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	229	<0.05	0.69	<1.0	0.13	0.00047	0.00047	<0.001	<0.001	<0.003
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	229	<0.05	0.69	<1.0	0.13	0.00047	0.00047	<0.001	<0.001	<0.003
2015	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	<0.05	<0.5	<1.0	0.33	0.00047	0.00047	<0.001	<0.001	<0.003
2015	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	147	0.1	2.1	2.4	1.5	0.00031	0.00033	<0.0005	<0.0005	<0.003
2015	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	211	0.08	1.0	1.1	0.2	0.00042	0.00042	<0.0005	<0.0005	<0.003
2015	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	215	0.095	0.6	<1.0	0.26	0.00047	0.00044	<0.0005	<0.0005	<0.003
2015	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	191	0.067	1.8	4.4	3.9	0.00079	0.00078	<0.0005	0.00051	<0.003
2015	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	171	<0.05	<0.5	<1.0	0.26	0.00071	0.00072	<0.0005	<0.0005	<0.003
2016	Q1	Reference (FR_UFR1)	<0.0001	0.011	0.011	244	<0.05	<0.5	<1.0	0.17	0.0005	0.00049	<0.0005	<0.0005	<0.003
2016	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	135	0.086	2.8	1.9	1.6	0.00032	0.00033	<0.0005	0.00051	<0.003
2016	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	0.077	0.92	1.2	0.22	0.00042	0.00044	<0.0005	<0.0005	<0.003
2016	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	204	0.069	1.1	<1.0	0.85	0.00044	0.00046	<0.0005	<0.0005	<0.003
2016	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	174	0.077	2.2	15	4.7	0.00076	0.00079	<0.0005	0.001	<0.003
2016	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	167	<0.05	0.62	<1.0	0.38	0.00076	0.00079	<0.0005	<0.0005	<0.003
2017	Q2	Reference (CM_MC1)	<0.0001	<0.01	<0.01	148	0.098	1.9	<1	0.41	0.00018	0.0002	<0.0005	<0.0005	<0.001
2017	Q3	Reference (CM_MC1)	<0.0001	<0.01	<0.01	162	0.1	1.2	<1	0.37	0.0002	0.00019	<0.0005	<0.0005	<0.001
2017	Q4	Reference (CM_MC1)	<0.0001	<0.01	<0.01	166	<0.2	1.4	2.4	1.3	0.00023	0.00021	<0.0005	<0.0005	<0.003
2017	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	194	<0.05	1.0	<1	0.25	0.00048	0.00048	<0.0005	<0.0005	<0.001
2017	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	143	0.18	3.7	4.4	4.7	0.00035	0.00034	0.00053	0.001	0.013
2017	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	164	0.078	2.7	1.1	0.36	0.00037	0.00038	<0.0005	<0.0005	<0.001
2017	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	221	<0.05	1.0	1.2	0.45	0.00051	0.00045	<0.0005	<0.0005	<0.003
2017	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	180	0.068	1.1	6.2	3.8	0.00079	0.00079	<0.0005	0.00061	<0.003
2017	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	148	0.12	0.91	1.4	0.81	0.00053	0.00058	<0.0005	<0.0005	<0.001
2017	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	174	<0.05	0.91	<1	0.38	0.00077	0.00072	<0.0005	<0.0005	<0.003
2018	Q1	Reference (CM_MC1)	<0.0001	<0.01	<0.01	182	<0.2	0.81	<1	0.22	0.00024	0.00024	<0.0005	<0.0005	<0.003
2018	Q2	Reference (CM_MC1)	<0.0001	<0.01	<0.01	134	0.092	3.4	4.5	2.4	0.00018	0.0002	<0.0005	<0.0005	<0.001
2018	Q3	Reference (CM_MC1)	<0.0001	<0.01	<0.01	174	0.052	1.5	<1	0.24	0.00023	0.00023	<0.0005	<0.0005	<0.001
2018	Q4	Reference (CM_MC1)	<0.0001	<0.01	<0.01	127	0.091	2.2	<1	0.29	0.00025	0.00023	<0.0005	<0.0005	<0.001
2018	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	216	0.064	0.59	<1	0.14	0.00049	0.00049	<0.0005	<0.0005	<0.003
2018	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	114	0.13	3.0	7.4	3.8	0.00033	0.00035	<0.0005	0.00065	<0.001
2018	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	0.24	2.4	<1	0.22	0.00045	0.00043	<0.0005	<0.0005	<0.001
2018	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	195	0.079	0.66	<1	0.19	0.00053	0.0005	<0.0005	<0.0005	<0.001
2018	Q1	Reference (GH_ER2)	<0.0001	<0.01	<0.01	186	<0.05	<0.5	<1	0.13	0.00077	0.00079	<0.0005	<0.0005	<0.003
2018	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	186	0.2	1.9	17	14	0.00072	0.00075	<0.0005	0.0013	<0.001
2018	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	179	0.057	1.6	6.9	0.61	0.00064	0.00061	<0.0005	0.0031	<0.001
2018	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	168	0.24	<0.5	<1	0.28	0.00077	0.00077	<0.0005	<0.0005	<0.001
2018	Q2	Reference (LC_SLC)	<0.0001	<0.01	<0.01	176	0.13	2.1	1.6	0.63	0.001	0.0011	<0.0005	<0.0005	0.0015
2018	Q3	Reference (LC_SLC)	<0.0001	<0.01	<0.01	233	<0.05	1.9	<1	0.13	0.0016	0.0016	<0.0005	<0.0005	0.0025
2018	Q4	Reference (LC_SLC)	<0.0001	<0.01	<0.01	214	<0.05	0.65	<1	0.27	0.0018	0.0019	<0.0005	<0.0005	0.0015
Tests categorized as no adverse response															
2017	Q1	EV MC2	<0.0001	<0.01	<0.01	561	<0.05	0.82	1.7	0.53	0.0022	0.0023	<0.001	<0.001	<0.003
2015	Q2	EV HC1	0.0001	0.01	0.01	233	0.13	1.4	2.6	1.2	0.0012	0.0012	0.0006	0.0006	0.003
2015	Q3	EV HC1	<0.0001	<0.01	<0.01	479	0.073	1.6	2.3	0.77	0.0023	0.0023	<0.0005	<0.0005	<0.003
2015	Q4	EV HC1	<0.0001	<0.01	<0.01	529	0.096	0.74	<1.0	0.29	0.0026	0.0027	<0.0005	<0.0005	<0.003
2015	Q1	EV MC2	<0.0001	0.014	0.013	438	0.13	1.2	1.2	0.31	0.0013	0.0012	<0.001	<0.001	0.0041
2015	Q4	EV MC2	<0.0001	<0.01	<0.01	492	0.14	0.7	1.0	0.36	0.0019	0.0019	<0.0005	<0.0005	<0.003
2015	Q2	FR FRCP1	<0.0001	<0.01	<0.01	372	<0.05	2.2	7.7	2.0	0.0015	0.0016	<0.0005	0.00054	<0.003
2015	Q3	FR FRCP1	<0.0001	<0.01	<0.01	566	0.14	0.93	2.6	0.47	0.0027	0.0028	<0.0005	<0.0005	<0.003
2015	Q1	GH ERC	<0.0001	<0.01	<0.01	203	<0.05	0.5	2.6	0.41	0.00081	0.00084	<0.001	<0.001	<0.003
2015	Q2	GH ERC	<0.0001	<0.01	<0.01	203	<0.05	1.3	7.0	1.6	0.00083	0.00084	<0.0005	0.0007	<0.003
2015	Q3	GH ERC	0.00016	<0.01	<0.01	179	<0.05	0.79	5.1	0.3	0.00085	0.00071	<0.0005	0.00058	<0.003
2015	Q4	GH ERC	<0.0001	<0.01	<0.01	214	<0.05	0.52	1.1	0.26	0.00077	0.00081	<0.0005	<0.0005	<0.003
2015	Q1	GH FR1	<0.0001	0.011	0.011	421	<0.05	0.6	<1.0	0.18	0.0022	0.0022	<0.001	<0.001	<0.003
2015	Q2	GH FR1	<0.0001	<0.01	<0.01	398	<0.05	1.6	3.8	2.2	0.0016	0.0016	<0.0005	<0.0005	<0.003
2015	Q4	GH FR1	<0.0001	<0.01	<0.01	520	0.091	0.57	<1.0	0.3	0.0019	0.0019	<0.0005	<0.0005	<0.003
2015	Q1	LC LCDSLLCC	<0.0001	0.014	0.013	690	<0.05	0.9	<1.0	0.29	0.0039	0.004	<0.001	<0.001	0.0038
2016	Q2	CM MC2	<0.0001	<0.01	<0.01	451	0.15	2.4	9.1	3.8	0.0017	0.0017	<0.0005	<0.0005	<0.003
2016	Q4	EV HC1	<0.0001	0.013	0.015	378	0.19	2.5	5.9	3.1	0.002	0.0021	<0.0005	0.00077	<0.003
2016	Q3	EV HC1	<0.0001	<0.01	<0.01	496	0.096	1.5	2.7	2.6	0.0023	0.0023	<0.0005	<0.0005	<0.003
2016	Q4	EV HC1	<0.0001	<0.01	<0.01	480	0.1	1.7	1.8	2.3	0.0026	0.0026	<0.0005	<0.0005	<0.003
2016	Q1	EV MC2	<0.0001	0.015	0.016	482	0.11	0.77	<1.0	0.77	0.0017	0.0017	<0.0005	<0.0005	<0.003
2016	Q2	EV MC2	<0.0001	<0.01	0.015	165	0.2	3.3	25	11	0.00052	0.00058	<0.0005	0.0019	<0.003
2016	Q3	EV MC2	<0.0001	<0.01	<0.01	570	0.14	0.96	<1.0	0.3	0.0015	0.0015	<0.0005	<0.0005	<0.003
2016	Q4	EV MC2	<0.0001	<0.01	<0.01	628	0.2	3.4	6.8	5.5	0.00062	0.00066	<0.0005	0.0011	<0.003
2016	Q3	FR FRCP1	<0.0001	<0.01	<0.01	511	0.17	1.3	1.4	0.36	0.003	0.003	<0.0005	<0.0005	<0.003
2															

Appendix D: Concentration-Response Analysis

Table D-2: *P. subcapita* Cell Yield Paired with Water Quality

Year	Quarter	Sample ID	ZINC-T-mg/l	ΣTU-WQGs	ΣTU-WQGs/Benchmarks	PCA Factor 1 (2015 to 2018)	PCA Factor 2 (2015 to 2018)	PCA Factor 3 (2015 to 2018)	PCA Factor 4 (2015 to 2018)	PCA Factor 1 (2018)	PCA Factor 2 (2018)	PCA Factor 3 (2018)	PCA Factor 4 (2018)
Reference													
2015	Q1	Reference (FR_UFR1)	<0.003	2.8	2.8	-5.5	-2.5	-5.2	0.53	-	-	-	-
2015	Q1	Reference (FR_UFR1)	<0.003	2.8	2.8	-5.5	-2.5	-5.2	0.53	-	-	-	-
2015	Q1	Reference (FR_UFR1)	<0.003	2.7	2.7	-5.3	-2.5	-4.9	0.57	-	-	-	-
2015	Q2	Reference (FR_UFR1)	<0.003	2.7	2.7	-7.7	1.8	-0.62	0.61	-	-	-	-
2015	Q2	Reference (FR_UFR1)	<0.003	2.2	2.2	-5.6	-2.0	-1.4	-0.1	-	-	-	-
2015	Q4	Reference (FR_UFR1)	<0.003	2.4	2.4	-5.9	-2.7	-1.7	-0.077	-	-	-	-
2015	Q2	Reference (GH_ER2)	<0.003	2.5	2.5	-5.0	0.83	-0.55	-0.91	-	-	-	-
2015	Q4	Reference (GH_ER2)	<0.003	2.4	2.4	-5.1	-2.4	-1.8	-1.7	-	-	-	-
2016	Q1	Reference (FR_UFR1)	<0.003	1.9	1.8	-5.7	-3.2	-2.0	0.28	-	-	-	-
2016	Q2	Reference (FR_UFR1)	<0.003	2.3	2.3	-8.2	2.1	-0.4	0.72	-	-	-	-
2016	Q3	Reference (FR_UFR1)	<0.003	1.2	1.2	-6.0	-2.2	-0.29	-0.21	-	-	-	-
2016	Q4	Reference (FR_UFR1)	<0.003	1.4	1.4	-6.5	-0.95	-0.12	-0.11	-	-	-	-
2016	Q2	Reference (GH_ER2)	<0.003	2.6	2.6	-5.1	3.5	0.0019	-0.01	-	-	-	-
2016	Q4	Reference (GH_ER2)	<0.003	1.7	1.7	-5.4	-2.2	-0.9	-2.3	-	-	-	-
2017	Q2	Reference (CM_MC1)	<0.003	1.2	1.2	-6.6	0.64	0.55	-3.0	-	-	-	-
2017	Q3	Reference (CM_MC1)	<0.003	1.2	1.2	-6.4	1.1	0.87	-3.2	-	-	-	-
2017	Q4	Reference (CM_MC1)	<0.003	1.1	1.1	-6.0	0.1	-0.1	-3.1	-	-	-	-
2017	Q1	Reference (FR_UFR1)	<0.003	1.1	1.1	-5.6	-2.6	0.13	-0.5	-	-	-	-
2017	Q2	Reference (FR_UFR1)	<0.003	3.7	3.7	-7.4	6.9	-1.0	0.94	-	-	-	-
2017	Q3	Reference (FR_UFR1)	<0.003	1.3	1.3	-6.3	-0.93	0.91	-0.8	-	-	-	-
2017	Q4	Reference (FR_UFR1)	<0.003	1.1	1.1	-6.2	-2.6	-0.44	-0.64	-	-	-	-
2017	Q2	Reference (GH_ER2)	<0.003	1.5	1.5	-5.0	0.52	0.29	-1.1	-	-	-	-
2017	Q3	Reference (GH_ER2)	<0.003	1.3	1.3	-5.7	-0.82	0.4	-2.6	-	-	-	-
2017	Q4	Reference (GH_ER2)	<0.003	1.2	1.2	-5.2	-2.2	-0.57	-2.5	-	-	-	-
2018	Q1	Reference (CM_MC1)	<0.003	1.1	1.1	-5.4	-1.7	-0.48	-3.2	-4.8	-2.3	-1.0	-2.1
2018	Q2	Reference (CM_MC1)	<0.003	1.9	1.9	-7.0	4.6	0.43	-1.6	-6.2	3.3	-1.6	-2.1
2018	Q3	Reference (CM_MC1)	0.0047	1.3	1.3	-5.8	0.22	-0.09	-3.5	-5.2	-0.77	-0.43	-2.8
2018	Q4	Reference (CM_MC1)	<0.003	1.2	1.2	-6.5	0.0118	-0.3	-3.3	-5.8	-0.89	-1.3	-3.0
2018	Q1	Reference (FR_UFR1)	<0.003	1.1	1.1	-5.9	-3.4	-0.68	-0.6	-5.5	-3.2	-0.82	0.68
2018	Q2	Reference (FR_UFR1)	<0.003	2.1	2.1	-7.7	4.4	0.97	1.11	-7.0	3.5	-1.2	0.27
2018	Q3	Reference (FR_UFR1)	<0.003	1.2	1.2	-5.7	-1.5	0.59	-1.0	-5.2	-1.9	-0.48	0.03
2018	Q4	Reference (FR_UFR1)	<0.003	1.2	1.2	-6.0	-2.9	-0.36	-1.1	-5.7	-3.0	-0.71	0.25
2018	Q1	Reference (GH_ER2)	<0.003	1.3	1.3	-5.3	-2.8	-0.99	-2.2	-5.0	-3.1	-1.0	-1.5
2018	Q2	Reference (GH_ER2)	0.0036	2.5	2.5	-4.9	4.9	1.2	-0.18	-4.5	3.6	-0.14	-0.57
2018	Q3	Reference (GH_ER2)	0.0073	4.9	4.9	-4.2	8.0	-0.33	-0.58	-4.2	7.0	-0.34	-1.9
2018	Q4	Reference (GH_ER2)	<0.003	1.4	1.4	-5.3	-1.4	-0.19	-2.3	-4.8	-1.9	-0.79	-1.5
2018	Q2	Reference (LC_SLC)	<0.003	1.3	1.3	-5.4	-0.46	0.15	-0.74	-5.0	-0.86	-0.9	-0.4
2018	Q3	Reference (LC_SLC)	0.0036	1.4	1.4	-4.1	-2.3	-0.49	-0.98	-3.9	-2.5	-0.58	-0.22
2018	Q4	Reference (LC_SLC)	<0.003	1.6	1.6	-3.9	-2.9	-0.69	-0.99	-3.8	-2.9	-0.67	-0.149
Tests categorized as no adverse response													
2015	Q1	EV MC2	0.0032	6.7	6.1	4.3	0.3	-2.7	-2.6	-	-	-	-
2015	Q2	EV MC2	0.003	2.7	2.7	-4.6	0.82	-0.96	1.9	-	-	-	-
2015	Q3	EV MC2	<0.003	3.2	3.0	-0.61	-0.075	-0.093	2.1	-	-	-	-
2015	Q4	EV MC2	<0.003	3.1	2.8	0.36	-2.6	-0.3	1.9	-	-	-	-
2015	Q1	EV MC2	<0.003	4.3	3.8	1.9	-0.61	-5.0	2.3	-	-	-	-
2015	Q2	EV MC2	<0.003	5.1	4.0	4.3	-2.6	0.4	0.36	-	-	-	-
2015	Q3	FR FRCP1	<0.003	5.9	4.2	0.71	1.4	1.3	2.8	-	-	-	-
2015	Q4	FR FRCP1	<0.003	6.7	4.6	3.8	-1.6	0.84	2.2	-	-	-	-
2015	Q1	GH ERC	0.0041	3.1	3.1	-3.9	-0.18	-4.7	-0.41	-	-	-	-
2015	Q2	GH ERC	<0.003	2.9	2.9	-4.3	1.7	-0.2	-0.002	-	-	-	-
2015	Q3	GH ERC	<0.003	2.6	2.6	-4.9	0.76	-1.6	-0.76	-	-	-	-
2015	Q4	GH ERC	<0.003	2.5	2.5	-4.3	-2.9	-1.8	-1.3	-	-	-	-
2015	Q1	GH FR1	<0.003	6.1	5.7	2.6	-2.9	-3.7	2.4	-	-	-	-
2015	Q2	GH FR1	<0.003	5.6	3.8	0.45	-0.31	0.72	2.6	-	-	-	-
2015	Q3	GH FR1	<0.003	6.4	3.8	1.6	-3.9	-0.36	2.0	-	-	-	-
2015	Q4	LC LCDSSLCC	0.0039	9.6	5.6	4.9	-2.9	-4.1	2.6	-	-	-	-
2016	Q1	EV MC2	<0.003	4.7	4.3	1.8	3.4	2.6	-2.6	-	-	-	-
2016	Q2	EV MC2	<0.003	2.9	2.8	-1.2	2.4	0.10	3.7	-	-	-	-
2016	Q3	EV MC2	<0.003	2.5	2.4	-0.51	0.91	1.4	2.1	-	-	-	-
2016	Q4	EV MC2	<0.003	2.6	2.4	0.025	-0.099	1.4	2.1	-	-	-	-
2016	Q1	EV MC2	<0.003	4.5	3.6	3.4	-2.3	-0.36	1.8	-	-	-	-
2016	Q2	EV MC2	0.0047	4.3	4.4	-3.8	9.2	-0.24	3.0	-	-	-	-
2016	Q3	EV MC2	0.0031	4.4	3.3	4.0	-2.2	1.1	0.98	-	-	-	-
2016	Q4	EV MC2	<0.003	3.0	3.0	-3.2	6.4	0.98	1.8	-	-	-	-
2016	Q1	FR FRCP1	<0.003	7.0	3.9	3.4	-2.5	1.8	2.2	-	-	-	-
2016	Q2	GH ERC	<0.003	2.7	2.6	-3.5	-3.4	-2.5	-0.73	-	-	-	-
2016	Q3	GH ERC	0.0035	3.2	3.3	-3.8	5.1	0.27	0.72	-	-	-	-
2016	Q4	GH ERC	<0.003	1.3	1.4	-5.3	-1.7	-0.58	-1.7	-	-	-	-
2016	Q1	GH ERC	<0.003	2.0	2.0	-4.5	-1.4	-0.51	-1.7	-	-	-	-
2016	Q2	GH FR1	<0.003	5.3	2.9	1.3	-2.9	1.1	2.0	-	-	-	-
2016	Q3	GH FR1	<0.003	5.6	3.4	2.0	-2.7	1.1	1.8	-	-	-	-
2016	Q4	GH FR1	<0.003	5.6	3.4	2.0	-2.7	1.1	1.8	-	-	-	-
2016	Q1	LC LCDSSLCC	0.0034	7.4	4.4	5.9	-3.8	-0.49	2.7	-	-	-	-
2016	Q2	LC LCDSSLCC	0.0075	5.9	3.9	4.0	-3.0	0.67	1.3	-	-	-	-
2016	Q3	LC LCDSSLCC	0.0078	5.2	3.5	3.5	-2.0	1.3	1.6	-	-	-	-
2016	Q4	LC LCDSSLCC	0.004	9.5	8.3	7.3	-0.46	2.8	-5.2	-	-	-	-
2017	Q1	CM MC2	0.0071	9.3	8.8	5.9	5.2	4.2	-4.9	-	-	-	-
2017	Q2	CM MC2	0.0059	10	9.6	7.1	3.9	3.9	-6.0	-	-	-	-
2017	Q3	CM MC2	<0.003	11	10.0	5.7	1.3	3.0	-6.6	-	-	-	-
2017	Q4	CM MC2	<0.003	7.0	6.0	6.3	-0.25	2.2	-4.6	-	-	-	-
2017	Q1	EV MC2	<0.003	2.3	2.1	-0.38	-1.9	0.54	1.6	-	-	-	-
2017	Q2	EV MC2	0.0044	2.4	2.3	-0.82	3.0	2.2	2.0	-	-	-	-
2017	Q3	EV MC2	<0.003	2.1	1.9	-0.71	-1.4	0.77	1.5	-	-	-	-
2017	Q4	EV MC2	<0.003	2.1	1.9	-0.84	-1.6	0.99	1.06	-	-	-	-
2017	Q1	EV MC2	<0.003	3.2	2.8	1.7	-1.7	1.2	0.47	-	-	-	-
2017	Q2	EV MC2	<0.003	2.8	2.9	-1.9	5.8	2.3	1.07	-	-	-	-
2017	Q3	EV MC2	<0.003	2.6	2.2	1.5	-1.4	1.2	0.16	-	-	-	-
2017	Q4	EV MC2	<0.003	2.5	2.2	0.108	-1.4	0.58	-0.5	-	-	-	-
2017	Q1	FR FRCP1	<0.003	13	7.3	7.1	-2.0	2.7	1.6	-	-	-	-
2017	Q2	FR FRCP1	0.0098	9.1	6.1	3.5	9.3	2.1	3.4	-	-	-	-
2017	Q3	FR FRCP1	<0.003	5.9	3.6	3.1	-1.3	3.1	2.0	-	-	-	-
2017	Q4	FR FRCP1	<0.003	9.6	5.4	5.4	-2.7	2.1	1.7	-	-	-	-
2017	Q1	GH ERC	<0.003	1.4	1.4	-4.4	-3.4	-1.4	-1.9	-	-	-	-
2017	Q2	GH ERC	<0.003	1.8	1.8	-3.8	0.93	0.46	-0.56	-	-	-	-
2017	Q3	GH ERC	<0.003	1.4	1.4	-5.1	0.12	1.0	-1.6	-	-	-	-
2017	Q4	GH ERC	<0.003	1.4	1.4	-4.6	-2.3	-0.48	-2.0	-	-	-	-
2017	Q1	GH FR1	<0.003	6.5	3.0	1.8	-3.9	0.88	1.8	-	-	-	-
2017	Q2	GH FR1	0.0072	7.5	5.8	3.5	8.8	1.6	4.2	-	-	-	-
2017	Q3	GH FR1	<0.003	5.6	3.2	1.7	-2.6	2.2	1.2	-	-	-	-
2017	Q4	GH FR1	<0.003	5.8	3.0	1.8	-2.6	1.7	1.7	-	-	-	-
2017	Q1	LC LCDSSLCC	0.0042	7.1	3.9	5.3	-2.9	1.4	1.3	-	-	-	-
2017	Q2	LC LCDSSLCC	0.012	8.3	4.5	5.8	-1.2	2.5	1.1	-	-	-	-
2017	Q3	LC LCDSSLCC	0.0098	6.8	4.5	4.8	-1.5	1.1	1.1	-	-	-	-
2017	Q4	LC LCDSSLCC	0.0076	6.6	4.2	4.8	-1.8	1.4	1.0	-	-	-	-
2018	Q1	CM MC2	<0.003	6.9	6.0	6.4	-1.0	2.2	-4.4	5.5	-1.9	2.8	-2.2
2018	Q2	CM MC2	0.012	8.9	8.6	5.7	5.7	3.6	-4.4	5.0	3.6	4.2	-3.2
2018	Q3	CM MC2	<0.003	18	17	10	0.78	2.8	-8.5	9.0	-1.0	4.1	-6.5

Appendix D: Concentration-Response Analysis

Table D-3: *H. azteca* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	Mean Survival (Control Normalized)	Mean Dry Weight (Control Normalized)	ALKALINITY, TOTAL (As CaCO ₃), lab measured, -N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADMIUM-D-mg/l	CADMIUM-T-mg/l	CALCIUM-T-mg/l	CARBON, DISSOLVED ORGANIC-D-mg/l	CHLORIDE-D-mg/l	
Reference																										
2015	Q1	Reference (FR UFR1)	72	82	139	0.0033	0.024	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00032	0.00032	0.01	0.01	0.05	0.000097	0.000011	52	1.3	1.0	
2015	Q2	Reference (FR UFR1)	104	92	116	0.0048	0.049	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000057	0.000006	37	1.8	1.0	
2015	Q3	Reference (FR UFR1)	96	70	160	0.0003	0.0086	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000081	0.000012	58	1.0	1.0	
2015	Q4	Reference (FR UFR1)	94	104	146	0.0003	0.0056	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000065	0.0000085	56	0.55	1.0	
2016	Q1	Reference (FR UFR1)	100	95	141	0.0039	0.0055	<-0.0001	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	<-0.0001	<-0.0001	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000055	0.0000082	57	0.52	0.92	
2016	Q2	Reference (FR UFR1)	98	105	114	0.0059	0.054	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000056	0.000012	38	1.7	0.1	
2016	Q3	Reference (FR UFR1)	102	110	158	<-0.0003	0.0071	<-0.0001	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000078	0.0000098	52	0.84	0.13	
2016	Q4	Reference (FR UFR1)	96	113	141	<-0.0002	0.042	<-0.0001	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000064	0.0000092	47	1.2	0.19	
2017	Q3	Reference (CM MC1)	80	65	142	0.0029	0.013	<-0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<-0.00002	<-0.00002	0.016	0.015	<-0.05	0.000093	0.000012	39	1.3	<-0.5	
2017	Q4	Reference (CM MC1)	98	71	136	<-0.0003	0.0054	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	0.013	0.014	<-0.05	0.000073	0.0000088	42	1.3	<-0.5	
2017	Q1	Reference (FR UFR1)	100	85	141	0.001	0.005	<-0.0001	0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000085	0.000011	49	0.72	<-0.5	
2017	Q2	Reference (FR UFR1)	100	101	119	0.032	0.09	<-0.0001	0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000012	0.000018	33	3.0	<-0.5	
2017	Q3	Reference (FR UFR1)	88	101	147	0.0026	0.0058	<-0.0001	0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000082	0.000012	50	1.1	0.21	
2017	Q4	Reference (FR UFR1)	102	89	144	<-0.0003	0.0033	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	0.052	0.000068	0.00001	51	0.73	<-0.5	
2017	Q2	Reference (GH ER2)	109	92	151	0.0032	0.14	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000081	0.000025	49	1.2	0.42	
2017	Q3	Reference (GH ER2)	83	94	136	0.0029	0.014	<-0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000073	0.0000088	45	0.78	0.32	
2017	Q4	Reference (GH ER2)	98	75	147	<-0.0003	0.0067	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000053	0.000008	43	0.67	<-0.5	
2018	Q1	Reference (CM MC1)	100	71	160	<-0.0003	0.0039	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	0.013	0.014	<-0.05	0.000071	0.0000079	42	0.89	0.56	
2018	Q2	Reference (CM MC1)	102	126	98	0.026	0.37	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	0.013	0.011	<-0.05	0.000011	0.000033	28	3.7	<-0.5	
2018	Q3	Reference (CM MC1)	95	137	148	0.003	0.016	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	0.016	0.017	<-0.05	0.000011	0.000011	41	1.2	0.43	
2018	Q4	Reference (CM MC1)	94	135	145	<-0.0003	0.0031	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	0.014	0.014	<-0.05	0.000072	0.0000087	41	0.72	0.58	
2018	Q1	Reference (FR UFR1)	98	79	143	0.0071	0.013	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0003	<-0.0003	<-0.0000625	<-0.0000625	<-0.0125	<-0.01	<-0.05	0.000083	0.00001	52	0.78	<-0.5	
2018	Q2	Reference (FR UFR1)	102	121	99	0.012	0.21	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.0000625	<-0.0000625	<-0.0000625	<-0.01	<-0.01	<-0.05	0.000096	0.000034	31	2.6	<-0.5
2018	Q3	Reference (FR UFR1)	107	180	153	<-0.0003	0.0046	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000075	0.000011	48	1.1	0.31	
2018	Q4	Reference (FR UFR1)	94	56	150	<-0.0003	0.0035	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000085	0.000012	52	0.59	<-0.5	
2018	Q1	Reference (GH ER2)	96	79	155	<-0.0003	<-0.0003	<-0.0001	0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.0000625	<-0.0000625	<-0.0000625	<-0.01	<-0.01	<-0.05	0.000058	0.000011	50	0.58	0.27
2018	Q2	Reference (GH ER2)	104	118	139	0.0053	0.87	<-0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	0.00072	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000089	0.000015	51	1.9	0.51	
2018	Q3	Reference (GH ER2)	107	143	135	<-0.0003	0.24	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	0.00032	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000064	0.000047	44	0.97	0.4	
2018	Q4	Reference (GH ER2)	96	71	149	<-0.0003	0.0078	<-0.0001	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000065	0.0000082	45	0.56	<-0.5	
2018	Q2	Reference (LC SLC)	104	126	117	0.0043	0.007	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000065	0.000025	36	2.5	<-0.5	
2018	Q3	Reference (LC SLC)	70	117	141	<-0.0003	0.0053	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000011	0.000015	49	0.88	0.44	
2018	Q4	Reference (LC SLC)	98	35	145	<-0.0003	<-0.0003	<-0.0001	<-0.0001	0.0001	0.0001	0.0001	0.0001	<-0.0002	<-0.0002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000094	0.00001	55	<-0.5	0.64	
Tests categorized as no adverse response																										
2015	Q1	CM MC2	94	73	176	0.0063	0.2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00032	0.00032	0.019	0.021	0.06	0.00002	0.000034	82	1.6	2.4	
2015	Q2	CM MC2	100	87	136	0.012	0.66	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.024	0.017	0.05	0.000035	0.000088	60	1.5	1.4	
2015	Q4	CM MC2	102	79	195	0.0031	0.05	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.024	0.027	0.25	0.000012	0.000019	107	1.2	3.4	
2015	Q1	FR FRCP1	94	82	226	0.003	0.024	0.00036	0.00037	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00032	0.00032	0.013	0.013	0.27	0.000037	0.000074	148	1.2	2.4	
2015	Q3	FR FRCP1	88	77	207	0.003	0.0082	0.00026	0.00029	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.013	0.014	0.25	0.000043	0.000052	123	0.92	1.6	
2015	Q4	FR FRCP1	102	92	213	0.0032	0.0046	0.00025	0.00028	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.00005	0.011	0.012	0.25	0.000043	0.000058	141	0.78	2.4	
2015	Q1	GH FR1	96	90	204	0.003	0.069	0.0002	0.00021	0.0001	0.0001	0.0														

Appendix D: Concentration-Response Analysis

Table D-3: *H. azteca* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l	COBALT-T-mg/l	CONDUCTIVITY, LAB-N-us/cm	COPPER-D-mg/l	COPPER-T-mg/l	FLUORIDE-D-mg/l	Hardness, Total or Dissolved CaCO ₃ -N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l	MANGANESE-D-mg/l	MANGANESE-T-mg/l	MERCURY-T-mg/l	MERCURY-T-mg/l	MOLYBDENUM-D-mg/l	MOLYBDENUM-T-mg/l	
Reference																									
2015	Q1	Reference (FR UFR1)	0.00013	0.00019	0.0001	0.0001	328	0.0005	0.0005	0.14	180	0.01	0.017	0.00005	0.00005	0.0013	0.0013	13	0.00062	0.001	0.000009	0.000009	0.00057	0.00057	
2015	Q2	Reference (FR UFR1)	0.00011	0.00026	0.0001	0.0001	234	0.0005	0.0005	0.15	131	0.01	0.036	0.00005	0.00005	0.0011	0.0012	9.2	0.00069	0.0022	0.000005	0.000005	0.00056	0.0006	
2015	Q3	Reference (FR UFR1)	0.00001	0.00014	0.0001	0.0001	348	0.0005	0.0005	0.15	199	0.01	0.011	0.00005	0.00005	0.0018	0.0021	14	0.00068	0.0013	0.000005	0.000005	0.00064	0.00065	
2015	Q4	Reference (FR UFR1)	0.00012	0.00018	0.0001	0.0001	356	0.0005	0.0005	0.15	193	0.01	0.01	0.00005	0.00005	0.0014	0.0013	14	0.00016	0.00031	0.000005	0.000005	0.00061	0.00059	
2016	Q1	Reference (FR UFR1)	0.00011	0.00018	<0.0001	<0.0001	356	<0.0005	<0.0005	0.15	195	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0017	14	0.0002	0.00036	<0.000005	<0.000005	0.00057	0.00059	
2016	Q2	Reference (FR UFR1)	0.00013	0.0002	<0.0001	<0.0001	243	<0.0005	<0.0005	0.16	133	<0.01	0.043	<0.00005	0.000053	0.0012	0.0013	10.0	0.00032	0.0016	<0.000005	0.00000595	0.00063	0.00065	
2016	Q3	Reference (FR UFR1)	0.00017	0.00057	<0.0001	<0.0001	193	<0.0005	<0.0005	0.17	101	<0.01	0.025	0.011	<0.00005	0.00018	0.0017	14	0.00019	0.00071	<0.000005	<0.000005	0.00063	0.00064	
2016	Q4	Reference (FR UFR1)	0.00011	0.00017	<0.0001	<0.0001	319	<0.0005	<0.0005	0.16	171	<0.01	0.019	<0.00005	<0.00005	0.0013	0.0016	12	0.00017	0.00056	<0.000005	0.00000568	0.00057	0.00059	
2017	Q3	Reference (CM MC1)	0.00013	0.00025	<0.0001	<0.0001	269	<0.000425	<0.0005	0.055	146	<0.01	0.016	<0.00005	<0.00005	0.0048	0.0045	11	0.00011	0.00054	<0.000005	0.00000054	0.00089	0.0009	
2017	Q4	Reference (CM MC1)	0.00017	0.00019	<0.0001	<0.0001	273	<0.0005	<0.0005	0.052	143	<0.01	<0.01	<0.00005	<0.00005	0.0046	0.0048	11	0.00013	0.00024	<0.000005	0.00000054	0.00085	0.00087	
2017	Q1	Reference (FR UFR1)	0.0001	0.00013	<0.0001	<0.0001	338	<0.0002	<0.0005	0.14	182	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0015	15	<0.0001	0.00027	<0.000005	<0.000005	0.0006	0.00059	
2017	Q2	Reference (FR UFR1)	0.00013	0.00046	<0.0001	<0.0001	247	0.00031	0.00055	0.11	126	0.023	0.082	<0.00005	0.000065	0.0011	0.0012	9.4	<0.00005	0.00026	<0.000005	0.0000022	0.00049	0.00052	
2017	Q3	Reference (FR UFR1)	0.00011	0.00021	<0.0001	<0.0001	333	<0.000425	<0.0005	0.15	178	<0.01	0.01	<0.00005	<0.00005	0.0018	0.0017	13	0.00021	0.00075	<0.000005	<0.000005	0.00063	0.00067	
2017	Q4	Reference (FR UFR1)	0.0001	0.00014	<0.0001	<0.0001	333	<0.0005	<0.0005	0.11	183	<0.01	0.01	<0.00005	<0.00005	0.0017	0.0017	14	0.00013	0.0005	<0.000005	<0.000005	0.00057	0.00058	
2017	Q2	Reference (GH ER2)	0.0002	0.00055	<0.0001	0.00011	307	<0.0005	0.00051	0.15	175	<0.01	0.15	<0.00005	0.00011	0.0017	0.0019	12	0.00078	0.0088	<0.000005	0.0000011	0.00092	0.00093	
2017	Q3	Reference (GH ER2)	0.00022	0.00024	<0.0001	<0.0001	282	<0.000425	<0.0005	0.16	155	<0.01	0.02	<0.00005	<0.00005	0.0016	0.0018	10	0.00021	0.00037	<0.000005	0.00000053	0.00099	0.001	
2017	Q4	Reference (GH ER2)	0.00025	0.00029	<0.0001	<0.0001	280	<0.0005	<0.0005	0.13	156	<0.01	0.011	<0.00005	<0.00005	0.0018	0.0017	11	0.00045	0.0016	<0.000005	<0.000005	0.001	0.001	
2018	Q1	Reference (CM MC1)	0.00015	0.0002	<0.0001	<0.0001	307	<0.0005	<0.0005	0.057	153	<0.01	<0.01	<0.00005	<0.00005	0.0045	0.0048	11	<0.0001	0.00017	<0.000005	<0.000005	0.00088	0.00093	
2018	Q2	Reference (CM MC1)	0.00017	0.00057	<0.000125	<0.000125	193	<0.0005	0.00083	0.059	101	0.025	0.34	<0.000625	0.00025	0.0027	0.0031	7.6	0.00098	0.0087	<0.000005	0.0000027	0.00087	0.00094	
2018	Q3	Reference (CM MC1)	0.00018	0.00024	<0.0001	<0.0001	277	<0.0005	0.00051	0.079	154	<0.01	0.013	<0.00005	<0.00005	0.0049	0.0051	11	0.00019	0.0007	<0.000005	<0.000005	0.00095	0.00091	
2018	Q4	Reference (CM MC1)	0.00019	0.00019	<0.0001	<0.0001	287	<0.0005	<0.0005	0.072	153	<0.01	<0.01	<0.00005	<0.00005	0.0044	0.0043	11	0.00034	0.00042	<0.000005	<0.000005	0.00087	0.00089	
2018	Q1	Reference (FR UFR1)	<0.000125	0.00014	<0.000125	<0.0001	357	0.00033	<0.0005	0.12	192	<0.0125	0.02	<0.000625	<0.00005	0.0016	0.0015	14	0.00016	0.00053	<0.000005	0.00000052	0.00057	0.00062	
2018	Q2	Reference (FR UFR1)	0.00011	0.00048	<0.0001	0.00015	207	<0.0005	0.0013	0.12	112	0.011	0.25	<0.00005	0.00018	0.0011	0.0014	8.6	0.00057	0.011	<0.000005	0.0000025	0.00055	0.00056	
2018	Q3	Reference (FR UFR1)	0.00011	0.00011	<0.0001	<0.0001	324	<0.0005	<0.0005	0.17	184	<0.01	<0.01	<0.00005	<0.00005	0.0018	0.0018	13	0.00025	0.00061	<0.000005	<0.000005	0.00064	0.00065	
2018	Q4	Reference (FR UFR1)	0.00012	0.00038	<0.0001	<0.0001	349	<0.0005	<0.0005	0.14	194	<0.01	0.011	<0.00005	<0.00005	0.0016	0.0017	14	<0.0001	0.00037	<0.000005	<0.000005	0.0006	0.00057	
2018	Q1	Reference (GH ER2)	0.00021	0.00027	<0.0001	<0.0001	329	<0.0005	<0.0005	0.16	170	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0016	12	0.0014	0.0015	<0.000005	<0.000005	0.00094	0.001	
2018	Q2	Reference (GH ER2)	0.00016	0.00022	<0.0001	0.00053	279	<0.0005	0.0017	0.15	150	<0.01	1.3	<0.00005	0.00085	0.0016	0.0026	12	0.00069	0.067	<0.000005	0.0000043	0.00091	0.00097	
2018	Q3	Reference (GH ER2)	0.0002	0.00073	<0.0001	0.0002	262	<0.0005	0.00069	0.17	151	<0.01	0.35	<0.00005	0.00029	0.0018	0.002	10	0.00052	0.022	<0.000005	0.00000079	0.001	0.00095	
2018	Q4	Reference (GH ER2)	0.00025	0.00036	<0.0001	<0.0001	304	<0.0005	<0.0005	0.16	169	<0.01	0.013	<0.00005	<0.00005	0.0017	0.0018	12	0.00035	0.0014	<0.000005	<0.000005	0.0011	0.0011	
2018	Q2	Reference (LC SLC)	0.00012	0.0003	<0.0001	<0.0001	243	<0.0005	<0.0005	0.21	134	<0.01	0.07	<0.00005	0.000066	0.0017	0.0019	9.6	0.00016	0.0028	<0.000005	0.0000012	0.00057	0.00058	
2018	Q3	Reference (LC SLC)	0.00013	0.00024	<0.0001	<0.0001	347	<0.0005	<0.0005	0.34	197	<0.01	0.01	<0.00005	<0.00005	0.0032	0.0034	15	<0.0001	0.0034	<0.000005	<0.000005	0.0013	0.0012	
2018	Q4	Reference (LC SLC)	0.00014	0.00029	<0.0001	<0.0001	399	<0.0005	<0.0005	0.37	224	<0.01	<0.01	<0.00005	<0.00005	0.0042	0.004	19	<0.0001	0.0001	<0.000005	<0.000005	0.0014	0.0013	
Tests categorized as no adverse response																									
2015	Q1	CM MC2	0.00015	0.00046	0.00047	0.00072	599	0.0005	0.00062	0.11	223	0.01	0.21	0.00005	0.00014	0.0081	0.0084	33	0.0038	0.011	0.000009	0.000009	0.00092	0.00096	
2015	Q2	CM MC2	0.00023	0.001	0.0003	0.00083	457	0.0005	0.0013	0.099	240	0.015	0.85	0.00005	0.00058	0.0062	0.0069	23	0.0027	0.028	0.000005	0.000007	0.00077	0.00097	
2015	Q4	CM MC2	0.00016	0.00026	0.00051	0.0006	821	0.0005	0.00059	0.11	456	<0.01	0.053	0.00005	0.000063	0.012	0.012	46	0.0039	0.0065	0.000005	0.0000051	0.0011	0.0011	
2015	Q1	FR FRCP1	0.00011	0.00017	0.00012	0.00014	1113	0.0005	0.0005	0.18	679	0.01	0.035	0.00005	0.000053	0.043	0.043	78	0.0069	0.01	0.000009	0.000009	0.002	0.002	
2015	Q3	FR FRCP1	0.0001	0.00014	0.0001	0.0001	925	0.0005	0.0005	0.2	541	0.01	0.019	0.00005	0.00005	0.035	0.036	59	0.0052	0.0071	0.000005	0.000005	0.0015	0.0015	
2015	Q4	FR FRCP1	0.00012	0.00016	0.0001	0.0001	1100	0.0005	0.0005	0.18	650	0.01	0.021	0.00005	0.00005	0.04	0.041	74	0.0076	0.0089	0.000005	0.000005	0.0015	0.0015	
2015	Q1	GH FR1	0.00011	0.00022	0.00011	0.00017	823	0.0005	0.00051	0.15	479	0.01	0.0												

Appendix D: Concentration-Response Analysis

Table D-3: *H. azteca* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	NICKEL-D-mg/l	NICKEL-T-mg/l	NITRATE NITROGEN (NO3) AS N-N-mg/l	NITRITE NITROGEN (NO2) AS N-N-mg/l	NITROGEN, AMMONIA (AS N)-N-mg/l	ORTHO-PHOSPHATE-N-mg/l	pH, LAB-N-ph units	PHOSPHORUS-N-mg/l	POTASSIUM-T-mg/l	SELENIUM-D-ug/l	SELENIUM-T-ug/l	SILVER-D-mg/l	SILVER-T-mg/l	SODIUM-T-mg/l	STRONTIUM-D-mg/l	STRONTIUM-T-mg/l	SULFATE (AS SO4)-D-mg/l	THALLIUM-D-mg/l	THALLIUM-T-mg/l	TIN-D-mg/l	TIN-T-mg/l	TITANIUM-D-mg/l	
Reference																									
2015	Q1	Reference (FR UFR1)	0.0005	0.0005	0.12	0.001	0.005	0.003	8.3	0.005	0.42	0.00072	0.00077	0.00001	0.00001	0.71	0.084	0.085	38	0.00001	0.00001	0.0001	0.0001	0.01	
2015	Q2	Reference (FR UFR1)	0.0005	0.0005	0.03	0.001	0.005	0.003	8.3	0.007	0.36	0.00045	0.0005	0.00001	0.00001	0.58	0.063	0.066	14	0.00001	0.00001	0.0001	0.0001	0.01	
2015	Q3	Reference (FR UFR1)	0.0005	0.0005	0.048	0.001	0.005	0.0036	8.4	0.0033	0.54	0.00049	0.00049	0.00001	0.00001	0.74	0.095	0.097	36	0.00001	0.00016	0.0001	0.0001	0.01	
2015	Q4	Reference (FR UFR1)	0.0005	0.0005	0.074	0.001	0.005	0.0015	8.4	0.0024	0.39	0.00065	0.00067	0.00001	0.00001	0.68	0.092	0.091	47	0.00001	0.00001	0.0001	0.0001	0.01	
2016	Q1	Reference (FR UFR1)	<-0.0005	<-0.0005	0.16	<-0.001	<-0.005	0.0031	8.3	0.0041	0.39	0.00083	0.00081	<-0.00001	<-0.00001	0.71	0.089	0.092	49	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2016	Q2	Reference (FR UFR1)	<-0.0005	<-0.0005	0.018	<-0.001	<-0.005	0.0025	8.3	0.0047	0.34	0.00051	0.00055	<-0.00001	<-0.00001	0.63	0.085	0.087	15	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2016	Q3	Reference (FR UFR1)	<-0.0005	<-0.0005	0.043	<-0.001	<-0.005	0.0027	8.3	0.0051	0.46	0.0006	0.00064	<-0.00001	<-0.00001	0.74	0.098	0.098	38	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2016	Q4	Reference (FR UFR1)	<-0.0005	<-0.0005	0.097	<-0.001	<-0.005	0.0024	8.3	0.0045	0.37	0.00066	0.00066	<-0.00001	<-0.00001	0.68	0.089	0.089	38	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q3	Reference (CM MC1)	<-0.0005	<-0.0005	0.015	<-0.001	0.0063	0.0049	8.3	0.0021	0.49	0.00018	0.00023	<-0.00001	<-0.00001	2.4	0.15	0.15	13	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q4	Reference (CM MC1)	<-0.0005	<-0.0005	0.015	<-0.001	0.0075	0.0035	8.2	0.0028	0.51	0.0002	0.00021	<-0.00001	<-0.00001	3.0	0.16	0.16	14	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q1	Reference (FR UFR1)	<-0.0005	<-0.0005	0.21	0.0012	<-0.005	0.007	8.2	0.012	0.43	0.001	0.00094	<-0.00001	<-0.00001	0.84	0.094	0.092	46	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q2	Reference (FR UFR1)	0.00051	0.00055	0.079	0.0022	0.007	0.0074	8.3	0.018	0.36	0.00068	0.00068	<-0.00001	0.000013	0.6	0.066	0.064	18	<-0.00001	0.000011	0.0001	<-0.0001	<-0.01	
2017	Q3	Reference (FR UFR1)	<-0.0005	<-0.0005	0.012	<-0.001	0.0063	0.0025	8.4	0.0042	0.46	0.00055	0.00059	<-0.00001	<-0.00001	0.69	0.096	0.096	36	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q4	Reference (FR UFR1)	<-0.0005	<-0.0005	0.024	0.001	0.0052	0.0014	8.4	0.0028	0.4	0.00059	0.00061	<-0.00001	<-0.00001	0.7	0.098	0.099	46	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q2	Reference (GH ER2)	<-0.0005	0.00059	0.12	<-0.001	<-0.005	0.0011	8.3	0.009	0.43	0.00089	0.00088	<-0.00001	<-0.00001	0.79	0.21	0.21	18	<-0.00001	0.00001	<-0.0001	<-0.0001	<-0.01	
2017	Q3	Reference (GH ER2)	<-0.0005	<-0.0005	0.04	<-0.001	0.0055	0.0011	8.2	0.004	0.38	0.00065	0.00064	<-0.00001	<-0.00001	0.6	0.21	0.21	16	<-0.00001	<-0.00001	0.0001	<-0.0001	<-0.01	
2017	Q4	Reference (GH ER2)	<-0.0005	<-0.0005	0.047	<-0.001	0.0074	<-0.001	8.4	0.0015	0.37	0.00083	0.00081	<-0.00001	<-0.00001	0.7	0.2	0.2	19	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q1	Reference (CM MC1)	<-0.0005	<-0.0005	0.041	<-0.001	0.0089	0.0027	8.3	0.004	0.45	0.00028	0.00028	<-0.00001	<-0.00001	3.4	0.16	0.17	18	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q2	Reference (CM MC1)	<-0.00025	0.00079	0.093	<-0.001	0.0082	0.0044	8.2	0.02	0.5	0.0002	0.00022	<-0.000125	<-0.00001	1.5	0.093	0.093	6.7	<-0.000125	0.000025	<-0.000125	<-0.0001	<-0.01	
2018	Q3	Reference (CM MC1)	<-0.0005	0.00055	0.017	<-0.001	0.016	0.0044	8.3	0.0056	0.5	0.00018	0.0002	<-0.00001	<-0.00001	2.9	0.16	0.15	13	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q4	Reference (CM MC1)	<-0.0005	<-0.0005	0.048	<-0.001	0.0074	0.0035	8.2	0.0044	0.44	0.00025	0.00029	<-0.00001	<-0.00001	3.4	0.15	0.15	18	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q1	Reference (FR UFR1)	<-0.00025	<-0.0005	0.19	<-0.001	0.0077	0.003	8.3	0.0045	0.37	0.0009	0.00089	<-0.000125	<-0.00001	0.79	0.096	0.091	48	<-0.000125	<-0.00001	<-0.000125	<-0.0001	<-0.01	
2018	Q2	Reference (FR UFR1)	<-0.0005	0.00074	0.089	<-0.001	0.0079	0.007	8.3	0.031	0.44	0.00059	0.00053	<-0.00001	0.000016	0.53	0.063	0.06	11	<-0.00001	0.000012	<-0.00001	<-0.0001	<-0.01	
2018	Q3	Reference (FR UFR1)	<-0.0005	<-0.0005	0.01	<-0.001	0.027	0.002	8.4	0.0045	0.44	0.00057	0.00059	<-0.00001	<-0.000125	0.67	0.1	0.096	36	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q4	Reference (FR UFR1)	<-0.0005	0.0005	0.21	<-0.001	0.0027	0.0053	8.3	0.0058	0.38	0.00093	0.00084	<-0.00001	<-0.00001	0.74	0.11	0.097	48	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q1	Reference (GH ER2)	<-0.0005	0.00064	0.1	<-0.001	<-0.005	0.0011	8.3	0.002	0.31	0.001	0.0011	<-0.00001	<-0.00001	0.74	0.2	0.22	23	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q2	Reference (GH ER2)	<-0.0005	0.00026	0.13	<-0.001	0.0093	0.0029	8.4	0.14	0.78	0.00078	0.00082	<-0.00001	0.000027	0.72	0.19	0.2	15	<-0.00001	0.000043	<-0.0001	<-0.0001	<-0.01	
2018	Q3	Reference (GH ER2)	<-0.0005	0.00094	0.036	0.0025	0.018	0.0022	8.3	0.01	0.43	0.00067	0.00066	<-0.00001	0.000011	0.61	0.21	0.2	17	<-0.00001	0.000015	<-0.0001	<-0.0001	<-0.01	
2018	Q4	Reference (GH ER2)	<-0.0005	<-0.0005	0.095	<-0.001	0.032	0.0017	8.3	0.0063	0.33	0.0011	0.0011	<-0.00001	<-0.00001	0.72	0.22	0.22	23	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q2	Reference (LC SLC)	<-0.0005	0.00057	0.11	<-0.001	0.0086	0.0023	8.3	0.016	0.33	0.00058	0.00056	<-0.000125	<-0.00001	0.57	0.083	0.081	14	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q3	Reference (LC SLC)	<-0.0005	0.00055	0.088	<-0.001	0.0089	0.0017	8.4	0.0029	0.35	0.0013	0.0014	<-0.00001	<-0.00001	0.85	0.15	0.15	51	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
2018	Q4	Reference (LC SLC)	<-0.0005	<-0.0005	0.14	<-0.001	0.016	0.0025	8.2	0.003	0.0019	0.0017	0.0017	<-0.00001	<-0.00001	1.2	0.19	0.18	74	<-0.00001	<-0.00001	<-0.0001	<-0.0001	<-0.01	
Tests categorized as no adverse response																									
2015	Q1	CM MC2	0.0061	0.0079	1.6	0.01	0.0079	0.0015	8.0	0.014	1.2	0.0043	0.0043	0.00001	0.00001	6.9	0.22	0.23	159	0.00001	0.000017	0.0001	0.0001	0.01	
2015	Q2	CM MC2	0.006	0.0081	1.1	0.0029	0.0068	0.0017	8.4	0.062	1.1	0.0039	0.0039	0.00001	0.000013	3.9	0.15	0.16	103	0.00001	0.000034	0.0001	0.0001	0.01	
2015	Q4	CM MC2	0.0087	0.009	2.4	0.034	0.016	0.0012	8.4	0.0081	1.4	0.0052	0.0052	0.00001	0.00001	9.5	0.29	0.29	252	0.000011	0.000012	0.0001	0.0001	0.01	
2015	Q1	FR FRCP1	0.0073	0.0077	15	0.014	0.019	0.001	8.4	0.004	2.2	0.11	0.11	0.00001	0.00001	2.5	0.17	0.17	407	0.000013	0.000013	0.0001	0.0001	0.013	
2015	Q3	FR FRCP1	0.0056	0.0058	10	0.0071	0.0064	0.001	8.4	0.0022	1.9	0.072	0.073	0.00001	0.00001	1.8	0.15	0.15	291	0.000011	0.00001	0.0001	0.0001	0.01	
2015	Q4	FR FRCP1	0.007	0.0072	16	0.0053	0.005	0.001	8.3	0.002	2.0	0.091	0.091	0.00001	0.00001	2.1	0.17	0.17	364	0.00001	0.00001	0.0001	0.0001	0.011	
2015	Q1	GH FR1	0.0037	0.0039	11	0.0038	0.005	0.0014	8.3	0.0061	1.3	0.05	0.049	0.00001	0.00001	2.4	0.15	0.15	230	0.00001	0.00001	0.0001	0.0001	0.012	
2015	Q2	GH FR1	0.0016	0.0018	7.8	0.003	0.0054	0.001	8.4	0.009	1.1	0.03	0.03	0.00001	0.00001	1.6	0.11								

Appendix D: Concentration-Response Analysis

Table D-3: *H. azteca* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	TITANIUM-T-mg/l	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	TOTAL KJELDAHL NITROGEN-N-mg/l	TOTAL ORGANIC CARBON-T-mg/l	TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	TURBIDITY, LAB-N-ntu	URANIUM-D-mg/l	URANIUM-T-mg/l	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l	ZINC-T-mg/l	ΣTU-WQGs	WQGs/Benchmarks	PCA Factor 1 (2015 to 2018)	PCA Factor 2 (2015 to 2018)	PCA Factor 3 (2015 to 2018)	PCA Factor 4 (2015 to 2018)	PCA Factor 5 (2015 to 2018)	PCA Factor 1 (2018)	PCA Factor 2 (2018)	PCA Factor 3 (2018)	PCA Factor 4 (2018)	PCA Factor 5 (2018)		
Reference																												
2015	Q1	Reference (FR UFR1)	0.01	203	0.075	1.1	1.1	0.69	0.0044	0.0044	0.0008	0.0008	0.003	0.0032	2.7	2.7	-5.6	-0.54	4.0	-7.3	-2.5	-	-	-	-	-	-	
2015	Q2	Reference (FR UFR1)	0.01	141	0.094	2.0	2.0	1.4	0.0031	0.0031	0.0005	0.0005	0.003	0.003	2.4	2.4	-7.6	0.53	1.5	-1.5	0.12	-	-	-	-	-	-	
2015	Q3	Reference (FR UFR1)	0.01	221	0.06	0.84	1.0	0.24	0.0043	0.0044	0.0005	0.0005	0.003	0.003	2.2	2.2	-5.3	-1.9	1.2	-1.7	0.31	-	-	-	-	-	-	
2015	Q4	Reference (FR UFR1)	0.01	217	0.065	0.6	1.0	0.22	0.0045	0.0045	0.0005	0.0005	0.003	0.003	2.3	2.3	-5.9	-3.3	1.1	-1.9	0.19	-	-	-	-	-	-	
2016	Q1	Reference (FR UFR1)	0.01	237	0.055	0.53	<1	0.2	0.0045	0.0005	<0.0005	<0.0005	<0.003	<0.003	1.8	1.8	-5.9	-3.4	0.92	-1.4	0.019	-	-	-	-	-	-	
2016	Q2	Reference (FR UFR1)	<0.01	147	0.077	2.0	1.5	0.82	0.0032	0.0033	<0.0005	<0.0005	<0.003	<0.003	1.5	1.5	-8.0	-0.03	0.62	-0.29	-0.13	-	-	-	-	-	-	
2016	Q3	Reference (FR UFR1)	<0.01	218	0.07	0.97	1.7	0.27	0.0045	0.0045	<0.0005	<0.0005	<0.003	<0.003	1.2	1.2	-8.1	-2.8	0.29	0.37	-0.085	-	-	-	-	-	-	
2016	Q4	Reference (FR UFR1)	<0.01	197	0.065	1.3	<1	0.69	0.0043	0.0043	<0.0005	<0.0005	<0.003	<0.003	1.4	1.4	-6.7	-1.4	0.4	0.26	-0.077	-	-	-	-	-	-	
2017	Q3	Reference (CM MC1)	<0.01	162	0.064	1.1	<1	0.37	0.0022	0.0022	<0.0005	<0.0005	<0.0025	<0.003	1.2	1.2	-8.2	-0.39	-3.0	-0.62	0.067	-	-	-	-	-	-	
2017	Q4	Reference (CM MC1)	<0.01	173	0.12	1.2	1.4	0.52	0.0022	0.0023	<0.0005	<0.0005	<0.003	<0.003	1.1	1.1	-6.2	-1.3	-3.0	-0.74	0.016	-	-	-	-	-	-	
2017	Q1	Reference (FR UFR1)	<0.01	195	0.074	0.77	<1	0.27	0.0046	0.0046	<0.0005	<0.0005	<0.001	<0.0037	1.2	1.2	-5.9	-3.2	-0.22	1.2	-1.0	-	-	-	-	-	-	
2017	Q2	Reference (FR UFR1)	<0.01	146	0.12	3.3	3.0	2.6	0.0031	0.0034	0.00051	0.00066	0.0011	<0.003	2.4	2.4	-7.9	4.0	0.61	1.0	-1.9	-	-	-	-	-	-	
2017	Q3	Reference (FR UFR1)	<0.01	201	0.063	1.5	1.1	0.24	0.0043	0.0041	<0.0005	<0.0005	<0.0025	<0.003	1.2	1.2	-6.3	-2.4	0.11	0.45	-0.045	-	-	-	-	-	-	
2017	Q4	Reference (FR UFR1)	<0.01	235	0.071	0.78	1.1	0.36	0.0052	0.0051	<0.0005	<0.0005	<0.003	<0.003	1.1	1.1	-6.0	-3.3	-0.065	-0.034	0.024	-	-	-	-	-	-	
2017	Q2	Reference (GH ER2)	<0.01	182	0.1	1.8	11	5.2	0.0079	0.0082	<0.0005	0.0009	<0.003	<0.003	1.8	1.8	-4.8	1.9	-0.26	0.37	1.1	-	-	-	-	-	-	
2017	Q3	Reference (GH ER2)	<0.01	162	0.067	0.79	1.3	0.62	0.0063	0.0063	<0.0005	<0.0005	<0.0025	<0.003	1.2	1.3	-5.5	-1.7	-1.6	-0.11	0.33	-	-	-	-	-	-	
2017	Q4	Reference (GH ER2)	<0.01	194	0.19	0.69	1.6	0.7	0.0078	0.0078	<0.0005	<0.0005	<0.003	<0.003	1.3	1.3	-5.3	-2.4	-1.7	-0.1	1.0	-	-	-	-	-	-	
2018	Q1	Reference (CM MC1)	<0.01	174	<0.2	0.96	<1	0.16	0.0025	0.0025	<0.0005	<0.0005	<0.003	<0.003	1.1	1.1	-5.6	-2.1	-3.0	-0.5	-0.029	-4.2	-3.4	-1.4	-1.2	-0.4		
2018	Q2	Reference (CM MC1)	<0.01	113	0.12	3.9	12	6.3	0.0014	0.0015	<0.00025	0.00032	<0.00125	0.0033	3.0	3.0	-7.5	8.9	-2.0	-0.68	-6.2	-7.6	6.2	-6.2	0.81	-3.28		
2018	Q3	Reference (CM MC1)	<0.01	175	0.056	1.2	1.2	0.6	0.0025	0.0024	<0.0005	<0.0005	0.001	0.0034	1.2	1.2	-5.9	-0.71	-3.4	-0.49	0.037	-4.8	-2.5	-1.5	-2.0	0.2		
2018	Q4	Reference (CM MC1)	<0.01	172	<0.05	0.79	<1	0.28	0.0024	0.0025	<0.0005	<0.0005	<0.001	<0.003	1.1	1.1	-5.9	-2.2	-3.4	-0.59	-0.82	-4.6	-3.5	-2.0	-1.6	0.4		
2018	Q1	Reference (FR UFR1)	<0.01	206	0.068	0.88	<1	0.31	0.0052	0.0049	<0.00025	0.0005	<0.003	<0.003	1.3	1.3	-5.6	-1.2	-0.62	-0.83	-4.8	-4.3	-1.4	-4.9	2.8	-4.0		
2018	Q2	Reference (FR UFR1)	<0.01	116	0.1	<0.0091	13	5.5	0.0029	0.0031	<0.0005	0.00099	<0.001	0.0031	2.8	2.8	-8.0	6.0	1.1	1.6	-0.13	-8.1	-3.3	0.73	0.75	0.44		
2018	Q3	Reference (FR UFR1)	<0.01	221	0.11	1.3	<1	0.75	0.0049	0.0045	<0.0005	<0.0005	<0.001	<0.003	1.1	1.1	-6.1	-2.4	-0.095	0.84	0.31	-4.8	-3.5	0.47	0.77	-0.24		
2018	Q4	Reference (FR UFR1)	<0.01	228	0.057	0.73	<1	0.51	0.0053	0.005	<0.0005	<0.0005	<0.001	<0.003	1.5	1.5	-6.0	-2.8	-0.49	0.74	-0.4	-4.7	-3.7	-0.0091	0.85	0.14		
2018	Q1	Reference (GH ER2)	<0.01	193	<0.05	0.51	<1	0.12	0.0068	0.0075	<0.0005	<0.0005	<0.003	<0.003	1.3	1.3	-5.1	-2.9	-1.8	-0.48	0.26	-3.8	-3.7	-1.6	-0.31	0.34		
2018	Q2	Reference (GH ER2)	<0.01	169	0.26	4.2	75	54	0.0007	0.00085	<0.0005	0.0043	<0.003	<0.003	6.6	6.6	-3.8	12	1.0	2.6	1.6	-5.3	8.7	2.9	-0.74	3.5		
2018	Q3	Reference (GH ER2)	<0.01	169	0.074	1.1	4.3	0.73	0.0068	0.0007	<0.0005	0.0013	<0.001	0.0041	2.5	2.5	-5.1	3.1	-1.0	0.85	0.87	-4.9	0.91	0.56	-1.0	2.0		
2018	Q4	Reference (GH ER2)	<0.01	174	0.18	0.61	1.0	0.38	0.0081	0.0083	<0.0005	<0.0005	<0.001	0.0039	1.5	1.5	-5.1	-1.9	-2.5	0.73	-0.0046	-3.9	-3.4	-0.48	-0.74	1.74		
2018	Q2	Reference (LC SLC)	<0.01	146	0.12	2.9	5.6	2.2	0.0072	0.0074	<0.0005	0.00054	0.0018	0.0038	1.6	1.6	-7.0	2.2	0.13	1.2	-1.6	-6.3	0.3	-0.45	1.3	0.6		
2018	Q3	Reference (LC SLC)	<0.01	227	0.068	1.2	1.1	0.25	0.0016	0.0016	<0.0005	<0.0005	0.0022	0.003	1.6	1.6	-4.3	-2.6	-0.78	1.3	-0.51	-3.0	-3.5	0.035	0.8	1.44		
2018	Q4	Reference (LC SLC)	<0.01	264	0.11	0.56	<1	0.39	0.0017	0.0017	<0.0005	<0.0005	0.0016	<0.003	1.6	1.6	-3.6	-3.5	-1.3	1.4	-1.3	-2.2	-4.1	-0.39	0.65	2.03		
Tests categorized as no adverse response																												
2015	Q1	CM MC2	0.014	408	0.12	1.9	10	6.1	0.0015	0.0015	0.0008	0.00092	0.003	0.0036	5.7	5.3	2.0	4.9	1.9	-8.5	-0.78	-	-	-	-	-	-	-
2015	Q2	CM MC2	0.018	308	0.18	2.2	32	16	0.0011	0.0011	0.0005	0.0016	0.0035	0.0091	7.0	6.8	-0.19	10	0.57	-1.8	2.0	-	-	-	-	-	-	
2015	Q4	CM MC2	0.012	571	0.14	1.4	4.1	2.0	0.0024	0.0023	0.0005	0.0053	0.003	0.003	6.5	5.8	3.9	1.0	-1.6	-3.2	2.0	-	-	-	-	-	-	
2015	Q1	FR FRCP1	0.014	866	0.05	1.3	1.9	1.3	0.0041	0.0042	0.0008	0.0008	0.003	0.0031	11	6.7	7.0	-0.27	5.8	-7.3	-2.2	-	-	-	-	-	-	
2015	Q3	FR FRCP1	0.01	703	0.13	0.96	1.0	0.23	0.0032	0.0033	0.0005	0.0005	0.003	0.003	8.0	5.2	4.5	-2.4	2.6	-0.26	0.61	-	-	-	-	-	-	
2015	Q4	FR FRCP1	0.011	836	0.1	0.88	1.1	0.37	0.0042	0.0043	0.0005	0.0005	0.003	0.003	10	5.9	5.2	-2.6	3.0	-0.67	0.7	-	-	-	-	-	-	
2015	Q1	GH FR1	0.014	574	0.12	1.9	2.5	3.6	0.0022	0.0023	0.0008	0.00083	0.003	0.003	7.7	4.8	3.2	0.53	6.0	-7.2	-1.7	-	-	-	-	-	-	
2015	Q2	GH FR1	0.01	386	0.073	1.6	4.4	1.8	0.0015	0.0015	0.0005	0.00056	0.003	0.003	5.6	3.8	0.11	-0.2	3.3	-0.5	1.1	-	-	-	-	-	-	
2015	Q3	GH FR1	0.01	508	0.12	0.89	8.3	1.9	0.0018	0.0019	0.0005	0.00051	0.003	0.003	6.4	4.0	1.5	-1.1	2.9	-0.43	0.46	-	-	-	-	-	-	
2015	Q4	GH FR1	0.01	545	0.11	0.7	1.0	0.27	0.002	0.002	0.0005	0.0005	0.003	0.003	8.5	3.8	-1.7	-3.7	2.8	-1.7	0.85	-	-	-	-	-	-	
2016	Q3	CM MC2	<0.01	704	0.14	1.2	1.1	0.43	0.0029	0.0029	<0.0005	<0.0005	<0.003	<0.003	6.1	5.2	4.4	-1.9	-4.0	-1.1	0.48	-	-					

Appendix D: Concentration-Response Analysis

Table D-4: *O. mykiss* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	Mean Survival (Control Normalized)	Mean Viability (Control Normalized)	Mean Length (Control Normalized)	Mean Wet Weight (Control Normalized)	ALKALINITY, TOTAL (As CaCO ₃), lab measured-N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADMIUM-D-mg/l	CADMIUM-T-mg/l
Tests not included in statistical analysis																								
2017	Q4	CM_MC2	23	23	113	128	202	<-0.003	0.0081	0.00025	0.00028	0.00017	0.0002	0.079	0.077	<-0.00002	<-0.00002	<-0.00005	<-0.00005	0.033	0.035	0.099	0.000012	0.000014
2017	Q4	EV_HC1	34	34	90	92	185	<-0.003	0.0055	<-0.0001	0.00011	0.00015	0.00018	0.065	0.062	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.09	0.000016	0.000019
2017	Q4	EV_MC2	24	23	91	102	175	<-0.003	0.0086	<-0.0001	0.00012	0.00015	0.00018	0.11	0.11	<-0.00002	<-0.00002	<-0.00005	<-0.00005	0.012	0.013	<-0.09	0.000026	0.000035
2017	Q4	FR_FRCP1	27	29	96	105	190	<-0.003	0.016	0.00024	0.00026	<-0.0001	0.00013	0.074	0.075	<-0.00002	<-0.00002	<-0.00005	<-0.00005	0.011	0.011	0.29	0.000012	0.000056
2017	Q4	GH_ERC	23	22	91	96	148	<-0.003	0.0044	<-0.0001	<-0.0001	<-0.0001	0.00011	0.057	0.055	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000063	0.000007
2017	Q4	GH_FR1	23	23	92	108	181	<-0.003	0.0055	0.00017	0.00019	0.0001	0.00012	0.11	0.11	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	0.05	0.000017	0.00002
2017	Q4	LC_LCDSSLCC	41	41	108	119	186	<-0.003	0.0043	0.00026	0.00028	0.00011	0.00013	0.079	0.077	<-0.00002	<-0.00002	<-0.00005	<-0.00005	0.013	0.014	0.053	0.000016	0.000017
2017	Q4	Reference (CM_MC1)	35	36	98	103	136	<-0.003	0.0067	<-0.0001	<-0.0001	0.00015	0.00018	0.051	0.051	<-0.00002	<-0.00002	<-0.00005	<-0.00005	0.013	0.014	<-0.09	0.0000077	0.0000086
2017	Q4	Reference (FR_UFR1)	70	74	100	99	144	<-0.003	0.0033	<-0.0001	<-0.0001	<-0.0001	0.00011	0.074	0.073	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	0.052	0.0000068	0.0000098
2017	Q4	Reference (GH_ER2)	57	59	99	98	147	<-0.003	0.0068	<-0.0001	<-0.0001	<-0.0001	0.00011	0.048	0.047	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000052	0.0000075
Reference																								
2015	Q2	Reference (FR_UFR1)	91	89	98	100	118	0.0075	0.059	0.0001	0.0001	0.0001	0.00013	0.043	0.043	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.0000066	0.0000099
2015	Q4	Reference (FR_UFR1)	90	90	100	102	146	0.003	0.0056	0.0001	0.0001	0.0001	0.00011	0.073	0.073	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.0000065	0.0000085
2015	Q2	Reference (GH_ER2)	61	62	102	106	150	0.003	0.082	0.0001	0.0001	0.00011	0.00016	0.044	0.046	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.0000056	0.000017
2015	Q4	Reference (GH_ER2)	94	94	97	147	0.003	0.014	0.0001	0.0001	0.0001	0.00012	0.047	0.048	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.0000051	0.0000074	
2016	Q2	Reference (FR_UFR1)	84	81	103	103	114	0.0059	0.054	<-0.0001	<-0.0001	0.00011	0.00012	0.042	0.043	<-0.00004	<-0.00004	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000006	0.000012
2016	Q4	Reference (FR_UFR1)	91	91	101	103	141	0.0082	0.042	<-0.0001	<-0.0001	<-0.0001	0.00012	0.064	0.063	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000064	0.0000092
2016	Q2	Reference (GH_ER2)	103	101	104	103	141	0.0032	0.14	<-0.0001	<-0.0001	0.0001	0.00019	0.041	0.042	<-0.00004	<-0.00004	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000059	0.00002
2016	Q4	Reference (GH_ER2)	96	97	101	103	146	<-0.003	0.0076	<-0.0001	<-0.0001	0.0001	0.00014	0.045	0.045	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000055	0.0000077
2017	Q2	Reference (FR_UFR1)	79	87	110	111	113	0.0056	0.16	<-0.0001	0.00011	0.00012	0.0002	0.039	0.04	<-0.00002	0.000021	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000094	0.000025
2017	Q2	Reference (FR_UFR1)	100	106	103	108	143	0.0047	0.71	<-0.0001	0.00011	0.00013	0.00063	0.043	0.053	<-0.00002	0.000059	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000008	0.000012
2018	Q2	Reference (CM_MC1)	104	107	105	105	92	0.025	0.33	<-0.00012	<-0.0001	0.00023	0.00037	0.028	0.029	<-0.000024	0.000023	<-0.00006	<-0.00006	<-0.012	0.01	<-0.05	0.000012	0.000033
2018	Q4	Reference (CM_MC1)	87	91	104	103	137	0.0033	0.008	<-0.0001	<-0.0001	0.00017	0.00019	0.047	0.046	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.013	0.014	<-0.05	0.0000081	0.0000091
2018	Q2	Reference (FR_UFR1)	96	99	101	100	102	0.0071	0.16	<-0.0001	<-0.0001	0.00013	0.00021	0.039	0.038	<-0.00002	0.000021	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000082	0.000024
2018	Q4	Reference (FR_UFR1)	94	95	102	102	151	<-0.003	0.0031	<-0.0001	<-0.0001	<-0.0001	0.00011	0.071	0.068	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000069	0.0000085
2018	Q2	Reference (GH_ER2)	97	101	105	105	137	0.005	0.71	<-0.0001	0.00013	0.00015	0.00066	0.041	0.054	<-0.00002	0.000064	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000085	0.000014
2018	Q4	Reference (GH_ER2)	95	100	102	102	147	<-0.003	0.01	<-0.0001	<-0.0001	<-0.0001	0.00012	0.048	0.045	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.0000055	0.0000073
2018	Q2	Reference (LC_SLC)	101	103	105	108	109	0.0041	0.059	<-0.0001	<-0.0001	0.00011	0.00017	0.025	0.026	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.06	0.0000081	0.000026
2018	Q4	Reference (LC_SLC)	97	101	103	102	145	<-0.003	0.0071	<-0.0001	<-0.0001	0.0001	0.00014	0.043	0.043	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000011	0.000014
Tests categorized as no adverse response																								
2015	Q2	CM_MC2	80	82	103	101	138	0.012	0.58	0.00019	0.00016	0.00023	0.00049	0.043	0.049	0.00018	0.00014	0.00054	0.00054	0.021	0.018	0.05	0.000038	0.000081
2015	Q2	EV_MC2	103	102	104	104	104	0.0085	0.66	0.00014	0.00017	0.00018	0.00054	0.064	0.076	0.0001	0.00012	0.00005	0.00005	0.01	0.01	0.05	0.000024	0.000013
2015	Q4	EV_MC2	87	86	98	98	167	0.0068	0.081	0.00026	0.00028	0.00016	0.00022	0.11	0.11	0.0001	0.0001	0.00005	0.00005	0.013	0.013	0.10	0.000029	0.000045
2015	Q2	FR_FRCP1	83	83	105	110	145	0.003	0.047	0.00022	0.00022	0.0001	0.00013	0.064	0.064	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000028	0.000042
2015	Q2	GH_ERC	69	68	101	106	153	0.0032	0.21	0.0001	0.0001	0.0001	0.00024	0.049	0.051	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.0000073	0.000033
2015	Q2	GH_FR1	89	92	102	98	156	0.003	0.051	0.00016	0.00017	0.0001	0.00015	0.085	0.086	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.07	0.000021	0.000028
2015	Q2	LC_LCDSSLCC	102	101	101	101	121	0.003	0.041	0.00014	0.00016	0.00012	0.00016	0.035	0.035	0.0001	0.0001	0.00005	0.00005	0.01	0.01	0.06	0.000011	0.000013
2015	Q4	LC_LCDSSLCC	87	87	98	103	199	0.003	0.0052	0.00028	0.00032	0.0001	0.00013	0.083	0.087	0.0001	0.0001	0.00005	0.00005	0.015	0.016	0.25	0.0002	0.00024
2016	Q4	EV_MC2	87	88	102	110	132	0.012	0.1	0.00012	0.00013	0.00018	0.00024	0.079	0.083	<-0.00002	<-0.00002	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000025	0.000036
2017	Q2	CM_MC2	97	93	106	117	142	0.0067	0.6	0.00018	0.00023	0.00018	0.00049	0.043	0.048	<-0.00002	0.000042	<-0.00005	<-0.00005	0.016	0.017	<-0.05	0.000092	0.000017
2017	Q2	EV_HC1	103	104	106	115	166	0.0064	0.38	0.00011	0.00011	0.00017	0.00033	0.04	0.043	<-0.00002	0.000028	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000025	0.000057
2017	Q2	EV_MC2	102	108	110	119	105	0.022	1.0	0.0001	0.00018	0.00021	0.0007	0.059	0.077	<-0.00002	0.000065	<-0.00005	<-0.00005	<-0.01	<-0.01	<-0.05	0.000029	0.000016
2017	Q2	FR_FRCP1	81																					

Appendix D: Concentration-Response Analysis

Table D-4: *O. mykiss* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	CALCIUM-T-mg/l	CARBON, DISSOLVED ORGANIC-D-mg/l	CHLORIDE-D-mg/l	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l	COBALT-T-mg/l	CONDUCTIVITY, LAB-N-us/cm	COPPER-D-mg/l	COPPER-T-mg/l	FLUORIDE-D-mg/l	Hardness, Total or Dissolved CaCO ₃ -N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l	MANGANESE-D-mg/l
Tests not included in statistical analysis																						
2017	Q4	CM_MC2	121	1.1	4.4	0.00012	0.00019	0.0011	0.0012	919	<0.0005	<0.0005	0.09	532	<0.01	0.012	<0.00005	<0.00005	0.018	0.019	59	0.0043
2017	Q4	EV_HC1	84	1.1	1.1	0.00013	0.00019	<0.0001	<0.0001	698	<0.0005	<0.0005	0.22	399	<0.01	0.011	<0.00005	<0.00005	0.007	0.0074	47	0.0025
2017	Q4	EV_MC2	81	0.93	7.1	0.00011	0.00015	<0.0001	<0.0001	588	<0.0005	<0.0005	0.14	314	<0.01	0.016	<0.00005	<0.00005	0.015	0.016	31	0.00073
2017	Q4	FR_FRCP1	151	0.97	<2.5	<0.0001	0.00018	<0.0001	0.00011	1174	<0.0005	<0.0005	0.11	745	0.01	0.049	<0.00005	0.000057	0.041	0.04	94	0.0075
2017	Q4	GH_ERC	47	0.68	<0.5	0.00022	0.00029	<0.0001	<0.0001	300	<0.0005	<0.0005	0.13	167	<0.01	<0.01	<0.00005	0.000055	0.0027	0.0026	12	0.00034
2017	Q4	GH_FR1	106	1.1	1.3	0.00012	0.00015	<0.0001	<0.0001	826	<0.0005	<0.0005	0.13	497	<0.01	0.013	<0.00005	<0.00005	0.017	0.017	57	0.0013
2017	Q4	LC_LCDSSLCC	114	0.87	6.7	0.00011	0.00019	<0.0001	<0.0001	853	<0.0005	<0.0005	0.18	494	<0.01	<0.01	<0.00005	<0.00005	0.041	0.041	51	0.00059
2017	Q4	Reference (CM_MC1)	41	1.2	1.1	0.00018	0.00019	<0.0001	<0.0001	275	<0.0005	<0.0005	0.093	144	<0.01	<0.01	<0.00005	<0.00005	0.0046	0.0047	11	0.00013
2017	Q4	Reference (FR_UFR1)	51	0.71	<0.5	0.00001	0.00018	<0.0001	<0.0001	334	<0.0005	<0.0005	0.11	184	<0.01	<0.01	<0.00005	<0.00005	0.0017	0.0017	14	0.00012
2017	Q4	Reference (GH_ER2)	43	0.63	<0.5	0.00025	0.00028	<0.0001	<0.0001	280	<0.0005	<0.0005	0.13	155	<0.01	0.011	<0.00005	<0.00005	0.0019	0.0017	11	0.00044
Reference																						
2015	Q2	Reference (FR_UFR1)	38	1.9	1.0	0.00012	0.00026	0.0001	0.0001	239	0.0005	0.0005	0.15	132	0.01	0.04	0.00005	0.00005	0.0012	0.0012	9.4	0.00067
2015	Q4	Reference (FR_UFR1)	56	0.55	1.0	0.00012	0.00018	0.0001	0.0001	356	0.0005	0.0005	0.15	193	0.01	0.01	0.00005	0.00005	0.0014	0.0013	14	0.00016
2015	Q2	Reference (GH_ER2)	49	1.1	1.2	0.0002	0.00075	0.0001	0.0001	297	0.0005	0.00052	0.16	162	0.01	0.093	0.00005	0.000072	0.0016	0.0017	11	0.0029
2015	Q4	Reference (GH_ER2)	52	0.68	1.1	0.00022	0.0003	0.0001	0.0001	314	0.0005	0.0005	0.16	173	0.01	0.022	0.00005	0.00005	0.0016	0.0016	11	0.0023
2016	Q2	Reference (FR_UFR1)	38	1.7	0.1	0.00013	0.0002	<0.0001	<0.0001	243	<0.0005	<0.0005	0.16	133	<0.01	0.043	<0.00005	0.000053	0.0012	0.0013	10.0	0.00032
2016	Q4	Reference (FR_UFR1)	47	1.2	0.19	0.00011	0.0002	<0.0001	<0.0001	319	<0.0005	<0.0005	0.16	171	<0.01	0.019	<0.00005	<0.00005	0.0013	0.0016	12	0.00017
2016	Q2	Reference (GH_ER2)	48	1.1	0.57	0.00019	0.00049	<0.0001	0.0001	287	<0.0005	<0.0005	0.16	162	<0.01	0.17	<0.00005	0.00011	0.0016	0.0017	11	0.0014
2016	Q4	Reference (GH_ER2)	48	0.64	0.37	0.00024	0.00026	<0.0001	<0.0001	297	<0.0005	<0.0005	0.17	163	<0.01	0.012	<0.00005	<0.00005	0.0019	0.0018	11	0.0011
2017	Q2	Reference (FR_UFR1)	31	2.5	<0.5	0.0001	0.00058	<0.0001	0.00014	218	0.00025	0.0006	0.11	112	<0.01	0.2	<0.00005	0.00014	0.001	0.0012	8.6	0.00054
2017	Q2	Reference (GH_ER2)	53	1.8	0.45	0.00017	0.0019	<0.0001	0.00047	276	<0.00044	0.0013	0.14	155	<0.01	1.1	<0.00005	0.00069	0.0013	0.0026	12	0.0014
2018	Q2	Reference (CM_MC1)	25	3.3	<0.5	0.00022	0.00057	<0.00012	0.00014	176	<0.0005	0.00077	0.046	93	0.02	0.31	<0.00006	0.00025	0.0021	0.0025	7.1	0.00099
2018	Q4	Reference (CM_MC1)	39	1.6	0.5	0.00018	0.00021	<0.0001	<0.0001	278	<0.0005	<0.0005	0.069	142	<0.01	<0.01	<0.00005	<0.00005	0.0043	0.0043	11	0.00011
2018	Q2	Reference (FR_UFR1)	30	2.2	<0.5	0.00011	0.00041	<0.0001	0.00014	206	<0.0005	0.0011	0.12	112	<0.01	0.19	<0.00005	0.00014	0.0011	0.0013	8.4	0.00059
2018	Q4	Reference (FR_UFR1)	50	0.72	<0.5	0.0001	0.00018	<0.0001	<0.0001	343	<0.0005	<0.0005	0.15	187	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0016	14	0.00013
2018	Q2	Reference (GH_ER2)	49	1.8	0.51	0.00015	0.0019	<0.0001	0.00047	265	<0.0005	0.0015	0.15	142	<0.01	1.0	<0.00005	0.00075	0.0014	0.0022	11	0.00077
2018	Q4	Reference (GH_ER2)	47	0.5	<0.5	0.00024	0.00028	<0.0001	<0.0001	297	<0.0005	<0.0005	0.17	167	<0.01	0.015	<0.00005	<0.00005	0.0018	0.0019	11	0.00039
2018	Q2	Reference (LC_SLC)	33	2.1	<0.5	0.00011	0.00028	<0.0001	<0.0001	220	<0.0005	<0.0005	0.2	123	<0.01	0.059	<0.00005	0.00063	0.0013	0.0015	8.5	0.00015
2018	Q4	Reference (LC_SLC)	52	0.71	0.5	0.00013	0.0002	<0.0001	<0.0001	368	<0.0005	<0.0005	0.36	201	<0.01	0.013	<0.00005	<0.00005	0.0035	0.0037	17	0.00013
Tests categorized as no adverse response																						
2015	Q2	CM_MC2	60	1.3	1.4	0.00028	0.00091	0.00034	0.00082	466	0.0005	0.0011	0.097	245	0.022	0.74	0.00009	0.0005	0.0063	0.0068	24	0.0029
2015	Q2	EV_MC2	46	2.0	3.2	0.00018	0.0012	0.0001	0.00048	321	0.00051	0.0014	0.12	170	0.01	0.82	0.00005	0.00067	0.0066	0.007	14	0.00073
2015	Q4	EV_MC2	91	1.5	5.6	0.00014	0.00027	0.0001	0.00011	588	0.0005	0.00056	0.15	320	0.013	0.083	0.00005	0.00077	0.016	0.015	29	0.0013
2015	Q2	FR_FRCP1	75	1.5	1.1	0.0001	0.00018	0.0001	0.0001	580	0.0005	0.0005	0.2	315	0.01	0.086	0.00005	0.00076	0.02	0.02	31	0.0031
2015	Q2	GH_ERC	53	1.1	1.3	0.00024	0.00069	0.0001	0.00014	323	0.0005	0.0007	0.15	177	0.01	0.26	0.000051	0.00018	0.0021	0.0023	12	0.00054
2015	Q2	GH_FR1	81	1.4	1.8	0.00012	0.00024	0.0001	0.0001	595	0.0005	0.0005	0.17	335	0.01	0.071	0.00005	0.00071	0.015	0.015	32	0.001
2015	Q2	LC_LCDSSLCC	58	1.2	1.5	0.00012	0.00032	0.0001	0.00012	436	0.0005	0.00056	0.15	232	0.01	0.048	0.00005	0.00081	0.014	0.012	22	0.00015
2015	Q4	LC_LCDSSLCC	125	0.67	3.8	0.00014	0.00017	0.0001	0.0001	901	0.0005	0.0005	0.22	497	0.01	0.01	0.00005	0.00005	0.0036	0.0036	52	0.00037
2016	Q4	EV_MC2	55	2.1	3.5	0.00012	0.00029	<0.0001	0.00011	410	<0.0005	0.00054	0.13	211	0.014	0.081	<0.00005	0.000078	0.0092	0.0092	19	0.00062
2017	Q2	CM_MC2	62	2.1	0.72	0.00015	0.00096	0.0001	0.0001	517	0.00023	0.0011	0.085	252	0.01	0.0023	<0.00005	0.0005	0.009	0.0095	26	0.011
2017	Q2	EV_HC1	59	2.4	0.5	0.00012	0.00061	<0.0001	0.00018	458	<0.0005	0.00082	0.16	260	<0.01	0.4	<0.00005	0.00023	0.0046	0.0047	26	0.0013
2017	Q2	EV_MC2	38	2.9	2.0	0.00013	0.0016	<0.0001	0.00069	277	<0.0005	0.0018	0.11	142	0.024	1.2	<0.00005	0.0008	0.005	0.0055	13	0.0018
2017	Q2	FR_FRCP1	68	2.0	0.5	<0.0001	0.00059	<0.0001	0.00027	540	0.00025	0.00087	0.16	279	<0.01	0.39	<0.00005	0.00028	0.019	0.019	28	0.0023
2017	Q2	GH_FR1	68	2.1	0.84	0.0001	0.00078	<0.0001	0.00029	506	<0.00044	0.00097	0.16	281	<0.01	0.51	<0.00005	0.00038	0.013	0.013	28	0.0013
2017	Q2	LC_LCDSSLCC	59	1.8	2.0	0.00011	0.00023	0.0001	0.00012	489	0.00033	0.00057	0.18	248	<0.01	0.043	<0.00005	0.000055	0.021	0.02	24	0.00054
2018	Q2	CM_MC2	58	2.0	1.7	0.00016	0.0014	0.00013	0.00027	486	<0.0005	0.0015	0.085	252	0.012	1.3	<0.00006	0.00082	0.0081	0.0091	24	0.01
2018	Q4	CM_MC2	126	1.0	3.9	0.00015	0.00018	0.0001	0.00055	993	<0.0005	<0.0005	0.14	556	<0.01	0.016	<0.00005	0.000055	0.024	0.025	57	0.018
2018</																						

Appendix D: Concentration-Response Analysis

Table D-4: *O. mykiss* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	MANGANESE-T- mg/l	MERCURY-D-mg/l	MERCURY-T-mg/l	MOLYBDENUM-D- mg/l	MOLYBDENUM-T- mg/l	NICKEL-D-mg/l	NICKEL-T-mg/l	NITRATE NITROGEN (NO ₃), AS N-N- mg/l	NITRITE NITROGEN (NO ₂), AS N-N- mg/l	NITROGEN, AMMONIA (AS N), N-mg/l	ORTHO- PHOSPHATE-N- mg/l	pH, LAB-N-ph units	PHOSPHORUS-N- mg/l	POTASSIUM-T- mg/l	SELENIUM-D- mg/l	SELENIUM-T- mg/l	SILVER-D-mg/l	SILVER-T-mg/l	SODIUM-T-mg/l	STRONTIUM-D- mg/l
Tests not included in statistical analysis																						
2017	Q4	CM_MC2	0.0054	<0.000005	<0.000005	0.0013	0.0014	0.016	0.017	3.9	0.014	0.02	<0.001	8.3	0.0029	1.9	0.0084	0.0079	<0.00001	<0.00001	14	0.41
2017	Q4	EV_HC1	0.0044	0.0000015	0.0000013	0.00089	0.00089	0.00058	0.0067	0.94	0.002	0.0088	0.0043	8.4	0.0063	0.88	0.04	0.04	<0.00001	0.000011	1.6	0.13
2017	Q4	EV_MC2	0.0017	0.0000031	0.0000032	0.00078	0.00078	0.00052	0.0062	2.8	0.0019	0.0091	0.0014	8.2	0.0029	1.0	0.018	0.018	<0.00001	<0.00001	5.0	0.2
2017	Q4	FR_FRCP1	0.013	<0.000005	<0.000005	0.0013	0.0014	0.0086	0.0092	15	0.0067	0.0063	<0.001	8.2	0.0022	2.2	0.14	0.13	<0.00001	<0.00001	2.0	0.18
2017	Q4	GH_ERC	0.00097	<0.000005	<0.000005	0.001	0.0011	<0.0005	<0.0005	0.25	0.0013	0.0085	<0.001	8.4	0.002	0.4	0.0012	0.0012	<0.00001	<0.00001	0.85	0.21
2017	Q4	GH_FR1	0.002	<0.000005	0.0000011	0.0011	0.0011	0.0026	0.0028	10	0.0056	0.0068	<0.001	8.4	0.0019	1.3	0.065	0.063	<0.00001	<0.00001	2.2	0.16
2017	Q4	LC_LCDSSLCC	0.0013	<0.000005	0.0000005	0.0016	0.0017	0.0056	0.0058	11	0.0015	0.008	0.0011	8.3	0.0024	1.5	0.054	0.051	<0.00001	<0.00001	6.7	0.21
2017	Q4	Reference (CM_MC1)	0.00026	<0.000005	0.00000053	0.00085	0.00088	<0.0005	<0.0005	0.068	0.0018	0.007	0.0035	8.2	0.0033	0.5	0.0002	0.00022	<0.00001	<0.00001	3.0	0.16
2017	Q4	Reference (FR_UFR1)	0.00047	<0.000005	<0.000005	0.00057	0.00059	<0.0005	<0.0005	0.031	0.001	0.0052	<0.001	8.4	0.0028	0.39	0.00059	0.00061	<0.00001	<0.00001	0.69	0.099
2017	Q4	Reference (GH_ER2)	0.0015	<0.000005	<0.000005	0.0011	0.001	<0.0005	<0.0005	0.05	<0.001	0.0069	<0.001	8.4	0.0017	0.36	0.00084	0.00081	<0.00001	<0.00001	0.7	0.21
Reference																						
2015	Q2	Reference (FR_UFR1)	0.0022	0.000005	0.000005	0.00055	0.00059	0.0005	0.0005	0.038	0.001	0.005	0.0035	8.3	0.0077	0.36	0.00046	0.0005	0.00001	0.00001	0.58	0.064
2015	Q4	Reference (FR_UFR1)	0.00031	0.000005	0.000005	0.00061	0.00059	0.0005	0.0005	0.074	0.001	0.005	0.0015	8.4	0.0024	0.39	0.00065	0.00067	0.00001	0.00001	0.68	0.092
2015	Q2	Reference (GH_ER2)	0.0074	0.0000055	0.000005	0.00095	0.00096	0.0005	0.00051	0.082	0.001	0.0068	0.0011	8.3	0.009	0.37	0.00075	0.00079	0.00001	0.00001	0.74	0.2
2015	Q4	Reference (GH_ER2)	0.0035	0.000005	0.000005	0.001	0.001	0.0005	0.0005	0.081	0.001	0.005	0.0012	8.3	0.003	0.36	0.00079	0.00084	0.00001	0.00001	0.67	0.21
2016	Q2	Reference (FR_UFR1)	0.0016	<0.000005	0.00000095	0.00063	0.00065	<0.0005	<0.0005	0.018	<0.001	<0.005	0.0025	8.3	0.0047	0.34	0.00051	0.00055	<0.00001	<0.00001	0.63	0.065
2016	Q4	Reference (FR_UFR1)	0.00056	<0.000005	0.00000058	0.00057	0.00058	<0.0005	<0.0005	0.097	<0.001	<0.005	0.0024	8.3	0.0045	0.37	0.00066	0.00066	<0.00001	<0.00001	0.68	0.089
2016	Q2	Reference (GH_ER2)	0.013	<0.000005	0.00000073	0.00095	0.00095	<0.0005	0.00053	0.089	<0.001	<0.005	0.0011	8.3	0.013	0.41	0.00075	0.00077	<0.00001	<0.00001	0.72	0.2
2016	Q4	Reference (GH_ER2)	0.0019	<0.000005	<0.000001625	0.00098	0.00098	<0.0005	<0.0005	0.075	<0.001	<0.005	0.0012	8.3	0.0023	0.37	0.00085	0.00089	<0.00001	<0.00001	0.69	0.23
2017	Q2	Reference (FR_UFR1)	0.0087	<0.000005	0.00000022	0.0005	0.00054	<0.0005	0.00064	0.07	0.0019	0.0056	0.0061	8.3	0.023	0.42	0.00056	0.00049	<0.00001	<0.00001	0.53	0.061
2017	Q2	Reference (FR_UFR1)	0.069	<0.000005	0.00000043	0.00085	0.00097	<0.0005	0.0022	0.11	<0.001	0.005	0.0019	8.4	0.1	0.67	0.00072	0.00077	<0.00001	<0.00002	0.69	0.19
2018	Q2	Reference (CM_MC1)	0.0092	0.0000052	0.00000025	0.00051	0.00057	<0.0006	0.00075	0.007	<0.001	0.008	0.0038	8.0	0.021	0.44	0.00018	0.00018	<0.000012	<0.00001	1.2	0.078
2018	Q4	Reference (CM_MC1)	0.00029	<0.000005	0.00000058	0.00086	0.00088	<0.0005	<0.0005	0.017	<0.001	0.015	0.0046	8.3	0.0045	0.42	0.00023	0.00023	<0.00001	<0.00001	3.1	0.14
2018	Q2	Reference (FR_UFR1)	0.0083	<0.000005	0.0000002	0.00059	0.00056	<0.0005	0.00066	0.052	<0.001	0.0082	0.0052	8.2	0.023	0.41	0.00049	0.00047	<0.00001	0.000015	0.52	0.063
2018	Q4	Reference (FR_UFR1)	0.00032	<0.000005	<0.0000005	0.00058	0.00058	<0.0005	<0.0005	0.078	<0.001	0.047	0.0021	8.4	0.0024	0.35	0.00076	0.00077	<0.00001	<0.00001	0.7	0.097
2018	Q2	Reference (GH_ER2)	0.065	<0.000005	0.00000039	0.00089	0.00089	<0.0005	0.0022	0.1	0.0011	0.009	0.003	8.3	0.13	0.68	0.00068	0.00074	<0.00001	0.000023	0.66	0.19
2018	Q4	Reference (GH_ER2)	0.0013	<0.000005	<0.0000005	0.001	0.001	<0.0005	<0.0005	0.081	<0.001	0.015	0.0028	8.3	0.0028	0.34	0.00092	0.00089	<0.00001	<0.00001	0.71	0.22
2018	Q2	Reference (LC_SLC)	0.0021	<0.000005	0.00000011	0.00052	0.00053	<0.0005	0.00055	0.091	<0.001	0.013	0.0021	8.1	0.014	0.29	0.00051	0.00055	<0.000012	<0.00001	0.46	0.068
2018	Q4	Reference (LC_SLC)	0.00033	<0.000005	<0.0000005	0.0013	0.0013	0.00052	<0.0005	0.13	<0.001	0.012	0.0024	8.3	0.011	0.37	0.0016	0.0015	<0.00001	<0.00001	0.98	0.17
Tests categorized as no adverse response																						
2015	Q2	CM_MC2	0.025	0.000006	0.00000076	0.00078	0.00095	0.0082	0.008	1.1	0.0047	0.0064	0.0016	8.3	0.052	1.0	0.004	0.004	0.000018	0.00002	4.1	0.16
2015	Q2	EV_MC2	0.024	0.000005	0.0000005	0.00078	0.00087	0.0012	0.0029	1.1	0.0013	0.006	0.0029	8.3	0.081	0.82	0.0064	0.0063	0.00001	0.000025	2.2	0.1
2015	Q4	EV_MC2	0.003	<0.000005	<0.0000005	0.0016	0.0016	0.0029	0.0031	3.8	0.0023	0.0054	0.0029	8.2	0.0088	1.1	0.016	0.016	0.00001	0.00001	3.9	0.19
2015	Q2	FR_FRCP1	0.0083	0.000005	0.0000005	0.0013	0.0013	0.0021	0.0023	7.9	0.0052	0.012	0.0013	8.4	0.0097	1.2	0.033	0.032	0.00001	0.00001	1.2	0.1
2015	Q2	GH_ERC	0.014	0.000005	0.0000005	0.00096	0.00094	0.0005	0.00069	0.26	0.001	0.0052	0.001	8.4	0.025	0.44	0.0015	0.0015	0.00001	0.000011	0.94	0.2
2015	Q2	GH_FR1	0.0045	0.000005	0.0000005	0.001	0.001	0.0018	0.002	7.9	0.0034	0.003	0.001	8.4	0.0084	1.1	0.031	0.032	0.00001	0.00001	1.6	0.11
2015	Q2	LC_LCDSSLCC	0.0023	0.000005	0.0000005	0.00095	0.00096	0.0029	0.0032	4.8	0.0015	0.005	0.0014	8.0	0.0088	0.68	0.022	0.022	0.00001	0.00001	2.4	0.11
2015	Q4	LC_LCDSSLCC	0.0005	0.000005	0.0000005	0.0018	0.0019	0.0066	0.0069	15	0.005	0.005	0.001	8.3	0.002	1.5	0.05	0.054	0.00001	0.00001	7.2	0.22
2016	Q4	EV_MC2	0.0026	0.000001	0.00000015	0.00079	0.00083	0.0013	0.0016	1.8	0.0011	<0.005	0.0065	8.2	0.011	0.79	0.0077	0.0081	<0.00001	<0.00001	3.0	0.13
2017	Q2	CM_MC2	0.039	<0.000005	0.00000022	0.00088	0.001	0.013	0.016	2.0	0.0064	0.03	0.0034	8.3	0.066	1.3	0.063	0.057	<0.00001	<0.00001	6.2	0.2
2017	Q2	EV_HC1	0.0089	0.00000082	0.00000025	0.00082	0.00066	0.00076	0.0014	0.56	<0.001	<0.005	0.0067	8.3	0.023	0.85	0.022	0.022	<0.00001	0.000011	1.1	0.087
2017	Q2	EV_MC2	0.033	0.0000016	0.00000061	0.00061	0.00067	0.0013	0.0037	0.76	0.0011	0.0058	0.015	8.1	0.11	0.92	0.0042	0.0043	<0.00001	0.000026	2.0	0.09
2017	Q2	FR_FRCP1	0.023	<0.000005	0.00000028	0.0011	0.0012	0.0025	0.0037	8.7	0.0031	0.0076	0.0025	8.3	0.048	1.3	0.035	0.031	<0.00001	0.000012	1.1	0.096
2017	Q2	GH_FR1	0.022	<0.000005	<0.0000008	0.001	0.0011	0.0018	0.0032	5.8	0.0024	0.0063	0.0033	8.4	0.037	1.1	0.026	0.025	<0.00001	0.000015	1.4	0.10
2017	Q2	LC_LCDSSLCC	0.0034	<0.000005	0.00000011	0.0012	0.0012	0.0048	0.0048	5.6	0.0011											

Appendix D: Concentration-Response Analysis

Table D-4: *O. mykiss* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	STRONTIUM-T- mg/l	SULFATE (AS SO4)-D-mg/l	THALLIUM-D- mg/l	THALLIUM-T-mg/l	TIN-D-mg/l	TIN-T-mg/l	TITANIUM-D-mg/l	TITANIUM-T-mg/l	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N- mg/l	TOTAL KJELDAHL NITROGEN-N- mg/l	TOTAL ORGANIC CARBON-T-mg/l	TOTAL SUSPENDED SOLIDS, LAB-N- mg/l	TURBIDITY, LAB- N-ntu	URANIUM-D-mg/l	URANIUM-T-mg/l	VANADIUM-D- mg/l	VANADIUM-T- mg/l	ZINC-D-mg/l	ZINC-T-mg/l	Σ TU-WQGs	Σ TU- WQGs/Benc hmarks
Tests not included in statistical analysis																							
2017	Q4	CM_MC2	0.41	334	0.000014	0.000015	<0.0001	<0.0001	<0.01	<0.01	748	0.38	0.99	2.8	1.3	0.003	0.0032	<0.0005	<0.0005	<0.003	<0.003	7.3	6.2
2017	Q4	EV_HC1	0.13	203	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	494	0.099	1.0	1.2	0.3	0.0027	0.0027	<0.0005	<0.0005	<0.003	<0.003	2.3	2.1
2017	Q4	EV_MC2	0.19	136	<0.00001	<0.00001	<0.0001	0.00011	<0.01	<0.01	413	0.2	0.99	<0.01	0.47	0.0011	0.0012	<0.0005	<0.0005	<0.003	<0.003	2.7	2.4
2017	Q4	FR_FRCP1	0.18	515	0.000011	0.000012	<0.0001	<0.0001	<0.01	<0.01	1058	0.38	0.98	1.3	0.63	0.0058	0.0057	<0.0005	0.00052	<0.003	0.0032	9.8	5.6
2017	Q4	GH_ERC	0.21	24	<0.00001	<0.00001	<0.0001	0.00011	<0.01	<0.01	202	0.066	0.72	1.3	0.55	0.00083	0.00081	<0.0005	<0.0005	<0.003	0.0031	1.4	1.4
2017	Q4	GH_FR1	0.16	267	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	672	0.36	1.3	8.3	9.3	0.0029	0.0029	<0.0005	<0.0005	<0.003	<0.003	6.1	3.3
2017	Q4	LC_LCDSSLCC	0.21	257	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	677	0.41	0.94	<0.01	0.44	0.0041	0.004	<0.0005	<0.0005	0.0061	0.0061	7.1	4.3
2017	Q4	Reference (CM_MC1)	0.16	28	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	171	0.11	1.2	1.3	0.48	0.00022	0.00023	<0.0005	<0.0005	<0.003	<0.003	1.2	1.2
2017	Q4	Reference (FR_UFR1)	0.099	46	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	235	0.075	0.8	1.0	0.37	0.00052	0.00049	<0.0005	<0.0005	<0.003	<0.003	1.2	1.2
2017	Q4	Reference (GH_ERC2)	0.2	19	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	192	0.16	0.66	1.5	0.73	0.00077	0.00075	<0.0005	<0.0005	<0.003	<0.003	1.3	1.3
Reference																							
2015	Q2	Reference (FR_UFR1)	0.066	14	0.00001	0.00001	0.0001	0.0001	0.01	0.01	143	0.092	2.0	1.9	1.4	0.00031	0.00032	0.0005	0.0005	0.003	0.003	2.4	2.4
2015	Q4	Reference (FR_UFR1)	0.091	47	0.00001	0.00001	0.0001	0.0001	0.01	0.01	217	0.065	0.6	1.0	0.22	0.00045	0.00045	0.0005	0.0005	0.003	0.003	2.3	2.3
2015	Q2	Reference (GH_ERC2)	0.21	17	0.00001	0.00001	0.0001	0.0001	0.01	0.01	181	0.086	1.4	5.9	4.1	0.00077	0.00079	0.0005	0.00061	0.003	0.003	2.9	2.9
2015	Q4	Reference (GH_ERC2)	0.22	22	0.00001	0.00001	0.0001	0.0001	0.01	0.01	176	0.05	0.62	1.3	0.37	0.00074	0.00075	0.0005	0.0005	0.003	0.003	2.4	2.4
2016	Q2	Reference (FR_UFR1)	0.067	15	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	147	0.077	2.0	1.5	0.82	0.00032	0.00033	<0.0005	0.0005	<0.003	<0.003	1.5	1.5
2016	Q4	Reference (FR_UFR1)	0.089	38	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	197	0.065	1.3	<0.01	0.69	0.00043	0.00045	<0.0005	0.0005	<0.003	<0.00375	1.4	1.4
2016	Q2	Reference (GH_ERC2)	0.21	17	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	0.01	180	0.075	1.6	10	2.8	0.00075	0.00077	<0.0005	0.00079	<0.003	<0.003	1.9	1.9
2016	Q4	Reference (GH_ERC2)	0.24	23	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	181	0.055	0.67	<0.01	0.36	0.00077	0.00078	<0.0005	<0.0005	0.0034	0.0035	1.4	1.4
2017	Q2	Reference (FR_UFR1)	0.06	10	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01	131	0.096	2.9	10	6.0	0.00027	0.0003	<0.0005	0.00083	0.001	0.0031	2.2	2.2
2017	Q2	Reference (FR_UFR1)	0.21	14	<0.00001	0.000035	<0.0001	<0.0001	<0.01	0.01	166	0.23	4.1	79	42	0.00069	0.00083	<0.0005	0.00033	<0.0026	0.0094	5.0	5.6
2018	Q2	Reference (CM_MC1)	0.074	5.1	<0.000012	0.000024	<0.00012	<0.0001	<0.01	<0.01	104	0.1	3.5	12	5.9	0.00013	0.00013	<0.0005	0.00088	<0.0012	0.0032	2.7	3.2
2018	Q4	Reference (CM_MC1)	0.14	14	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	153	0.16	1.7	<0.01	0.31	0.00023	0.00023	<0.0005	<0.0005	0.001	<0.003	1.1	1.2
2018	Q2	Reference (FR_UFR1)	0.06	9.9	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01	123	0.11	2.7	9.6	3.9	0.0003	0.00031	<0.0005	0.0009	<0.001	0.0031	1.9	2.1
2018	Q4	Reference (FR_UFR1)	0.096	44	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	209	0.1	0.68	<0.01	0.23	0.0005	0.0005	<0.0005	<0.0005	<0.001	<0.003	1.3	1.3
2018	Q2	Reference (GH_ERC2)	0.19	13	<0.00001	0.000036	<0.0001	<0.0001	<0.01	<0.01	161	0.3	3.7	72	48	0.00066	0.00079	<0.0005	0.00036	<0.001	0.0093	4.8	5.7
2018	Q4	Reference (GH_ERC2)	0.21	22	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	171	0.096	<0.01	<0.01	0.38	0.00075	0.00077	<0.0005	<0.0005	<0.001	<0.003	1.3	1.3
2018	Q2	Reference (LC_SLC)	0.066	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	135	0.09	2.5	4.8	1.8	0.00065	0.00067	<0.0005	0.00063	0.002	0.0061	1.5	1.6
2018	Q4	Reference (LC_SLC)	0.17	61	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	224	0.077	0.91	<0.01	0.22	0.00018	0.00018	<0.0005	<0.0005	0.0014	0.0035	1.5	1.5
Tests categorized as no adverse response																							
2015	Q2	CM_MC2	0.17	107	0.000018	0.000037	0.0001	0.00013	0.01	0.016	316	0.16	1.9	29	15	0.0011	0.0011	0.0014	0.0023	0.0058	0.01	7.2	7.0
2015	Q2	EV_MC2	0.1	49	0.000011	0.000036	0.0001	0.0001	0.01	0.017	208	0.29	3.6	57	15	0.00062	0.00067	0.0005	0.0029	0.003	0.0087	5.8	5.8
2015	Q4	EV_MC2	0.19	129	0.00001	0.000011	0.0001	0.0001	0.01	0.01	387	0.17	3.1	2.5	2.5	0.0014	0.0014	0.0005	0.00071	0.003	0.003	4.2	3.7
2015	Q2	FR_FRCP1	0.11	125	0.00001	0.00001	0.0001	0.0001	0.01	0.01	382	0.18	5.2	1.4	1.4	0.0016	0.0017	0.0005	0.00051	0.003	0.003	5.9	4.1
2015	Q2	GH_ERC	0.2	23	0.00001	0.000014	0.0001	0.0001	0.01	0.01	182	0.12	1.7	6.9	6.9	0.0008	0.00081	0.0005	0.0011	0.003	0.0038	3.2	3.2
2015	Q2	GH_FR1	0.12	134	0.00001	0.00001	0.0001	0.0001	0.01	0.01	399	0.068	1.6	4.1	1.8	0.0016	0.0016	0.0005	0.00054	0.003	0.003	5.7	3.9
2015	Q2	LC_LCDSSLCC	0.11	90	0.000011	0.000012	0.0001	0.0001	0.01	0.01	280	0.075	1.3	5.3	1.7	0.0016	0.0017	0.0005	0.00056	0.0052	0.007	5.1	4.2
2015	Q4	LC_LCDSSLCC	0.22	248	0.00001	0.00001	0.0001	0.0001	0.01	0.01	651	0.13	0.77	1.0	0.45	0.004	0.0042	0.0005	0.0005	0.0085	0.0092	9.8	6.0
2016	Q4	EV_MC2	0.13	79	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01	261	0.17	2.4	3.6	2.9	0.00083	0.00084	<0.0005	0.00076	<0.003	<0.003	2.6	2.6
2017	Q2	CM_MC2	0.21	135	0.000013	0.000035	<0.0001	0.00012	<0.01	<0.01	348	<0.01	2.6	<0.01	23	0.0013	0.0013	<0.0005	0.0016	0.0071	0.015	8.7	8.3
2017	Q2	EV_HC1	0.086	85	<0.00001	0.00002	<0.0001	<0.0001	<0.01	<0.01	290	0.19	3.4	13	12	0.0014	0.0014	<0.0005	0.0014	<0.003	0.004	3.0	2.9
2017	Q2	EV_MC2	0.093	40	<0.00001	0.000044	<0.0001	<0.0001	<0.01	<0.015	178	<0.01	0.27	6.6	38	0.00049	0.00057	<0.0005	0.00043	<0.003	0.010	7.0	7.0
2017	Q2	FR_FRCP1	0.097	111	0.00001	0.000017	<0.0001	<0.0001	<0.01	<0.01	362	0.56	2.7	27	13	0.0015	0.0016	<0.0005	0.0013	0.0023	0.0062	6.4	4.5
2017	Q2	GH_FR1	0.1	99	<0.00001	0.000018	<0.0001	<0.0001	<0.01	<0.01	331	<0.01	0.38	4.2	34	0.0015	0.0015	<0.0005	0.0018	0.0027	0.0064	6.1	4.9
2017	Q2	LC_LCDSSLCC	0.12	98	<0.00001	0.00001	<0.0001	<0.0001	<0.01	<0.01	327	0.56	1.9	3.5	1.9	0.0017	0.0019	<0.0005	<0.0005	0.011	0.011	4.9	3.9
2018																							

Table D-4: *O. mykiss* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	PCA Factor 1 (2015 to 2018)	PCA Factor 2 (2015 to 2018)	PCA Factor 3 (2015 to 2018)	PCA Factor 4 (2015 to 2018)	PCA Factor 1 (2018)	PCA Factor 2 (2018)	PCA Factor 3 (2018)	PCA Factor 4 (2018)
Tests not included in statistical analysis										
2017	Q4	CM_MC2	8.2	1.5	-2.3	-5.7	-	-	-	-
2017	Q4	EV_HC1	2.0	-2.8	0.77	1.4	-	-	-	-
2017	Q4	EV_MC2	2.6	-2.4	0.2	-0.055	-	-	-	-
2017	Q4	FR_FRCP1	7.9	-0.46	1.6	0.91	-	-	-	-
2017	Q4	GH_ERC	-2.1	-5.0	-2.6	-1.4	-	-	-	-
2017	Q4	GH_FR1	4.7	-1.7	1.5	0.64	-	-	-	-
2017	Q4	LC_LCDSSLCC	7.3	-0.97	1.7	0.16	-	-	-	-
2017	Q4	Reference (CM_MC1)	-3.1	-4.0	-2.7	-1.6	-	-	-	-
2017	Q4	Reference (FR_UFR1)	-3.3	-5.7	-1.4	0.03	-	-	-	-
2017	Q4	Reference (GH_ER2)	-2.9	-5.0	-2.4	-1.7	-	-	-	-
Reference										
2015	Q2	Reference (FR_UFR1)	-6.2	-3.0	-0.76	1.0	-	-	-	-
2015	Q4	Reference (FR_UFR1)	-3.3	-5.7	-1.4	0.37	-	-	-	-
2015	Q2	Reference (GH_ER2)	-3.8	-2.1	-1.2	-1.3	-	-	-	-
2015	Q4	Reference (GH_ER2)	-2.9	-4.5	-2.2	-1.3	-	-	-	-
2016	Q2	Reference (FR_UFR1)	-6.2	-3.9	-1.1	0.84	-	-	-	-
2016	Q4	Reference (FR_UFR1)	-4.5	-4.6	-0.97	0.67	-	-	-	-
2016	Q2	Reference (GH_ER2)	-4.1	-2.0	-1.0	-1.1	-	-	-	-
2016	Q4	Reference (GH_ER2)	-2.9	-5.0	-2.4	-1.5	-	-	-	-
2017	Q2	Reference (FR_UFR1)	-7.6	-0.49	0.4	0.66	-	-	-	-
2017	Q2	Reference (GH_ER2)	-5.9	5.0	1.7	-1.8	-	-	-	-
2018	Q2	Reference (CM_MC1)	-9.0	3.0	-4.2	1.1	-6.7	2.3	-5.3	-2.9
2018	Q4	Reference (CM_MC1)	-4.2	-3.6	-2.9	-1.6	-2.9	-3.8	-2.3	-2.4
2018	Q2	Reference (FR_UFR1)	-7.8	-0.27	-0.01	0.85	-6.2	-0.8	-1.6	0.23
2018	Q4	Reference (FR_UFR1)	-3.1	-5.8	-1.8	-0.24	-2.2	-5.8	-1.6	-0.43
2018	Q2	Reference (GH_ER2)	-6.3	5.4	1.7	-1.6	-5.2	4.2	1.5	0.48
2018	Q4	Reference (GH_ER2)	-2.9	-5.2	-2.7	-1.5	-1.9	-5.0	-1.8	-1.2
2018	Q2	Reference (LC_SLC)	-6.3	-2.2	-1.4	1.9	-4.7	-2.4	-2.9	0.59
2018	Q4	Reference (LC_SLC)	-1.3	-4.9	-1.1	0.2	-0.87	-4.9	-0.97	0.54
Tests categorized as no adverse response										
2015	Q2	CM_MC2	-0.065	12	-11	2.8	-	-	-	-
2015	Q2	EV_MC2	-4.0	6.5	2.1	-0.22	-	-	-	-
2015	Q4	EV_MC2	3.3	0.61	1.5	0.16	-	-	-	-
2015	Q2	FR_FRCP1	2.4	-0.79	1.8	1.2	-	-	-	-
2015	Q2	GH_ERC	-3.9	-0.085	-0.23	-1.1	-	-	-	-
2015	Q2	GH_FR1	2.0	-1.3	1.7	1.2	-	-	-	-
2015	Q2	LC_LCDSSLCC	0.26	-0.26	0.82	2.2	-	-	-	-
2015	Q4	LC_LCDSSLCC	8.0	-1.1	1.5	-0.077	-	-	-	-
2016	Q4	EV_MC2	-1.2	0.17	1.3	1.2	-	-	-	-
2017	Q2	CM_MC2	0.99	8.3	0.073	-4.0	-	-	-	-
2017	Q2	EV_HC1	-2.8	2.2	2.3	2.1	-	-	-	-
2017	Q2	EV_MC2	-5.9	8.5	2.9	0.67	-	-	-	-
2017	Q2	FR_FRCP1	0.55	3.6	3.7	1.1	-	-	-	-
2017	Q2	GH_FR1	-0.43	4.1	3.7	0.93	-	-	-	-
2017	Q2	LC_LCDSSLCC	2.4	0.47	2.4	1.3	-	-	-	-
2018	Q2	CM_MC2	-0.049	9.4	-1.1	-2.9	0.28	7.3	2.1	-3.5
2018	Q4	CM_MC2	11	3.6	-3.3	-8.3	8.9	1.0	3.8	-7.4
2018	Q2	EV_HC1	-2.5	1.7	1.0	2.0	-2.3	0.6	0.02	1.3
2018	Q4	EV_HC1	2.1	-2.3	0.55	0.83	1.5	-2.9	0.73	1.0
2018	Q2	EV_MC2	-6.5	10	-0.81	2.4	-5.3	8.2	0.082	-0.13
2018	Q4	EV_MC2	4.1	-1.4	0.6	-0.91	3.2	-2.3	1.8	-0.13
2018	Q2	FR_FRCP1	0.2	4.5	3.6	1.2	-0.25	3.2	2.8	2.9
2018	Q2	GH_ERC	-5.4	7.5	2.6	-1.8	-4.7	6.1	2.8	0.95
2018	Q4	GH_ERC	-2.4	-4.3	-1.8	-1.5	-1.7	-4.4	-0.99	-0.81
2018	Q2	GH_FR1	0.21	3.5	3.4	1.2	-0.44	2.7	2.7	3.1
2018	Q2	LC_LCDSSLCC	2.5	0.37	2.0	1.8	2.0	-0.27	1.5	2.3
2018	Q4	LC_LCDSSLCC	7.9	-1.6	1.1	-0.64	6.3	-2.5	3.0	0.55
Tests categorized as possible or likely response for length (2015 to 2017)										
2016	Q4	GH_ERC	-2.3	-4.8	-2.0	-1.2	-	-	-	-
Tests categorized as possible or likely response for weight (2015 to 2017)										
2015	Q2	EV_HC1	-2.9	-1.6	-0.71	3.4	-	-	-	-
Tests categorized as possible or likely response for viability (2015 to 2017)										
2016	Q4	CM_MC2	3.5	1.8	-0.79	-3.5	-	-	-	-
Tests categorized as possible or likely response for survival and viability (2015 to 2017)										
2015	Q4	CM_MC2	5.4	1.7	-1.5	-4.5	-	-	-	-
2015	Q4	EV_HC1	2.4	-2.1	0.95	1.6	-	-	-	-
2016	Q2	CM_MC2	1.6	5.7	-0.57	-4.6	-	-	-	-
2016	Q2	EV_HC1	-0.34	-1.4	1.0	2.3	-	-	-	-
2016	Q4	EV_HC1	1.9	-2.3	0.96	1.7	-	-	-	-
2016	Q2	EV_MC2	-4.5	4.0	1.9	0.88	-	-	-	-
2016	Q4	FR_FRCP1	5.6	-1.4	2.0	1.1	-	-	-	-
2016	Q2	GH_ERC	-3.6	-0.74	-0.27	-1.1	-	-	-	-
2016	Q2	GH_FR1	1.8	-1.3	1.8	1.3	-	-	-	-
2016	Q4	GH_FR1	4.5	-2.0	1.5	0.96	-	-	-	-
2016	Q2	LC_LCDSSLCC	3.9	-1.3	2.9	0.61	-	-	-	-
2016	Q4	LC_LCDSSLCC	6.0	-0.75	2.1	0.41	-	-	-	-
2017	Q2	GH_ERC	-5.3	6.5	2.4	-1.8	-	-	-	-
Tests categorized as possible or likely response for survival, viability, and length (2015 to 2017)										
2015	Q4	FR_FRCP1	7.6	-1.1	1.5	0.75	-	-	-	-
2015	Q4	GH_FR1	4.4	-3.2	0.77	0.54	-	-	-	-
2016	Q2	FR_FRCP1	1.8	-0.68	2.0	1.5	-	-	-	-
Tests categorized as possible or likely response for survival, viability, length, weight (2015 to 2017)										
2015	Q4	GH_ERC	-2.1	-4.5	-2.0	-0.97	-	-	-	-
Tests categorized as possible or likely response for survival and viability (2018)										
2018	Q4	GH_FR1	5.4	-3.4	0.95	0.46	4.2	-3.9	1.7	1.5
2018	Q4	FR_FRABCH	5.8	-2.9	1.2	0.55	4.5	-3.6	2.1	1.6
2018	Q4	FR_FRCP1	14	8.3	-12	8.2	14	6.9	-9.1	2.0
Tests categorized as possible or likely response for length and weight (2018)										
2018	Q4	FR_FRCP1	14	8.3	-12	8.2	14	6.9	-9.1	2.0

Notes:
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO₃ = calcium carbonate;
 TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent.

Screening
 Concentrations of parameters in 2018 tests categorized as possible or likely response are shaded if the concentration is greater than the maximum concentration measured in references or tests categorized as no adverse response.

Appendix D: Concentration-Response Analysis

Table D-5: *P. promelas* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	Mean Hatch (control normalized)	Mean Survival (Control Normalized)	Mean Biomass (Control Normalized)	Mean Length (Control Normalized)	Mean Normal Development (Control Normalized)	ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADIUM-D-mg/l
Tests not included in statistical analysis																								
2016	Q1	CM_MC2	-	-	-	-	-	210	<0.003	0.018	0.00021	0.00022	0.00016	0.00019	0.077	0.076	<0.0001	<0.0001	<0.00005	<0.00005	0.025	0.027	<0.25	0.000015
2016	Q1	FR_FRCP1	-	-	-	-	-	234	0.0032	0.0048	0.00026	0.00028	<0.0001	0.0001	0.084	0.085	<0.0001	<0.0001	<0.00005	<0.00005	0.011	0.012	<0.3	0.000022
2016	Q1	GH_FR1	-	-	-	-	-	200	<0.003	0.0094	0.00014	0.00016	<0.0001	0.00012	0.12	0.12	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.25	0.000015
2016	Q1	Reference (FR_UFR1)	-	-	-	-	-	139	0.0072	0.024	<0.0001	<0.0001	<0.0001	0.0001	0.075	0.075	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000065
2016	Q4	Reference (FR_UFR1)	100	58	58	97	102	141	0.0073	0.038	<0.0001	<0.0001	<0.0001	0.00012	0.063	0.063	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000063
2018	Q2	Reference (FR_UFR1)	100	6.1	19	150	107	102	0.0071	0.16	<0.0001	<0.0001	0.00013	0.00021	0.039	0.038	<0.00002	0.000021	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000082
2018	Q2	Reference (GH_ER2)	97	39	59	120	96	137	0.005	0.71	<0.0001	0.00013	0.00015	0.00066	0.041	0.054	<0.00002	0.000064	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000085
Reference																								
2016	Q2	Reference (FR_UFR1)	100	104	95	95	98	116	0.0056	0.059	<0.0001	<0.0001	0.0001	0.00012	0.042	0.044	<0.000036	<0.000036	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000006
2016	Q3	Reference (FR_UFR1)	107	96	100	102	100	156	<0.003	0.0063	<0.0001	<0.0001	<0.0001	0.00011	0.076	0.077	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000079
2017	Q3	Reference (CM_MC1)	100	92	128	82	100	142	0.0029	0.012	<0.0001	0.0001	0.00021	0.00022	0.052	0.052	<0.00002	<0.00002	<0.00005	<0.00005	0.016	0.015	<0.05	0.0000099
2017	Q4	Reference (CM_MC1)	100	78	91	97	100	136	<0.003	0.0067	<0.0001	<0.0001	0.00015	0.00018	0.051	0.051	<0.00002	<0.00002	<0.00005	<0.00005	0.013	0.014	<0.09	0.0000077
2017	Q1	Reference (FR_UFR1)	97	100	91	107	100	139	0.0014	0.0076	<0.0001	0.00013	<0.0001	0.00011	0.074	0.082	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000084
2017	Q2	Reference (FR_UFR1)	100	98	111	98	100	116	0.026	0.13	<0.0001	0.00011	0.00013	0.00018	0.046	0.046	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000011
2017	Q3	Reference (FR_UFR1)	98	98	130	84	100	147	0.0027	0.0057	<0.0001	0.0001	<0.0001	0.00012	0.075	0.073	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000083
2017	Q4	Reference (FR_UFR1)	105	98	98	93	100	144	<0.003	0.0033	<0.0001	<0.0001	<0.0001	0.00011	0.074	0.073	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	0.052	0.0000068
2017	Q2	Reference (GH_ER2)	100	98	105	100	98	150	0.0035	0.27	<0.0001	<0.0001	0.00012	0.00027	0.047	0.049	<0.00002	0.000028	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000078
2017	Q3	Reference (GH_ER2)	100	83	130	85	100	140	0.0029	0.014	<0.0001	0.00012	0.00011	0.00012	0.048	0.047	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000068
2017	Q4	Reference (GH_ER2)	103	96	85	92	100	147	<0.003	0.0068	<0.0001	<0.0001	<0.0001	0.00011	0.048	0.047	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000052
2018	Q1	Reference (CM_MC1)	100	100	86	88	102	157	<0.003	0.0038	<0.0001	<0.0001	0.00015	0.00016	0.054	0.053	<0.00002	<0.00002	<0.00005	<0.00005	0.013	0.014	<0.05	0.0000067
2018	Q2	Reference (CM_MC1)	98	116	97	100	107	92	0.025	0.33	<0.00012	<0.0001	0.00023	0.00037	0.028	0.029	<0.000024	0.00023	<0.00006	<0.00006	<0.012	0.01	<0.05	0.000012
2018	Q3	Reference (CM_MC1)	98	106	93	93	100	146	0.003	0.14	<0.0001	<0.0001	0.00018	0.00021	0.059	0.054	<0.00002	<0.00002	<0.00005	<0.00005	0.015	0.016	<0.05	0.00001
2018	Q4	Reference (CM_MC1)	98	93	79	99	100	139	0.0033	0.0071	<0.0001	<0.0001	0.00017	0.00018	0.048	0.047	<0.00002	<0.00002	<0.00005	<0.00005	0.013	0.013	<0.05	0.000008
2018	Q1	Reference (FR_UFR1)	102	89	98	96	100	148	0.0063	0.011	<0.00012	<0.0001	0.00012	0.00012	0.08	0.071	<0.000028	<0.00002	<0.00006	<0.00005	<0.012	<0.01	<0.05	0.0000077
2018	Q3	Reference (FR_UFR1)	102	102	87	98	100	152	<0.003	0.0045	<0.0001	<0.0001	0.0001	0.00012	0.075	0.072	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.09	0.0000073
2018	Q4	Reference (FR_UFR1)	100	109	97	104	100	150	<0.003	0.0031	<0.0001	<0.0001	<0.0001	0.00011	0.071	0.071	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000076
2018	Q1	Reference (GH_ER2)	100	77	86	109	102	156	<0.003	0.0045	<0.0001	<0.0001	<0.0001	0.00021	0.051	0.05	<0.00002	<0.00002	<0.00006	<0.00005	<0.01	<0.01	<0.05	0.0000056
2018	Q3	Reference (GH_ER2)	98	69	54	94	100	137	<0.003	0.19	<0.0001	<0.0001	0.0001	0.00026	0.043	0.045	<0.00002	0.000029	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000065
2018	Q4	Reference (GH_ER2)	100	104	100	106	100	147	<0.003	0.0055	<0.0001	<0.0001	<0.0001	0.00011	0.047	0.047	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000055
Tests categorized as no adverse response																								
2016	Q2	CM_MC2	100	107	100	97	100	144	0.0062	0.34	0.00015	0.00016	0.00017	0.00028	0.044	0.045	<0.000036	0.000039	<0.00005	<0.00005	0.016	0.017	<0.05	0.000059
2016	Q4	CM_MC2	100	105	92	103	102	174	0.0065	0.1	0.00021	0.00022	0.00024	0.00028	0.053	0.056	<0.000036	<0.000036	<0.00009	<0.00009	0.025	0.026	<0.09	0.000029
2016	Q2	FR_FRCP1	98	104	86	96	100	155	<0.003	0.064	0.00017	0.00022	<0.0001	0.00013	0.058	0.059	<0.000036	<0.000036	<0.00005	0.000051	<0.01	<0.01	<0.05	0.000027
2016	Q3	FR_FRCP1	105	92	111	105	100	201	<0.003	0.015	0.00021	0.00024	<0.0001	0.00011	0.077	0.077	<0.00002	<0.00002	<0.00005	<0.00005	0.011	0.011	<0.25	0.00002
2016	Q4	FR_FRCP1	97	87	95	103	102	197	0.0036	0.023	0.00019	0.0002	<0.0001	0.00013	0.075	0.075	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.25	0.000044
2016	Q2	GH_FR1	97	100	91	99	100	168	<0.003	0.065	0.00016	0.00019	0.0001	0.00015	0.079	0.08	<0.000036	<0.000036	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00002
2016	Q3	GH_FR1	107	102	89	101	100	199	<0.003	0.0072	0.00013	0.00015	0.0001	0.00013	0.11	0.11	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	0.01	<0.25	0.000015
2016	Q4	GH_FR1	98	89	92	101	102	194	<0.003	0.01	0.00016	0.00022	0.0001	0.00014	0.10	0.099	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.25	0.000016
2017	Q1	CM_MC2	98	113	103	94	100	196	0.0032	0.036	0.00031	0.00041	0.00015	0.0002	0.068	0.07	<0.00002	<0.00002	<0.00005	<0.00005	0.03	0.031	<0.17	0.000037
2017	Q2	CM_MC2	100	95	111	100	100	170	0.005	0.31	0.00023	0.00026	0.00017	0.00036	0.055	0.058	<0.00002	0.00003	<0.00005	<0.00005	0.023	0.025	<0.05	0.000071
2017	Q3	CM_MC2	102	96	119	96	100	190	0.003	0.029	0.00031	0.00036	0.00019	0.00024	0.067	0.066	<0.00002	<0.00002	<0.00005	<0.00005	0.032	0.033	<0.09	0.0000061
2017	Q4	CM_MC2	98	82	95	97	100	202	<0.003	0.0081	0.00025	0.00028	0.00017	0.0002	0.079	0.077	<0.00002	<0.00002	<0.00005	<0.00005	0.033	0.035	0.099	0.000012
2017	Q1	FR_FRCP1	102	81	72	115	100	250</																

Appendix D: Concentration-Response Analysis

Table D-5: *P. promelas* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	CADMIUM-T-mg/l	CALCIUM-T-mg/l	CARBON, DISSOLVED ORGANIC-D-mg/l	CHLORIDE-D-mg/l	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l	COBALT-T-mg/l	CONDUCTIVITY, LAB-N-us/cm	COPPER-D-mg/l	COPPER-T-mg/l	FLUORIDE-D-mg/l	Hardness, Total or Dissolved CaCO3-N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l	MANGANES E-D-mg/l	MANGANES E-T-mg/l	MERCURY-D-mg/l	
Tests not included in statistical analysis																										
2016	Q1	CM_MC2	0.000016	121	0.68	4.9	0.00016	0.00025	0.00093	0.001	922	0.00052	0.021	0.12	499	<0.01	0.016	<0.00005	<0.00005	0.014	0.014	51	0.0059	0.0071	<0.000005	
2016	Q1	FR_FRCP1	0.000055	183	0.76	2.8	0.0001	0.0009	<0.0001	<0.0001	1412	<0.0005	0.021	0.18	863	<0.01	0.023	<0.00005	<0.00005	0.058	0.06	103	0.0073	0.0093	<0.000005	
2016	Q1	GH_FR1	0.000018	120	0.62	2.7	0.00011	0.00014	<0.0001	<0.0001	897	<0.0005	0.021	0.18	504	<0.01	0.013	<0.00005	<0.00005	0.015	0.015	52	0.0012	0.0017	<0.000005	
2016	Q1	Reference (FR_UFR1)	0.0000094	56	0.6	0.77	0.00011	0.0002	<0.0001	<0.0001	353	<0.0005	0.021	0.15	193	<0.01	0.017	<0.00005	<0.00005	0.0015	0.0016	14	0.00021	0.00045	<0.000005	
2016	Q4	Reference (FR_UFR1)	0.0000089	48	1.1	0.19	0.00011	0.00018	<0.0001	<0.0001	318	<0.0005	0.011	0.16	172	<0.01	0.017	<0.00005	<0.00005	0.0013	0.0015	13	0.00016	0.00052	<0.000005	
2018	Q2	Reference (FR_UFR1)	0.000024	30	2.2	<0.5	0.00011	0.00041	<0.0001	0.00014	206	<0.0005	0.0011	0.12	112	<0.01	0.19	<0.00005	0.00014	0.0011	0.0013	8.4	0.00059	0.0083	<0.000005	
2018	Q2	Reference (GH_ER2)	0.00014	49	1.8	0.51	0.00015	0.00019	<0.0001	0.00047	265	<0.0005	0.0015	0.15	142	<0.01	1.0	<0.00005	0.00075	0.0014	0.0022	11	0.00077	0.065	<0.000005	
Reference																										
2016	Q2	Reference (FR_UFR1)	0.000012	39	1.7	0.1	0.00012	0.00021	<0.0001	<0.0001	245	0.00061	0.011	0.16	134	<0.01	0.043	<0.00005	0.000052	0.0011	0.0013	10	0.00031	0.0016	<0.000005	
2016	Q3	Reference (FR_UFR1)	0.00001	51	0.8	0.14	0.0001	0.00016	<0.0001	<0.0001	341	<0.0005	0.011	0.17	178	<0.01	0.011	<0.00005	<0.00005	0.0018	0.0015	14	0.00019	0.00066	<0.000005	
2017	Q3	Reference (CM_MC1)	0.000012	40	1.4	<0.5	0.00012	0.00025	<0.0001	<0.0001	270	<0.00044	<0.0005	0.053	146	<0.01	0.015	<0.00005	<0.00005	0.0049	0.0045	11	0.00012	0.00052	<0.000005	
2017	Q4	Reference (CM_MC1)	0.0000086	41	1.2	1.1	0.00018	0.00019	<0.0001	<0.0001	275	<0.0005	<0.0005	0.093	144	<0.01	<0.01	<0.00005	<0.00005	0.0046	0.0047	11	0.00013	0.00026	<0.000005	
2017	Q1	Reference (FR_UFR1)	0.000011	50	0.68	<0.5	0.0001	0.00014	<0.0001	<0.0001	333	<0.0002	<0.0005	0.14	177	<0.01	0.011	<0.00005	<0.00005	0.0016	0.0016	15	<0.0001	0.00034	<0.000005	
2017	Q2	Reference (FR_UFR1)	0.000022	32	2.9	<0.5	0.00012	0.00049	<0.0001	0.00012	238	0.0003	0.00059	0.11	122	0.02	0.14	<0.00005	0.00011	0.0011	0.0012	9.1	0.00064	0.0054	<0.000005	
2017	Q3	Reference (FR_UFR1)	0.000012	50	1.3	0.27	0.0001	0.0002	<0.0001	<0.0001	333	<0.00044	<0.0005	0.15	180	<0.01	0.01	<0.00005	<0.00005	0.0018	0.0017	13	0.00023	0.00071	<0.000005	
2017	Q4	Reference (FR_UFR1)	0.0000098	51	0.71	<0.5	0.0001	0.00018	<0.0001	<0.0001	334	<0.0005	<0.0005	0.11	184	<0.01	<0.01	<0.00005	<0.00005	0.0017	0.0017	14	0.00012	0.00047	<0.000005	
2017	Q2	Reference (GH_ER2)	0.000043	50	1.3	0.4	0.0002	0.00082	<0.0001	0.00018	301	<0.0005	0.00068	0.15	171	<0.01	0.34	<0.00005	0.00023	0.0016	0.0021	12	0.00078	0.021	<0.000005	
2017	Q3	Reference (GH_ER2)	0.0000085	45	0.83	0.35	0.00021	0.00024	<0.0001	<0.0001	282	<0.00044	<0.0005	0.13	155	<0.01	0.019	<0.00005	<0.00005	0.0017	0.0018	10	0.0022	0.0038	<0.000005	
2017	Q4	Reference (GH_ER2)	0.0000075	43	0.63	<0.5	0.00025	0.00028	<0.0001	<0.0001	280	<0.0005	<0.0005	0.13	155	<0.01	0.011	<0.00005	<0.00005	0.0019	0.0017	11	0.00044	0.0015	<0.000005	
2018	Q1	Reference (CM_MC1)	0.0000081	43	0.89	0.55	0.00015	0.0002	<0.0001	<0.0001	305	<0.0005	<0.0005	0.054	152	<0.01	<0.01	<0.00005	<0.00005	0.0046	0.0049	11	<0.0001	0.00017	<0.000005	
2018	Q2	Reference (CM_MC1)	0.000033	25	3.3	<0.5	0.00022	0.00057	<0.00012	0.00014	176	<0.0005	0.00077	0.046	93	0.02	0.31	<0.00005	0.00025	0.0021	0.0025	7.1	0.00099	0.0092	0.0000052	
2018	Q3	Reference (CM_MC1)	0.00001	41	1.1	0.44	0.00018	0.00024	<0.0001	<0.0001	274	<0.0005	0.0005	0.078	152	<0.01	0.012	<0.00005	<0.00005	0.0049	0.005	11	0.00018	0.00063	<0.000005	
2018	Q4	Reference (CM_MC1)	0.0000092	39	1.5	0.5	0.00017	0.00021	<0.0001	<0.0001	279	<0.0005	<0.0005	0.069	145	<0.01	<0.01	<0.00005	<0.00005	0.0042	0.0042	11	0.00011	0.00028	<0.000005	
2018	Q1	Reference (FR_UFR1)	0.000011	52	0.75	<0.5	<0.00012	0.0002	<0.00012	<0.0001	359	0.00052	<0.0005	0.12	190	<0.012	0.018	<0.00005	<0.00005	0.0015	0.0015	14	0.00015	0.0005	<0.000005	
2018	Q3	Reference (FR_UFR1)	0.000011	48	0.99	0.75	0.00011	0.00011	<0.0001	<0.0001	329	<0.0005	<0.0005	0.16	183	<0.01	<0.01	<0.00005	<0.00005	0.0018	0.0018	13	0.00023	0.00059	<0.000005	
2018	Q4	Reference (FR_UFR1)	0.0000089	51	0.76	<0.5	0.0001	0.00017	<0.0001	<0.0001	340	<0.0005	<0.0005	0.15	187	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0016	14	0.00013	0.00031	<0.000005	
2018	Q1	Reference (GH_ER2)	0.00001	50	0.56	0.27	0.00021	0.00026	<0.0001	<0.0001	324	<0.0005	<0.0005	0.16	171	<0.01	0.012	<0.00005	<0.00005	0.0016	0.0016	11	0.00013	0.00016	<0.000005	
2018	Q3	Reference (GH_ER2)	0.000039	44	0.89	0.42	0.0002	0.00063	<0.0001	0.00018	268	<0.0005	0.00065	0.17	150	<0.01	0.28	<0.00005	0.00024	0.0017	0.0019	10	0.00058	0.018	<0.000005	
2018	Q4	Reference (GH_ER2)	0.000064	47	0.5	<0.5	0.00024	0.00026	<0.0001	<0.0001	293	<0.0005	<0.0005	0.17	165	<0.01	0.013	<0.00005	<0.00005	0.0018	0.0019	11	0.00037	0.00099	<0.000005	
Tests categorized as no adverse response																										
2016	Q2	CM_MC2	0.000096	68	1.4	1.3	0.00018	0.00058	0.002	0.0027	532	<0.0005	0.011	0.1	278	<0.01	0.36	0.000053	0.00023	0.0088	0.0092	26	0.011	0.023	<0.000005	
2016	Q4	CM_MC2	0.000037	83	1.6	1.8	0.00023	0.00037	0.0011	0.0013	648	<0.0006	0.011	0.11	349	<0.018	0.1	<0.00009	0.0001	0.011	0.011	36	0.009	0.014	<0.000005	
2016	Q2	FR_FRCP1	0.000044	76	1.5	0.51	0.0001	0.00023	<0.0001	0.0001	570	0.00061	0.011	0.21	312	<0.01	0.082	<0.00005	0.000072	0.018	0.019	31	0.0022	0.0074	<0.000005	
2016	Q3	FR_FRCP1	0.000051	113	0.94	1.7	<0.0001	0.00013	0.0001	0.00011	909	<0.0005	0.011	0.2	497	<0.01	0.029	<0.00005	<0.00005	0.037	0.037	57	0.0044	0.0077	<0.000005	
2016	Q4	FR_FRCP1	0.000052	110	1.0	1.4	<0.0001	0.00015	<0.0001	<0.0001	855	<0.0005	0.011	0.2	489	<0.01	0.032	<0.00005	<0.00005	0.033	0.034	52	0.0069	0.0087	<0.000005	
2016	Q2	GH_FR1	0.000033	80	1.4	0.98	0.00012	0.00023	<0.0001	<0.0001	603	<0.0005	0.011	0.19	336	<0.01	0.091	<0.00005	0.000073	0.014	0.014	33	0.00082	0.0047	<0.000005	
2016	Q3	GH_FR1	0.000018	95	0.85	1.6	0.00011	0.00017	<0.0001	<0.0001	744	<0.00052	0.011	0.19	406	<0.01	0.015	<0.00005	<0.00005	0.018	0.018	42	0.00087	0.0018	<0.000005	
2016	Q4	GH_FR1	0.000019	100	0.85	1.6	0.00011	0.00015	<0.0001	<0.0001	763	<0.0005	0.011	0.17	429	<0.01	0.018	<0.00005	<0.00005	0.018	0.018	46	0.00096	0.0017	<0.000005	
2017	Q1	CM_MC2	0.000044	120	1.0	3.5	0.00014	0.00027	0.0039	0.0041	923	<0.00044	<0.0005	0.13	504	<0.01	0.036	<0.00005	0.000054	0.019	0.019	51	0.019	0.021	0.0000057	
2017	Q2	CM_MC2	0.000012	82	1.9	1.6	0.00013	0.00062	0.0029	0.0039	652	0.00022	0.00082	0.098	327	<0.01	0.42	<0.00005	0.000027	0.013	0.013	34	0.017	0.033	<0.000005	
2017	Q3	CM_MC2	0.000019	113	1.4	1.6																				

Appendix D: Concentration-Response Analysis

Table D-5: *P. promelas* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	MERCURY-T- mg/l	MOLYBDEN UM-D-mg/l	MOLYBDEN UM-T-mg/l	NICKEL-D- mg/l	NICKEL-T- mg/l	NITRATE NITROGEN (NO ₃), AS N- N-mg/l	NITRITE NITROGEN (NO ₂), AS N- N-mg/l	NITROGEN, AMMONIA (AS N)-N- mg/l	ORTHO- PHOSPHATE- N-mg/l	pH, LAB-N- ph units	PHOSPHOR US-N-mg/l	POTASSIUM- T-mg/l	SELENIUM-D- ug/l	SELENIUM-T ug/l	SILVER-D- mg/l	SILVER-T- mg/l	SODIUM-T- mg/l	STRONTIUM- D-mg/l	STRONTIUM- T-mg/l	SULFATE (AS SO ₄)-D- mg/l	THALLIUM-D mg/l	THALLIUM-T- mg/l	TIN-D-mg/l	
Tests not included in statistical analysis																										
2016	Q1	CM_MC2	<0.000023	0.0011	0.0011	0.01	0.01	3.0	0.026	0.01	0.0012	8.3	0.0022	1.6	0.0055	0.0055	<0.00001	<0.00001	13	0.33	0.34	292	0.000011	0.000015	<0.0001	
2016	Q1	FR_FRCP1	<0.000005	0.0016	0.0017	0.0089	0.0093	25	0.0063	<0.005	<0.001	8.3	0.0027	2.4	0.14	0.14	<0.00001	<0.00001	2.5	0.2	0.2	533	0.000012	0.000014	<0.0001	
2016	Q1	GH_FR1	<0.000014	0.00091	0.00091	0.0017	0.0017	13	0.0054	<0.005	<0.001	8.3	0.0031	1.2	0.051	0.05	<0.00001	<0.00001	2.4	0.16	0.16	250	<0.00001	<0.00001	<0.0001	
2016	Q1	Reference (FR_UFR1)	0.0000062	0.00057	0.00059	<0.0005	<0.0005	0.15	<0.001	<0.005	0.0031	8.3	0.0047	0.39	0.00081	0.0008	<0.00001	<0.00001	0.7	0.088	0.09	48	<0.00001	<0.00001	<0.0001	
2016	Q4	Reference (FR_UFR1)	0.0000056	0.00057	0.00058	<0.0005	<0.0005	0.1	<0.001	<0.005	0.0023	8.3	0.0044	0.37	0.00067	0.00067	<0.00001	<0.00001	0.68	0.089	0.09	38	<0.00001	<0.00001	<0.0001	
2018	Q2	Reference (FR_UFR1)	0.000002	0.00059	0.00056	<0.0005	0.00066	0.052	<0.001	0.0082	0.0052	8.2	0.023	0.41	0.00049	0.00047	<0.00001	0.000015	0.52	0.063	0.06	9.9	<0.00001	0.000012	<0.0001	
2018	Q2	Reference (GH_ER2)	0.0000039	0.00089	0.00089	<0.0005	0.0022	0.1	0.0011	0.009	0.003	8.3	0.13	0.68	0.00068	0.00074	<0.00001	0.000023	0.66	0.19	0.19	13	<0.00001	0.000036	<0.0001	
Reference																										
2016	Q2	Reference (FR_UFR1)	0.0000096	0.00063	0.00065	<0.0005	<0.0005	0.016	<0.001	<0.005	0.0026	8.3	0.0047	0.36	0.00051	0.00055	<0.00001	<0.00001	0.65	0.066	0.068	15	<0.00001	<0.00001	<0.0001	
2016	Q3	Reference (FR_UFR1)	<0.000005	0.00061	0.00062	<0.0005	<0.0005	0.041	<0.001	<0.005	0.0026	8.3	0.0048	0.45	0.0006	0.00065	<0.00001	<0.00001	0.74	0.096	0.098	39	<0.00001	<0.00001	<0.0001	
2017	Q3	Reference (CM_MC1)	0.0000054	0.00089	0.0009	<0.0005	<0.0005	0.018	<0.001	0.0063	0.005	8.3	0.018	0.5	0.00018	0.00022	<0.00001	<0.00001	2.4	0.15	0.15	13	<0.00001	<0.00001	<0.0001	
2017	Q4	Reference (CM_MC1)	0.0000053	0.00085	0.00088	<0.0005	<0.0005	0.068	0.0018	0.007	0.0035	8.2	0.0033	0.5	0.0002	0.00022	<0.00001	<0.00001	3.0	0.16	0.16	28	<0.00001	<0.00001	<0.0001	
2017	Q1	Reference (FR_UFR1)	<0.000005	0.00058	0.00062	<0.0005	<0.0005	0.21	0.0012	<0.005	0.0064	8.2	0.015	0.43	0.001	0.00095	<0.00001	<0.00001	0.85	0.093	0.096	46	<0.00001	<0.00001	<0.0001	
2017	Q2	Reference (FR_UFR1)	0.0000024	0.00049	0.00052	0.0005	0.0006	0.078	0.0019	0.0066	0.0072	8.3	0.022	0.39	0.00068	0.00064	<0.00001	0.000012	0.58	0.064	0.063	16	<0.00001	0.000011	0.0001	
2017	Q3	Reference (FR_UFR1)	<0.000005	0.00063	0.00067	<0.0005	<0.0005	0.014	<0.001	0.0061	0.0026	8.4	0.0043	0.46	0.00054	0.00058	<0.00001	<0.00001	0.68	0.097	0.096	37	<0.00001	<0.00001	<0.0001	
2017	Q4	Reference (FR_UFR1)	<0.000005	0.00057	0.00059	<0.0005	<0.0005	0.031	0.001	0.0052	0.0015	8.4	0.0028	0.39	0.00059	0.00061	<0.00001	<0.00001	0.69	0.099	0.099	46	<0.00001	<0.00001	<0.0001	
2017	Q2	Reference (GH_ER2)	<0.000018	0.00091	0.00094	<0.0005	0.0009	0.12	<0.001	<0.005	0.0012	8.3	0.026	0.48	0.00084	0.00087	<0.00001	0.000012	0.77	0.2	0.21	18	<0.00001	0.000016	<0.0001	
2017	Q3	Reference (GH_ER2)	0.0000052	0.00099	0.001	<0.0005	<0.0005	0.043	<0.001	0.0061	0.0014	8.2	0.0037	0.38	0.00065	0.00066	<0.00001	<0.00001	0.61	0.21	0.21	16	<0.00001	<0.00001	0.0001	
2017	Q4	Reference (GH_ER2)	<0.000005	0.0011	0.001	<0.0005	<0.0005	0.05	<0.001	0.0069	<0.001	8.4	0.0017	0.36	0.00084	0.00081	<0.00001	<0.00001	0.7	0.21	0.2	19	<0.00001	<0.00001	<0.0001	
2018	Q1	Reference (CM_MC1)	<0.000005	0.00087	0.00092	<0.0005	<0.0005	0.048	<0.001	0.0081	0.003	8.2	0.004	0.45	0.00028	0.00028	<0.00001	<0.00001	3.4	0.16	0.17	18	<0.00001	<0.00001	<0.0001	
2018	Q2	Reference (CM_MC1)	0.0000025	0.00051	0.00057	<0.0006	0.00075	0.007	<0.001	0.008	0.0038	8.0	0.021	0.44	0.00018	0.00018	<0.000012	<0.00001	1.2	0.078	0.074	5.1	<0.000012	0.000024	<0.00012	
2018	Q3	Reference (CM_MC1)	<0.000005	0.00094	0.00092	<0.0005	0.00054	0.018	<0.001	0.014	0.0047	8.3	0.0063	0.49	0.00018	0.00019	<0.00001	<0.00001	2.9	0.16	0.16	13	<0.00001	<0.00001	<0.0001	
2018	Q4	Reference (CM_MC1)	0.0000056	0.00086	0.00087	<0.0005	<0.0005	0.021	<0.001	0.026	0.0046	8.3	0.0042	0.42	0.00023	0.00023	<0.00001	<0.00001	3.1	0.14	0.14	14	<0.00001	<0.00001	<0.0001	
2018	Q1	Reference (FR_UFR1)	0.0000052	0.00061	<0.0006	<0.0006	0.0061	0.19	<0.001	0.0084	0.0033	8.3	0.0043	0.37	0.00088	0.00087	<0.000012	<0.00001	0.77	0.097	0.092	48	<0.000012	<0.00001	<0.00012	
2018	Q3	Reference (FR_UFR1)	<0.000005	0.00064	0.00065	<0.0005	<0.0005	0.014	<0.0018	0.023	0.0022	8.4	0.005	0.44	0.00059	0.00058	<0.00001	<0.000012	0.68	0.1	0.097	37	<0.00001	<0.00001	<0.0001	
2018	Q4	Reference (FR_UFR1)	<0.000005	0.00058	0.00057	<0.0005	<0.0005	0.1	<0.001	0.047	0.0024	8.4	0.0026	0.36	0.00076	0.00081	<0.00001	<0.00001	0.72	0.096	0.098	44	<0.00001	<0.00001	<0.0001	
2018	Q1	Reference (GH_ER2)	<0.000005	0.00094	0.001	<0.0005	0.00061	0.1	<0.001	<0.005	0.0011	8.2	0.0039	0.32	0.001	0.0011	<0.00001	<0.00001	0.73	0.21	0.22	23	<0.00001	<0.00001	<0.0001	
2018	Q3	Reference (GH_ER2)	0.0000074	0.001	0.00096	<0.0005	0.00085	0.035	0.0022	0.018	0.002	8.3	0.0085	0.42	0.0007	0.00067	<0.00001	0.000011	0.62	0.21	0.2	17	<0.00001	0.000014	<0.0001	
2018	Q4	Reference (GH_ER2)	<0.000005	0.001	0.001	<0.0005	<0.0005	0.086	<0.001	0.017	0.002	8.3	0.0028	0.34	0.00091	0.00093	<0.00001	<0.00001	0.72	0.22	0.21	22	<0.00001	<0.00001	<0.0001	
Tests categorized as no adverse response																										
2016	Q2	CM_MC2	0.0000096	0.00086	0.00089	0.015	0.016	1.9	0.008	0.02	0.002	8.3	0.018	1.1	0.0043	0.0042	<0.00001	<0.00001	6.0	0.19	0.19	132	0.000012	0.000021	<0.0001	
2016	Q4	CM_MC2	0.0000086	0.00092	0.00095	0.011	0.012	2.1	0.0096	0.012	0.0015	8.3	0.0071	1.3	0.0054	0.0055	<0.000018	<0.000018	7.6	0.24	0.24	187	0.000019	0.000022	<0.00018	
2016	Q2	FR_FRCP1	0.0000086	0.0011	0.0011	0.0019	0.0024	8.3	0.0026	0.0057	0.0015	8.3	0.0086	1.2	0.03	0.031	<0.00001	<0.00001	1.1	0.099	0.1	119	<0.00001	0.000011	<0.0001	
2016	Q3	FR_FRCP1	<0.000005	0.0013	0.0013	0.0055	0.0058	13	0.0065	0.0056	0.0013	8.3	0.0051	1.7	0.068	0.067	<0.00001	<0.00001	1.8	0.15	0.15	284	<0.00001	0.00001	<0.0001	
2016	Q4	FR_FRCP1	<0.000005	0.0013	0.0013	0.0051	0.0054	13	<0.005	<0.005	<0.001	8.3	0.0036	1.6	0.06	0.059	<0.00001	<0.00001	1.6	0.15	0.15	256	0.000011	<0.00001	<0.0001	
2016	Q2	GH_FR1	0.0000012	0.001	0.001	0.0018	0.002	7.6	0.0027	0.0052	0.0012	8.3	0.0089	1.1	0.029	0.03	<0.00001	<0.00001	1.5	0.11	0.11	130	<0.00001	0.00001	<0.0001	
2016	Q3	GH_FR1	<0.0000095	0.00095	0.00097	0.0016	0.0017	10	0.0056	<0.005	0.001	8.3	0.0041	1.2	0.039	0.04	<0.00001	<0.00001	2.0	0.14	0.14	190	<0.00001	<0.00001	<0.0001	
2016	Q4	GH_FR1	<0.000014	0.0011	0.0011	0.0024	0.0025	9.6	<0.005	0.0053	0.0011	8.3	0.01	1.3	0.043	0.043	<0.00001	<0.00001	2.1	0.14	0.15	214	<0.00001	<0.00001	<0.0001	
2017	Q1	CM_MC2	0.000005	0.0016	0.0016	0.029	0.03	4.1	0.019	0.042	0.0026	8.3	0.0057	1.9	0.0066	0.0062	<0.00001	<0.00001	1.5	0.41	0.42	320	0.000016	0.00002	<0.0001	
2017	Q2	CM_MC2	0.00000																							

Appendix D: Concentration-Response Analysis

Table D-5: *P. promelas* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	TIN-T-mg/l	TITANIUM-D-mg/l	TITANIUM-T-mg/l	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	TOTAL KJELDAHL NITROGEN-N-mg/l	TOTAL ORGANIC CARBON-T-mg/l	TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	TURBIDITY, LAB-N-ntu	URANIUM-D-mg/l	URANIUM-T-mg/l	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l	ZINC-T-mg/l	ΣTU-WQGs	ΣTU-WQGs/Benchmarks	PCA Factor 1 (2015 to 2018)	PCA Factor 2 (2015 to 2018)	PCA Factor 3 (2015 to 2018)	PCA Factor 4 (2015 to 2018)	PCA Factor 1 (2018)	PCA Factor 2 (2018)	PCA Factor 3 (2018)	PCA Factor 4 (2018)	
Tests not included in statistical analysis																											
2016	Q1	CM_MC2	<0.0001	0.011	0.011	650	0.12	0.8	1.1	0.65	0.0026	0.0026	<0.0005	<0.0005	<0.003	<0.003	8.5	7.8	-	-	-	-	-	-	-	-	-
2016	Q1	FR_FRCP1	<0.0001	0.014	0.015	1159	0.13	0.9	1.0	0.33	0.006	0.0061	<0.0005	<0.0005	<0.003	<0.003	17	9.8	-	-	-	-	-	-	-	-	-
2016	Q1	GH_FR1	<0.0001	0.012	0.012	625	0.098	0.89	<1	0.53	0.0023	0.0023	<0.0005	<0.0005	<0.003	<0.003	9.2	5.7	-	-	-	-	-	-	-	-	-
2016	Q1	Reference (FR_UFR1)	<0.0001	0.01	0.01	231	0.058	0.64	<1	0.48	0.00045	0.0005	<0.0005	0.00051	<0.003	<0.003	4.5	4.5	-	-	-	-	-	-	-	-	-
2016	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	198	0.063	1.3	<1	0.65	0.00043	0.00044	<0.0005	0.0005	<0.003	<0.0036	2.8	2.8	-	-	-	-	-	-	-	-	-
2018	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	123	0.11	2.7	9.6	3.9	0.0003	0.00031	<0.0005	0.0009	<0.001	<0.0031	2.1	2.1	-	-	-	-	-	-	-	-	-
2018	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	161	0.3	3.7	72	48	0.00066	0.00079	<0.0005	0.0036	<0.001	0.0093	5.7	5.7	-	-	-	-	-	-	-	-	-
Reference																											
2016	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	147	0.081	2.0	1.7	0.89	0.00033	0.00034	<0.0005	0.0005	<0.003	<0.003	3.3	3.4	-7.3	2.1	-0.43	1.7	-	-	-	-	-
2016	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	221	0.068	0.92	1.6	0.29	0.00044	0.00044	<0.0005	<0.0005	<0.003	<0.003	2.6	2.6	-6.5	-1.8	-0.4	0.9	-	-	-	-	-
2017	Q3	Reference (CM_MC1)	<0.0001	<0.01	<0.01	163	0.061	1.1	1.0	0.38	0.00022	0.00022	<0.0005	<0.0005	<0.0026	<0.003	1.2	1.2	-6.0	0.78	-2.1	-2.2	-	-	-	-	-
2017	Q4	Reference (CM_MC1)	<0.0001	<0.01	<0.01	171	0.11	1.2	1.3	0.48	0.00022	0.00023	<0.0005	<0.0005	<0.003	<0.003	1.2	1.2	-5.5	-0.47	-2.4	-1.6	-	-	-	-	-
2017	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	196	0.069	0.71	<1	0.33	0.00045	0.00049	<0.0005	<0.0005	<0.001	<0.0035	1.2	1.2	-6.4	-2.0	-0.2	0.11	-	-	-	-	-
2017	Q2	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	143	0.12	3.1	6.5	4.2	0.0003	0.00033	0.00051	0.00079	0.0011	<0.003	2.4	2.4	-6.4	5.8	0.78	1.2	-	-	-	-	-
2017	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	204	0.06	1.4	1.1	0.28	0.00044	0.00042	<0.0005	<0.0005	<0.0026	<0.003	1.2	1.2	-6.5	-1.4	-0.25	0.31	-	-	-	-	-
2017	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	235	0.075	0.8	1.0	0.37	0.00052	0.00049	<0.0005	<0.0005	<0.003	<0.003	1.2	1.2	-6.5	-2.3	-0.75	0.32	-	-	-	-	-
2017	Q2	Reference (GH_ER2)	<0.0001	<0.01	<0.01	180	0.13	2.5	2.4	11	0.00078	0.00082	<0.0005	0.0014	<0.003	0.0046	2.6	2.6	-3.5	5.4	1.8	-0.076	-	-	-	-	-
2017	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	164	0.063	0.86	1.2	0.6	0.00064	0.00065	<0.0005	<0.0005	<0.0026	<0.003	1.2	1.2	-5.6	-0.76	-1.6	-0.91	-	-	-	-	-
2017	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	192	0.16	0.66	1.5	0.73	0.00077	0.00075	<0.0005	<0.0005	<0.003	<0.003	1.3	1.3	-5.6	-1.7	-1.7	-0.87	-	-	-	-	-
2018	Q1	Reference (CM_MC1)	<0.0001	<0.01	<0.01	190	0.18	0.93	<1	0.15	0.00025	0.00025	<0.0005	<0.0005	<0.003	<0.003	1.1	1.1	-5.7	-1.0	-2.8	-1.8	-5.0	-1.7	-1.6	-1.6	
2018	Q2	Reference (CM_MC1)	<0.0001	<0.01	<0.01	104	0.1	3.5	12	5.9	0.00013	0.00013	<0.0006	0.00088	<0.0012	0.0032	3.1	3.2	-5.8	9.6	-3.0	0.7	-5.5	8.1	-4.1	-1.9	
2018	Q3	Reference (CM_MC1)	<0.0001	<0.01	<0.01	175	0.054	1.1	1.2	0.51	0.00024	0.00024	<0.0005	<0.0005	0.001	0.0033	1.2	1.2	-5.9	0.21	-2.3	-2.3	-5.3	-0.72	-0.96	-2.2	
2018	Q4	Reference (CM_MC1)	<0.0001	<0.01	<0.01	158	0.17	1.5	<1	0.3	0.00023	0.00023	<0.0005	<0.0005	0.001	<0.003	1.1	1.2	-6.1	0.17	-2.5	-2.0	-5.4	-0.79	-1.5	-2.0	
2018	Q1	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	212	0.086	0.87	<1	0.28	0.00052	0.00049	<0.0006	0.00053	<0.003	<0.003	1.3	1.3	-5.4	-0.6	-2.8	1.5	-4.6	-0.8	-2.8	1.1	
2018	Q3	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	222	0.096	1.2	<1	0.64	0.00048	0.00046	<0.0005	<0.0005	<0.001	<0.003	1.2	1.2	-5.9	-1.9	-0.48	0.17	-5.1	-2.2	-0.14	1.0	
2018	Q4	Reference (FR_UFR1)	<0.0001	<0.01	<0.01	212	0.11	0.71	<1	0.24	0.0005	0.0005	<0.0005	<0.0005	<0.001	<0.003	1.3	1.3	-6.4	-2.5	-0.87	-0.13	-5.5	-2.8	-0.46	0.77	
2018	Q1	Reference (GH_ER2)	<0.0001	<0.01	<0.01	191	<0.05	0.51	1.0	0.15	0.0007	0.00077	<0.0005	<0.0005	<0.003	<0.003	1.3	1.3	-5.4	-1.6	-2.2	-0.64	-4.8	-2.2	-1.3	-0.28	
2018	Q3	Reference (GH_ER2)	<0.0001	<0.01	<0.01	170	0.069	0.94	3.6	0.71	0.00067	0.0007	<0.0005	0.0011	<0.001	0.0039	2.3	2.3	-4.5	3.1	0.39	-1.1	-4.3	2.3	0.72	-0.44	
2018	Q4	Reference (GH_ER2)	<0.0001	<0.01	<0.01	172	0.062	<0.5	1.2	0.44	0.00075	0.00077	<0.0005	<0.0005	<0.001	<0.003	1.3	1.3	-5.8	-2.0	-2.2	-1.1	-5.1	-2.6	-1.2	-0.6	
Tests categorized as no adverse response																											
2016	Q2	CM_MC2	<0.0001	0.011	0.015	365	0.19	1.8	12	5.9	0.0014	0.0014	<0.0005	0.00082	0.0054	0.0099	8.5	8.1	2.8	7.0	1.9	-2.4	-	-	-	-	-
2016	Q4	CM_MC2	<0.00018	<0.01	<0.01	462	0.14	1.9	4.6	2.9	0.0017	0.0018	<0.0009	<0.0009	0.0035	0.0062	6.9	6.4	6.2	6.4	-7.7	3.4	-	-	-	-	-
2016	Q2	FR_FRCP1	<0.0001	0.011	0.011	377	0.15	1.9	6.3	1.0	0.0017	0.0018	<0.0005	0.00052	<0.003	0.0031	6.0	4.2	0.15	0.88	2.7	2.5	-	-	-	-	-
2016	Q3	FR_FRCP1	<0.0001	<0.01	<0.01	700	0.14	1.1	2.1	1.8	0.0033	0.0034	<0.0005	<0.0005	<0.003	<0.003	8.7	5.2	2.7	-3.4	2.3	1.6	-	-	-	-	-
2016	Q4	FR_FRCP1	<0.0001	<0.01	<0.01	636	0.095	1.3	1.3	1.1	0.0031	0.0032	<0.0005	<0.0005	<0.003	<0.0042	8.4	5.0	2.4	-2.9	2.6	1.7	-	-	-	-	-
2016	Q2	GH_FR1	<0.0001	0.01	0.011	401	0.18	1.8	15	2.6	0.0017	0.0017	<0.0005	0.00052	<0.003	0.003	5.8	4.0	0.13	0.59	2.8	2.4	-	-	-	-	-
2016	Q3	GH_FR1	<0.0001	<0.01	<0.01	522	0.13	1.1	<1	0.36	0.0021	0.0021	<0.0005	0.00051	<0.003	<0.003	6.7	4.0	0.29	-3.9	1.7	1.6	-	-	-	-	-
2016	Q4	GH_FR1	<0.0001	<0.01	<0.01	562	0.2	1.6	2.0	0.71	0.0023	0.0023	<0.0005	<0.0005	<0.003	<0.003	6.7	4.2	1.1	-3.0	2.0	1.6	-	-	-	-	-
2017	Q1	CM_MC2	<0.0001	<0.01	<0.01	668	0.14	1.1	1.9	1.2	0.0034	0.0033	<0.0005	<0.0005	0.0041	0.0048	12	10	6.5	0.15	0.15	-6.1	-	-	-	-	-
2017	Q2	CM_MC2	0.00012	<0.01	<0.01	448	0.22	2.5	19	12	0.0018	0.0018	<0.0005	0.001	0.0063	0.011	9.0	8.5	5.1	6.4	2.3	-4.1	-	-	-	-	-
2017	Q3	CM_MC2	<0.0001	<0.01	<0.01	653	0.26	1.2	3.2	1.2	0.003	0.003	<0.0005	<0.0005	<0.0026	0.0037	10	9.2	5.2	-0.33	-0.96	-4.6	-	-	-	-	-
2017	Q4	CM_MC2	<0.0001	<0.01	<0.01	748	0.38	0.99	2.8	1.3	0.003	0.0032	<0.0005	<0.0005	<0.003	<0.003	7.3	6.2	5.0	-2.3	-1.1	-4.2	-	-	-	-	-
2017	Q1	FR_FRCP1	<0.0001	<0.01	<0.01	1231	0.29	1.3	1.3	1.1	0.0067	0.0069	<0.0005	0.00052	0.002	0.0031	13	7.1	5.8	-3.5	3.0	0.61	-	-	-	-	-
2017	Q2	FR_FRCP1	<0.0001	<0.01	<0.01	462	0.6	2.7	17	10	0.002	0.0021	<0.0005	0.0016	0.0024												

APPENDIX E

Principal Component Analysis

Table E-1: PCA Results for *C. dubia* Tests

	2015 to 2018 Dataset				2018 Dataset			
	PC1	PC2	PC3	PC4	PC1	PC2	PC3	PC4
Percent of Total Variance Explained								
	31.2	15.7	9.4	8.0	33.8	18.2	10.7	8.607
Component Loadings by Water Quality Parameter								
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	0.787	-0.32	-0.054	0.031	0.759	-0.38	-0.124	0.186
ALUMINUM-D-mg/l	-0.209	0.621	-0.014	0.153	-0.207	0.662	-0.006	0.026
ALUMINUM-T-mg/l	-0.181	0.852	0.165	0.193	-0.16	0.9	0.061	0.011
ANTIMONY-D-mg/l	0.877	0.075	0.012	-0.124	0.886	0.087	0.115	-0.131
ANTIMONY-T-mg/l	0.846	0.085	0.07	-0.056	0.898	0.137	0.127	-0.067
ARSENIC-D-mg/l	0.316	0.461	-0.104	-0.431	0.374	0.209	0.094	-0.538
ARSENIC-T-mg/l	0.199	0.832	0.074	-0.103	0.087	0.822	0.218	-0.223
BARIUM-D-mg/l	0.33	-0.345	0.084	0.203	0.17	-0.313	0.338	0.487
BARIUM-T-mg/l	0.346	-0.255	0.051	0.235	0.205	-0.162	0.291	0.495
BERYLLIUM-D-mg/l	0.064	-0.006	-0.601	0.177	0.473	-0.064	-0.781	-0.219
BERYLLIUM-T-mg/l	0.051	0.098	-0.578	0.222	0.09	0.727	-0.265	-0.021
BISMUTH-D-mg/l	0.127	-0.046	-0.695	-0.008	0.473	-0.064	-0.781	-0.219
BISMUTH-T-mg/l	0.11	-0.039	-0.672	0.005	0.436	0.143	-0.626	-0.222
BORON-D-mg/l	0.605	0.145	-0.015	-0.7	0.662	-0.088	0.3	-0.603
BORON-T-mg/l	0.618	0.142	0.028	-0.674	0.621	-0.055	0.414	-0.583
BROMIDE-D-mg/l	0.542	-0.29	-0.039	0.202	0.472	-0.182	0.046	0.122
CADMIUM-D-mg/l	0.639	0.13	0.009	0.364	0.565	0.117	0.129	0.506
CADMIUM-T-mg/l	0.583	0.389	0.053	0.399	0.433	0.513	0.136	0.421
CALCIUM-T-mg/l	0.927	-0.213	-0.055	0.133	0.934	-0.115	-0.112	0.186
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.01	0.715	0.218	0.2	0.035	0.736	-0.006	0.028
CHLORIDE-D-mg/l	0.753	-0.081	0.004	0.087	0.875	0.016	0.024	0.101
CHROMIUM-D-mg/l	-0.186	0.122	-0.513	-0.446	-0.131	-0.105	-0.292	-0.545
CHROMIUM-T-mg/l	-0.187	0.766	0.022	-0.02	-0.206	0.798	0.164	-0.18
COBALT-D-mg/l	0.468	0.25	0.218	-0.683	0.546	0.019	0.496	-0.604
COBALT-T-mg/l	0.438	0.478	0.263	-0.559	0.487	0.369	0.554	-0.492
CONDUCTIVITY, LAB-N-us/cm	0.938	-0.185	0.013	0.163	0.932	-0.139	-0.088	0.226
COPPER-D-mg/l	0.007	-0.011	-0.403	0.125	0.074	0.522	-0.012	0.255
COPPER-T-mg/l	0.19	0.781	-0.329	0.138	0.106	0.897	-0.142	0.131
FLUORIDE-D-mg/l	0.268	-0.212	-0.138	0.34	0.089	-0.087	0.201	0.286
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	0.927	-0.189	-0.025	0.175	0.926	-0.123	-0.108	0.222
IRON-D-mg/l	0.125	0.502	-0.462	-0.006	0.206	0.4	-0.607	-0.118
IRON-T-mg/l	-0.083	0.866	0.157	0.245	-0.117	0.893	0.055	0.116
LEAD-D-mg/l	0.364	0.179	-0.693	-0.18	0.473	-0.064	-0.781	-0.219
LEAD-T-mg/l	-0.016	0.883	-0.065	0.208	-0.083	0.931	-0.036	0.079
LITHIUM-D-mg/l	0.923	-0.066	0.104	0.204	0.916	-0.048	0.029	0.235
LITHIUM-T-mg/l	0.925	-0.048	0.104	0.204	0.919	-0.026	0.02	0.23
MAGNESIUM-T-mg/l	0.918	-0.153	-0.001	0.219	0.919	-0.091	-0.112	0.27
MANGANESE-D-mg/l	0.565	0.113	0.363	-0.02	0.578	-0.002	0.487	-0.015
MANGANESE-T-mg/l	0.31	0.573	0.426	0.1	0.284	0.645	0.383	0.009
MERCURY-D-mg/l	0.115	-0.093	-0.095	-0.079	0.264	-0.101	0.054	0.115
MERCURY-T-mg/l	-0.097	0.284	-0.252	0.154	-0.155	0.388	0.018	0.146
MOLYBDENUM-D-mg/l	0.793	-0.058	0.07	-0.124	0.81	-0.01	0.109	-0.116
MOLYBDENUM-T-mg/l	0.798	-0.046	0.084	-0.123	0.809	-0.024	0.128	-0.115
NICKEL-D-mg/l	0.892	0.131	0.167	-0.206	0.896	0.091	0.234	-0.211
NICKEL-T-mg/l	0.889	0.22	0.185	-0.168	0.887	0.23	0.244	-0.188
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	0.867	-0.065	0.037	0.36	0.848	-0.005	0.029	0.427
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	0.822	-0.036	0.244	-0.134	0.765	0.007	0.485	-0.095
NITROGEN, AMMONIA (AS N)-N-mg/l	0.245	0.206	0.343	-0.387	0.378	-0.084	0.333	-0.291
ORTHO-PHOSPHATE-N-mg/l	-0.308	0.285	0.07	0.227	-0.301	0.375	0.018	0.055
pH, LAB-N-ph units	0.02	-0.024	0.213	-0.052	-0.141	0.066	0.454	0.338
PHOSPHORUS-N-mg/l	-0.197	0.799	0.201	0.199	-0.139	0.851	0.054	0.121
POTASSIUM-T-mg/l	0.949	0.057	0.138	0.158	0.943	0.151	0.052	0.195
SELENIUM-D-mg/l	0.803	-0.089	-0.012	0.519	0.782	0.001	-0.144	0.562
SELENIUM-T-mg/l	0.806	-0.087	-0.015	0.513	0.789	0.009	-0.14	0.553
SILVER-D-mg/l	0.36	0.2	-0.731	-0.201	0.473	-0.064	-0.781	-0.219
SILVER-T-mg/l	0.207	0.666	-0.451	0.106	0.177	0.789	-0.272	0.096
SODIUM-T-mg/l	0.753	0.048	0.199	-0.319	0.715	-0.073	0.364	-0.241
STRONTIUM-D-mg/l	0.557	-0.039	0.165	-0.599	0.612	-0.092	0.381	-0.51
STRONTIUM-T-mg/l	0.557	-0.041	0.146	-0.599	0.606	-0.092	0.351	-0.501
SULFATE (AS SO ₄)-D-mg/l	0.922	-0.15	0.042	0.202	0.922	-0.125	0.018	0.27
THALLIUM-D-mg/l	0.6	0.224	-0.306	-0.538	0.72	0.01	-0.08	-0.608
THALLIUM-T-mg/l	0.461	0.712	-0.077	-0.268	0.487	0.68	0.109	-0.374
TIN-D-mg/l	0.348	0.192	-0.746	-0.177	0.473	-0.064	-0.781	-0.219
TIN-T-mg/l	0.302	0.227	-0.689	-0.16	0.436	0.143	-0.626	-0.222
TITANIUM-D-mg/l	0.248	-0.179	-0.299	0.252	n/a	n/a	n/a	n/a
TITANIUM-T-mg/l	0.226	-0.026	-0.251	0.307	n/a	n/a	n/a	n/a
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.932	-0.18	0.003	0.169	0.927	-0.126	-0.088	0.23
TOTAL KJELDAHL NITROGEN-N-mg/l	0.372	0.358	0.393	0.096	0.574	0.31	-0.114	0.1
TOTAL ORGANIC CARBON-T-mg/l	-0.002	0.759	0.245	0.228	0.048	0.791	0.002	-0.015
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.055	0.836	0.172	0.191	0.053	0.908	-0.178	0.063
TURBIDITY, LAB-N-ntu	-0.013	0.816	0.271	0.19	0.138	0.869	-0.099	0.034
URANIUM-D-mg/l	0.902	-0.142	0.008	0.193	0.887	-0.129	-0.042	0.238
URANIUM-T-mg/l	0.904	-0.126	0.011	0.193	0.886	-0.1	-0.04	0.235
VANADIUM-D-mg/l	0.262	0.065	-0.858	-0.101	0.473	-0.064	-0.781	-0.219
VANADIUM-T-mg/l	0.034	0.761	-0.36	0.226	-0.048	0.879	-0.119	0.096
ZINC-D-mg/l	0.341	-0.111	-0.185	0.09	0.406	-0.125	0.112	0.052
ZINC-T-mg/l	0.379	0.496	-0.082	0.088	0.288	0.636	0.103	0.132

Notes:

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; ntu = nephelometric turbidity units; PC = principle component; "-T-" = total concentration; µg/l = micrograms per litre.

n/a = parameter not included in analysis because concentrations were the same in all samples.

PCA scores for each test are provided in Appendix D.

Shaded value = component loading not between -0.6 and 0.6.

Table E-2: PCA Results for *P. subcapitata* Tests

	2015 to 2018 Dataset				2018 Dataset			
	PC1	PC2	PC3	PC4	PC1	PC2	PC3	PC4
Percent of Total Variance Explained								
	31.4	15.8	9.4	7.8	34.3	18.5	10.5	8.25
Component Loadings by Water Quality Parameter								
ALKALINITY, TOTAL (As CaCO ₃ , lab measured.-N-mg/l	0.792	-0.313	-0.048	0.025	0.77	-0.375	-0.069	0.177
ALUMINUM-D-mg/l	-0.21	0.619	0.005	0.151	-0.211	0.655	-0.011	0.046
ALUMINUM-T-mg/l	-0.182	0.851	0.195	0.164	-0.162	0.9	0.066	0.003
ANTIMONY-D-mg/l	0.879	0.079	0.008	-0.135	0.892	0.094	0.105	-0.178
ANTIMONY-T-mg/l	0.847	0.088	0.072	-0.073	0.901	0.141	0.124	-0.106
ARSENIC-D-mg/l	0.315	0.457	-0.17	-0.392	0.379	0.202	-0.09	-0.483
ARSENIC-T-mg/l	0.193	0.834	0.067	-0.095	0.068	0.839	0.154	-0.217
BARIUM-D-mg/l	0.338	-0.338	0.109	0.17	0.184	-0.314	0.452	0.364
BARIUM-T-mg/l	0.357	-0.244	0.084	0.2	0.223	-0.157	0.418	0.369
BERYLLIUM-D-mg/l	0.071	0.011	-0.578	0.232	0.482	-0.055	-0.805	-0.066
BERYLLIUM-T-mg/l	0.058	0.116	-0.548	0.273	0.1	0.742	-0.236	-0.004
BISMUTH-D-mg/l	0.131	-0.034	-0.691	0.063	0.482	-0.055	-0.805	-0.066
BISMUTH-T-mg/l	0.114	-0.027	-0.668	0.075	0.442	0.152	-0.651	-0.098
BORON-D-mg/l	0.605	0.137	-0.085	-0.705	0.662	-0.097	0.177	-0.668
BORON-T-mg/l	0.618	0.132	-0.04	-0.68	0.62	-0.066	0.293	-0.669
BROMIDE-D-mg/l	0.548	-0.282	-0.017	0.196	0.486	-0.177	0.095	0.057
CADMIUM-D-mg/l	0.642	0.135	0.054	0.35	0.572	0.114	0.238	0.454
CADMIUM-T-mg/l	0.585	0.391	0.103	0.382	0.438	0.509	0.231	0.372
CALCIUM-T-mg/l	0.929	-0.207	-0.039	0.133	0.938	-0.111	-0.062	0.192
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.008	0.715	0.249	0.158	0.045	0.738	0.016	0.001
CHLORIDE-D-mg/l	0.753	-0.083	0.013	0.085	0.875	0.006	0.041	0.097
CHROMIUM-D-mg/l	-0.19	0.132	-0.557	-0.387	-0.143	-0.083	-0.403	-0.484
CHROMIUM-T-mg/l	-0.197	0.768	0.028	-0.006	-0.226	0.813	0.121	-0.178
COBALT-D-mg/l	0.472	0.229	0.143	-0.698	0.558	-0.01	0.356	-0.676
COBALT-T-mg/l	0.44	0.467	0.207	-0.579	0.494	0.367	0.449	-0.577
CONDUCTIVITY, LAB-N-us/cm	0.94	-0.181	0.032	0.157	0.936	-0.136	-0.033	0.231
COPPER-D-mg/l	0.005	-0.009	-0.394	0.188	0.081	0.529	0.056	0.232
COPPER-T-mg/l	0.195	0.796	-0.294	0.144	0.119	0.916	-0.079	0.113
FLUORIDE-D-mg/l	0.261	-0.221	-0.119	0.41	0.07	-0.096	0.225	0.322
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	0.93	-0.184	-0.006	0.171	0.931	-0.12	-0.051	0.225
IRON-D-mg/l	0.129	0.515	-0.448	0.022	0.219	0.414	-0.605	-0.019
IRON-T-mg/l	-0.082	0.868	0.195	0.213	-0.114	0.894	0.088	0.098
LEAD-D-mg/l	0.368	0.191	-0.702	-0.119	0.482	-0.055	-0.805	-0.066
LEAD-T-mg/l	-0.013	0.889	-0.028	0.194	-0.076	0.935	0.002	0.06
LITHIUM-D-mg/l	0.923	-0.064	0.127	0.188	0.916	-0.049	0.081	0.218
LITHIUM-T-mg/l	0.925	-0.047	0.128	0.188	0.919	-0.026	0.072	0.213
MAGNESIUM-T-mg/l	0.92	-0.147	0.024	0.212	0.924	-0.087	-0.046	0.275
MANGANESE-D-mg/l	0.563	0.097	0.358	-0.038	0.578	-0.028	0.461	-0.052
MANGANESE-T-mg/l	0.307	0.564	0.442	0.059	0.278	0.639	0.38	-0.051
MERCURY-D-mg/l	0.114	-0.096	-0.106	-0.062	0.26	-0.108	0.061	0.13
MERCURY-T-mg/l	-0.093	0.295	-0.226	0.164	-0.147	0.396	0.07	0.101
MOLYBDENUM-D-mg/l	0.793	-0.059	0.06	-0.125	0.813	-0.002	0.097	-0.149
MOLYBDENUM-T-mg/l	0.798	-0.047	0.076	-0.126	0.814	-0.015	0.117	-0.154
NICKEL-D-mg/l	0.896	0.118	0.144	-0.21	0.906	0.077	0.175	-0.22
NICKEL-T-mg/l	0.892	0.209	0.169	-0.176	0.895	0.221	0.194	-0.206
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	0.867	-0.061	0.077	0.354	0.847	-0.006	0.116	0.418
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	0.822	-0.048	0.228	-0.148	0.766	-0.007	0.455	-0.167
NITROGEN, AMMONIA (AS N)-N-mg/l	0.238	0.189	0.303	-0.399	0.368	-0.095	0.257	-0.317
ORTHO-PHOSPHATE-N-mg/l	-0.309	0.287	0.094	0.222	-0.303	0.38	0.025	0.059
pH, LAB-N-ph units	0.014	-0.038	0.201	-0.055	-0.155	0.049	0.49	0.294
PHOSPHORUS-N-mg/l	-0.194	0.804	0.236	0.148	-0.127	0.856	0.097	0.077
POTASSIUM-T-mg/l	0.95	0.059	0.16	0.131	0.947	0.151	0.105	0.16
SELENIUM-D-mg/l	0.808	-0.079	0.046	0.512	0.791	0.009	-0.018	0.571
SELENIUM-T-mg/l	0.811	-0.076	0.042	0.508	0.799	0.016	-0.016	0.561
SILVER-D-mg/l	0.364	0.212	-0.742	-0.136	0.482	-0.055	-0.805	-0.066
SILVER-T-mg/l	0.212	0.681	-0.422	0.132	0.188	0.803	-0.221	0.117
SODIUM-T-mg/l	0.754	0.034	0.165	-0.335	0.716	-0.092	0.299	-0.296
STRONTIUM-D-mg/l	0.555	-0.055	0.102	-0.611	0.609	-0.107	0.273	-0.585
STRONTIUM-T-mg/l	0.555	-0.056	0.083	-0.609	0.603	-0.106	0.246	-0.57
SULFATE (AS SO ₄)-D-mg/l	0.922	-0.148	0.063	0.198	0.921	-0.126	0.071	0.268
THALLIUM-D-mg/l	0.618	0.208	-0.401	-0.474	0.756	-0.016	-0.276	-0.528
THALLIUM-T-mg/l	0.464	0.714	-0.109	-0.241	0.493	0.7	0.006	-0.346
TIN-D-mg/l	0.352	0.205	-0.755	-0.111	0.482	-0.055	-0.805	-0.066
TIN-T-mg/l	0.306	0.239	-0.696	-0.098	0.442	0.152	-0.651	-0.098
TITANIUM-D-mg/l	0.25	-0.171	-0.275	0.289	n/a	n/a	n/a	n/a
TITANIUM-T-mg/l	0.229	-0.017	-0.219	0.335	n/a	n/a	n/a	n/a
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.935	-0.175	0.023	0.161	0.932	-0.122	-0.03	0.228
TOTAL KJELDAHL NITROGEN-N-mg/l	0.369	0.342	0.403	0.074	0.579	0.297	-0.128	0.194
TOTAL ORGANIC CARBON-T-mg/l	-0.001	0.759	0.28	0.183	0.055	0.791	0.013	-0.033
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.054	0.837	0.204	0.154	0.061	0.911	-0.155	0.091
TURBIDITY, LAB-N-ntu	-0.014	0.813	0.301	0.147	0.14	0.867	-0.089	0.064
URANIUM-D-mg/l	0.902	-0.14	0.028	0.199	0.886	-0.126	0.008	0.251
URANIUM-T-mg/l	0.904	-0.124	0.031	0.197	0.885	-0.098	0.01	0.246
VANADIUM-D-mg/l	0.267	0.079	-0.86	-0.018	0.482	-0.055	-0.805	-0.066
VANADIUM-T-mg/l	0.039	0.778	-0.316	0.238	-0.037	0.896	-0.064	0.076
ZINC-D-mg/l	0.343	-0.114	-0.179	0.112	0.405	-0.147	0.107	0.049
ZINC-T-mg/l	0.382	0.494	-0.065	0.086	0.296	0.63	0.142	0.091

Notes:

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; ntu = nephelometric turbidity units; PC = principle component; "-T-" = total concentration; µg/l = micrograms per litre.

n/a = parameter not included in analysis because concentrations were the same in all samples.

PCA scores for each test are provided in Appendix D.

Shaded value = component loading not between -0.6 and 0.6.

Table E-3: PCA Results for *H. azteca* Tests

	2015 to 2018 Dataset					2018 Dataset				
	PC1	PC2	PC3	PC4	PC5	PC1	PC2	PC3	PC4	PC5
Percent of Total Variance Explained	32.3	19.8	9.3	6.5	5.3	32.4	23.9	9.1	8.1	4.70
Component Loadings by Water Quality Parameter										
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	0.847	-0.356	0.029	0.036	-0.154	0.88	-0.232	-0.058	0.194	0.129
ALUMINUM-D-mg/l	-0.246	0.664	0.029	-0.065	-0.128	-0.35	0.664	-0.222	0.035	-0.368
ALUMINUM-T-mg/l	-0.079	0.913	0.191	-0.073	0.128	-0.339	0.895	0.139	-0.034	-0.027
ANTIMONY-D-mg/l	0.891	0.075	-0.042	0.004	-0.141	0.846	0.28	-0.143	-0.054	0.034
ANTIMONY-T-mg/l	0.903	0.097	0.002	0.058	-0.035	0.846	0.339	0.011	-0.084	0.096
ARSENIC-D-mg/l	0.186	0.483	-0.688	-0.159	-0.049	0.154	0.445	-0.393	-0.562	0.004
ARSENIC-T-mg/l	0.094	0.877	-0.28	0.003	0.106	-0.163	0.868	0.018	-0.32	0.139
BARIUM-D-mg/l	0.358	-0.522	0.319	-0.086	0.283	0.341	-0.407	0.404	-0.058	-0.532
BARIUM-T-mg/l	0.362	-0.423	0.378	-0.091	0.333	0.311	-0.277	0.501	-0.073	-0.494
BERYLLIUM-D-mg/l	0.092	-0.014	0.428	-0.657	0.027	0.093	0.403	-0.618	0.323	-0.371
BERYLLIUM-T-mg/l	0.099	0.233	0.443	-0.575	0.065	-0.069	0.881	0.079	-0.01	0.171
BISMUTH-D-mg/l	0.077	0.097	0.337	-0.727	-0.296	0.068	0.315	-0.708	0.338	-0.282
BISMUTH-T-mg/l	0.119	0.072	0.341	-0.701	-0.316	0.472	0.177	-0.537	0.477	0.41
BORON-D-mg/l	0.49	0.136	-0.717	-0.344	0.122	0.523	0.065	-0.315	-0.717	-0.133
BORON-T-mg/l	0.535	0.137	-0.69	-0.345	0.119	0.585	0.077	-0.299	-0.682	-0.032
BROMIDE-D-mg/l	0.692	-0.322	0.136	0.021	-0.022	0.716	-0.152	0.093	0.072	0.006
CADMIUM-D-mg/l	0.588	0.281	0.324	0.174	0.247	0.459	0.302	0.519	0.137	-0.374
CADMIUM-T-mg/l	0.491	0.579	0.36	0.242	0.194	0.21	0.667	0.506	0.191	-0.178
CALCIUM-T-mg/l	0.941	-0.222	0.11	0.022	-0.129	0.96	-0.021	-0.03	0.187	0.072
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.035	0.773	0.182	0.06	-0.125	-0.166	0.813	-0.02	0.094	-0.05
CHLORIDE-D-mg/l	0.844	-0.064	-0.028	-0.141	0.002	0.872	0.043	0.082	-0.023	-0.157
CHROMIUM-D-mg/l	-0.222	0.108	-0.542	-0.179	0.054	-0.244	-0.272	-0.306	-0.388	0.242
CHROMIUM-T-mg/l	-0.044	0.829	0.017	0.1	0.042	-0.277	0.81	0.132	0.008	0.215
COBALT-D-mg/l	0.447	0.34	-0.618	-0.31	0.215	0.432	0.307	-0.228	-0.728	-0.158
COBALT-T-mg/l	0.434	0.565	-0.521	-0.237	0.24	0.331	0.613	-0.053	-0.656	-0.01
CONDUCTIVITY, LAB-N-us/cm	0.958	-0.188	0.102	0.047	-0.107	0.97	-0.013	-0.007	0.179	0.022
COPPER-D-mg/l	-0.041	0.06	0.02	-0.166	0.037	-0.077	0.395	0.058	-0.149	0.003
COPPER-T-mg/l	-0.003	0.872	0.07	0.172	-0.016	-0.177	0.914	0.113	0.011	0.123
FLUORIDE-D-mg/l	0.187	-0.233	0.385	0.298	0.057	0.279	-0.17	0.424	0.182	0.329
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	0.946	-0.203	0.119	0.061	-0.144	0.96	-0.018	-0.023	0.218	0.057
IRON-D-mg/l	-0.15	0.474	-0.012	0.055	-0.454	-0.143	0.474	-0.551	0.232	-0.323
IRON-T-mg/l	0.021	0.929	0.239	0.047	0.1	-0.288	0.913	0.174	0.05	-0.014
LEAD-D-mg/l	0.091	0.112	-0.01	0.131	-0.467	0.158	0.169	-0.279	0.332	-0.286
LEAD-T-mg/l	-0.013	0.921	0.116	0.135	0.058	-0.238	0.901	0.164	0.015	0.058
LITHIUM-D-mg/l	0.927	-0.074	0.162	0.142	0.003	0.916	0.088	0.143	0.138	-0.11
LITHIUM-T-mg/l	0.93	-0.045	0.16	0.146	0.005	0.914	0.132	0.15	0.129	-0.09
MAGNESIUM-T-mg/l	0.954	-0.159	0.139	0.074	-0.121	0.958	0.036	0.008	0.221	0.043
MANGANESE-D-mg/l	0.717	0.269	0.047	-0.149	0.234	0.516	0.378	0.104	-0.348	-0.327
MANGANESE-T-mg/l	0.479	0.674	0.137	-0.001	0.243	0.12	0.788	0.247	-0.196	-0.111
MERCURY-D-mg/l	0.093	0.024	0.354	-0.626	-0.181	0.104	-0.061	0.133	0.14	-0.191
MERCURY-T-mg/l	0.002	0.476	0.489	-0.473	0.07	-0.358	0.87	0.215	0.041	0.047
MOLYBDENUM-D-mg/l	0.815	-0.088	-0.099	0.142	-0.083	0.821	-0.042	0.036	-0.036	0.272
MOLYBDENUM-T-mg/l	0.826	-0.041	-0.101	0.131	-0.078	0.818	-0.002	0.011	-0.05	0.231
NICKEL-D-mg/l	0.908	0.209	-0.21	-0.102	0.037	0.849	0.351	-0.106	-0.235	-0.024
NICKEL-T-mg/l	0.895	0.311	-0.186	-0.067	0.063	0.793	0.493	-0.036	-0.245	0.052
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	0.89	-0.048	0.327	0.125	0.066	0.867	0.127	0.305	0.21	-0.086
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	0.894	0.057	-0.094	-0.153	0.101	0.859	0.19	0.006	-0.239	-0.071
NITROGEN, AMMONIA (AS N)-N-mg/l	0.25	0.093	-0.417	0.155	-0.051	0.307	-0.221	0.06	-0.102	0.133
ORTHO-PHOSPHATE-N-mg/l	-0.51	0.306	-0.096	0.171	-0.193	-0.536	0.276	-0.045	0.034	0.059
pH, LAB-N-ph units	-0.165	-0.035	0.205	-0.106	0.571	-0.203	-0.115	0.602	-0.012	-0.397
PHOSPHORUS-N-mg/l	-0.149	0.867	0.118	0.131	0.089	-0.379	0.853	0.24	-0.021	0.068
POTASSIUM-T-mg/l	0.967	0.089	0.099	0.046	-0.016	0.905	0.347	0.071	0.062	-0.031
SELENIUM-D-mg/l	0.847	-0.113	0.429	0.227	-0.05	0.847	0.09	0.271	0.399	-0.012
SELENIUM-T-mg/l	0.847	-0.112	0.432	0.221	-0.05	0.849	0.098	0.268	0.396	-0.015
SILVER-D-mg/l	0.041	0.287	-0.132	0.047	-0.722	0.073	0.389	-0.698	0.323	-0.265
SILVER-T-mg/l	-0.003	0.602	0.174	0.352	-0.153	-0.071	0.616	0.16	0.26	0.476
SODIUM-T-mg/l	0.708	0.088	-0.488	-0.24	0.218	0.685	0.012	-0.022	-0.529	-0.263
STRONTIUM-D-mg/l	0.655	-0.042	-0.621	-0.145	0.149	0.671	-0.147	-0.136	-0.579	0.127
STRONTIUM-T-mg/l	0.66	-0.041	-0.61	-0.163	0.16	0.666	-0.14	-0.13	-0.574	0.122
SULFATE (AS SO ₄)-D-mg/l	0.95	-0.159	0.118	0.029	-0.026	0.957	-0.007	0.087	0.128	-0.03
THALLIUM-D-mg/l	0.528	0.204	-0.499	-0.073	-0.399	0.535	0.354	-0.564	-0.176	0.225
THALLIUM-T-mg/l	0.334	0.795	-0.256	-0.012	-0.108	0.144	0.883	-0.187	-0.165	0.213
TIN-D-mg/l	0.074	0.283	-0.101	0.04	-0.751	0.135	0.409	-0.717	0.375	-0.318
TIN-T-mg/l	0.311	0.103	-0.094	0.139	-0.651	0.472	0.177	-0.537	0.477	0.41
TITANIUM-D-mg/l	0.261	-0.038	0.346	-0.43	0.034	n/a	n/a	n/a	n/a	n/a
TITANIUM-T-mg/l	0.208	0.405	0.228	-0.49	0.084	0.024	0.499	-0.104	-0.165	-0.349
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.953	-0.2	0.094	0.059	-0.116	0.967	-0.021	-0.01	0.187	0.049
TOTAL KJELDAHL NITROGEN-N-mg/l	0.507	0.271	-0.034	0.426	0.088	0.501	0.345	0.403	0.082	-0.043
TOTAL ORGANIC CARBON-T-mg/l	0.001	0.813	0.246	0.13	-0.043	-0.187	0.873	0.084	0.093	0.008
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.002	0.915	0.191	0.085	0.131	-0.276	0.912	0.23	0.055	0.09
TURBIDITY, LAB-N-ntu	0.076	0.913	0.191	0.024	0.13	-0.179	0.915	0.252	0.016	0.009
URANIUM-D-mg/l	0.939	-0.13	0.117	0.146	-0.04	0.925	0.004	0.132	0.187	0.153
URANIUM-T-mg/l	0.94	-0.109	0.122	0.15	-0.036	0.92	0.038	0.141	0.18	0.165
VANADIUM-D-mg/l	0.103	0.201	0.268	-0.637	-0.549	0.135	0.409	-0.717	0.375	-0.318
VANADIUM-T-mg/l	-0.007	0.885	0.195	0.071	-0.006	-0.196	0.9	0.168	0.009	0.187
ZINC-D-mg/l	0.235	0.058	0.237	-0.247	0.293	0.196	0.167	0.159	0.162	-0.434
ZINC-T-mg/l	0.162	0.752	0.033	0.205	0.135	0.045	0.765	0.295	0.109	0.024

Notes:

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; ntu = nephelometric turbidity units; PC = principle component; "-T-" = total concentration; µg/l = micrograms per litre.

n/a = parameter not included in analysis because concentrations were the same in all samples.

PCA scores for each test are provided in Appendix D.

Shaded value = component loading not between -0.6 and 0.6.

Table E-4: PCA Results for *O. mykiss* Tests

	2015 to 2018 Dataset				2018 Dataset			
	PC1	PC2	PC3	PC4	PC1	PC2	PC3	PC4
Percent of Total Variance Explained								
	30.1	23.0	9.0	6.3	35.4	25.0	12.0	7.16
Component Loadings by Water Quality Parameter								
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	0.856	-0.113	-0.034	-0.019	0.916	-0.095	0.056	0.187
ALUMINUM-D-mg/l	-0.474	0.54	-0.092	0.138	-0.491	0.572	-0.126	-0.13
ALUMINUM-T-mg/l	-0.553	0.732	0.21	-0.016	-0.589	0.744	0.159	0.019
ANTIMONY-D-mg/l	0.784	0.339	-0.014	0.058	0.819	0.339	-0.024	-0.117
ANTIMONY-T-mg/l	0.73	0.449	0.161	0.057	0.753	0.503	0.117	-0.042
ARSENIC-D-mg/l	-0.075	0.729	-0.24	0.046	-0.007	0.697	-0.274	-0.38
ARSENIC-T-mg/l	-0.367	0.873	0.144	-0.083	-0.379	0.872	0.183	-0.057
BARIUM-D-mg/l	0.345	-0.227	0.418	-0.292	0.113	-0.392	0.706	-0.066
BARIUM-T-mg/l	0.289	-0.061	0.458	-0.292	0.08	-0.211	0.765	-0.029
BERYLLIUM-D-mg/l	0.112	-0.088	-0.228	-0.034	0.503	0.482	-0.69	0.026
BERYLLIUM-T-mg/l	-0.106	0.253	-0.001	-0.12	-0.288	0.823	0.264	0.095
BISMUTH-D-mg/l	0.095	0.403	-0.621	0.136	0.517	0.453	-0.689	0.026
BISMUTH-T-mg/l	0.06	0.355	-0.543	0.085	0.609	0.345	-0.656	0.185
BORON-D-mg/l	0.512	0.387	-0.41	-0.48	0.657	0.193	0.061	-0.671
BORON-T-mg/l	0.515	0.323	-0.266	-0.585	0.58	0.107	0.252	-0.711
BROMIDE-D-mg/l	0.792	-0.118	0.027	-0.012	0.825	-0.149	0.084	-0.003
CADMIUM-D-mg/l	0.511	0.377	0.423	0.141	0.323	0.281	0.537	0.162
CADMIUM-T-mg/l	0.129	0.695	0.521	0.08	-0.087	0.655	0.556	0.237
CALCIUM-T-mg/l	0.939	0.069	-0.029	0.063	0.948	0.103	0.006	0.178
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.381	0.651	0.182	0.32	-0.373	0.721	-0.179	0.052
CHLORIDE-D-mg/l	0.705	0.198	0.052	-0.004	0.84	0.138	0.159	-0.051
CHROMIUM-D-mg/l	-0.24	0.175	-0.569	-0.379	-0.129	0.279	-0.434	-0.408
CHROMIUM-T-mg/l	-0.591	0.706	0.157	-0.168	-0.589	0.725	0.227	0.035
COBALT-D-mg/l	0.284	0.466	-0.247	-0.589	0.395	0.332	0.205	-0.757
COBALT-T-mg/l	-0.024	0.794	-0.006	-0.504	0.057	0.672	0.41	-0.54
CONDUCTIVITY, LAB-N-us/cm	0.962	0.098	-0.001	0.125	0.963	0.087	0.018	0.165
COPPER-D-mg/l	0.048	-0.162	-0.163	0.012	-0.164	0.38	0.151	0.212
COPPER-T-mg/l	-0.41	0.82	0.158	-0.011	-0.413	0.828	0.167	0.083
FLUORIDE-D-mg/l	0.353	-0.481	0.373	0.166	0.236	-0.391	0.369	0.479
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	0.951	0.077	-0.034	0.151	0.959	0.085	-0.032	0.184
IRON-D-mg/l	-0.151	0.511	-0.315	0.308	-0.12	0.56	-0.309	-0.03
IRON-T-mg/l	-0.498	0.784	0.238	-0.013	-0.547	0.771	0.203	0.094
LEAD-D-mg/l	0.086	0.525	-0.641	0.334	0.232	0.633	-0.518	0.015
LEAD-T-mg/l	-0.44	0.806	0.198	-0.07	-0.447	0.816	0.242	0.058
LITHIUM-D-mg/l	0.881	0.231	0.248	0.191	0.877	0.157	0.212	0.174
LITHIUM-T-mg/l	0.87	0.281	0.266	0.178	0.872	0.212	0.226	0.177
MAGNESIUM-T-mg/l	0.933	0.143	0.016	0.204	0.945	0.129	-0.007	0.202
MANGANESE-D-mg/l	0.302	0.449	0.167	-0.404	0.171	0.456	0.499	-0.38
MANGANESE-T-mg/l	-0.258	0.755	0.303	-0.244	-0.304	0.724	0.45	-0.085
MERCURY-D-mg/l	-0.011	0.003	-0.19	-0.228	-0.281	0.116	-0.383	-0.269
MERCURY-T-mg/l	-0.365	0.367	0.091	-0.036	-0.598	0.753	0.167	0.145
MOLYBDENUM-D-mg/l	0.794	0.053	0.056	-0.166	0.82	0.061	0.157	-0.04
MOLYBDENUM-T-mg/l	0.786	0.137	0.042	-0.183	0.82	0.122	0.158	-0.085
NICKEL-D-mg/l	0.746	0.499	-0.052	-0.108	0.779	0.447	0.061	-0.234
NICKEL-T-mg/l	0.601	0.718	0.064	-0.119	0.635	0.677	0.168	-0.166
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	0.822	0.252	0.36	0.183	0.782	0.204	0.378	0.376
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	0.757	0.252	0.003	-0.282	0.775	0.154	0.275	-0.274
NITROGEN, AMMONIA (AS N)-N-mg/l	0.284	0.227	-0.319	-0.249	0.603	-0.078	-0.133	-0.515
ORTHO-PHOSPHATE-N-mg/l	-0.408	0.323	0.159	0.239	-0.544	0.299	0.118	-0.16
pH, LAB-N-ph units	0.097	-0.192	0.339	-0.409	-0.072	-0.455	0.765	0.002
PHOSPHORUS-N-mg/l	-0.523	0.754	0.252	0.029	-0.573	0.729	0.207	0.143
POTASSIUM-T-mg/l	0.807	0.503	0.185	0.119	0.817	0.473	0.193	0.13
SELENIUM-D-mg/l	0.804	0.167	0.303	0.397	0.793	0.166	0.196	0.464
SELENIUM-T-mg/l	0.805	0.166	0.299	0.398	0.792	0.176	0.19	0.465
SILVER-D-mg/l	0.173	0.47	-0.746	0.354	0.4	0.512	-0.721	0.036
SILVER-T-mg/l	-0.366	0.691	0.098	0.064	-0.323	0.687	0.125	0.235
SODIUM-T-mg/l	0.696	0.358	0.055	-0.307	0.671	0.1	0.384	-0.422
STRONTIUM-D-mg/l	0.487	0.068	-0.2	-0.685	0.644	-0.033	0.273	-0.441
STRONTIUM-T-mg/l	0.482	0.087	-0.198	-0.678	0.649	0	0.259	-0.423
SULFATE (AS SO ₄)-D-mg/l	0.927	0.155	0.086	0.142	0.924	0.094	0.165	0.18
THALLIUM-D-mg/l	0.415	0.49	-0.672	0.108	0.68	0.445	-0.503	-0.206
THALLIUM-T-mg/l	-0.209	0.914	-0.083	-0.046	-0.028	0.938	-0.06	-0.111
TIN-D-mg/l	0.272	0.308	-0.575	0.362	0.517	0.453	-0.689	0.026
TIN-T-mg/l	0.246	0.444	-0.66	0.224	0.609	0.345	-0.656	0.185
TITANIUM-D-mg/l	0.059	0.057	-0.052	-0.139	n/a	n/a	n/a	n/a
TITANIUM-T-mg/l	-0.12	0.519	-0.127	-0.156	-0.045	0.397	0.09	-0.392
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.957	0.114	-0.01	0.146	0.96	0.1	-0.005	0.18
TOTAL KJELDAHL NITROGEN-N-mg/l	0.186	0.656	0.318	0.155	0.376	0.579	0.298	0.31
TOTAL ORGANIC CARBON-T-mg/l	-0.434	0.724	0.265	0.236	-0.456	0.797	-0.051	0.087
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.396	0.83	0.126	0.068	-0.296	0.9	-0.004	0.247
TURBIDITY, LAB-N-ntu	-0.375	0.853	0.159	0.083	-0.293	0.91	0.033	0.173
URANIUM-D-mg/l	0.921	0.095	0.088	0.129	0.906	0.081	0.129	0.274
URANIUM-T-mg/l	0.911	0.126	0.095	0.135	0.898	0.113	0.124	0.286
VANADIUM-D-mg/l	0.144	0.493	-0.716	0.266	0.422	0.576	-0.662	0.021
VANADIUM-T-mg/l	-0.455	0.804	0.184	-0.013	-0.435	0.819	0.227	0.116
ZINC-D-mg/l	0.331	0.14	0.109	-0.089	0.388	0.229	0.207	-0.096
ZINC-T-mg/l	-0.032	0.732	0.237	-0.086	-0.128	0.725	0.392	0.099

Notes:

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; ntu = nephelometric turbidity units; PC = principle component; "-T-" = total concentration; µg/l = micrograms per litre.

n/a = parameter not included in analysis because concentrations were the same in all samples.

PCA scores for each test are provided in Appendix D.

Shaded value = component loading not between -0.6 and 0.6.

Table E-5: PCA Results for *P. promelas* Tests

	2015 to 2018 Dataset				2018 Dataset			
	PC1	PC2	PC3	PC4	PC1	PC2	PC3	PC4
Percent of Total Variance Explained								
	34.8	19.7	12.1	8.6	35.8	22.4	12.6	9.90
Component Loadings by Water Quality Parameter								
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	0.791	-0.495	-0.023	0.152	0.824	-0.445	-0.088	0.234
ALUMINUM-D-mg/l	-0.099	0.67	-0.034	0.07	-0.148	0.652	-0.14	-0.116
ALUMINUM-T-mg/l	0.151	0.876	0.36	-0.048	0.013	0.909	0.293	-0.105
ANTIMONY-D-mg/l	0.927	-0.017	-0.063	-0.116	0.911	0.036	-0.026	-0.204
ANTIMONY-T-mg/l	0.928	-0.031	0.032	-0.1	0.926	0.053	0.054	-0.165
ARSENIC-D-mg/l	0.348	0.509	-0.576	-0.334	0.292	0.392	-0.339	-0.668
ARSENIC-T-mg/l	0.301	0.852	-0.035	-0.236	0.148	0.892	0.065	-0.304
BARIUM-D-mg/l	0.126	-0.596	0.434	0.01	-0.012	-0.503	0.71	0.233
BARIUM-T-mg/l	0.172	-0.553	0.478	0.037	0.043	-0.446	0.753	0.271
BERYLLIUM-D-mg/l	0.258	0.329	-0.408	0.445	0.444	0.239	-0.783	0.171
BERYLLIUM-T-mg/l	0.215	0.756	0.122	0.219	0.179	0.87	0.22	0.141
BISMUTH-D-mg/l	0.387	0.263	-0.723	0.457	0.419	0.246	-0.822	0.11
BISMUTH-T-mg/l	0.37	0.195	-0.612	0.385	0.506	0.008	-0.447	0.298
BORON-D-mg/l	0.583	0.116	-0.467	-0.592	0.581	-0.1	0.039	-0.773
BORON-T-mg/l	0.553	0.097	-0.386	-0.651	0.509	-0.142	0.233	-0.781
BROMIDE-D-mg/l	0.61	-0.492	0.012	0.142	0.664	-0.434	0.043	0.079
CADMIUM-D-mg/l	0.603	0.301	0.518	0.1	0.513	0.454	0.483	0.321
CADMIUM-T-mg/l	0.561	0.47	0.587	0.103	0.434	0.653	0.47	0.276
CALCIUM-T-mg/l	0.891	-0.389	0.027	0.152	0.927	-0.295	-0.076	0.189
CARBON, DISSOLVED ORGANIC-D-mg/l	0.195	0.746	0.16	0.137	0.218	0.795	-0.118	-0.03
CHLORIDE-D-mg/l	0.866	-0.222	-0.067	-0.1	0.898	-0.204	0.056	-0.068
CHROMIUM-D-mg/l	-0.124	0.379	-0.634	-0.151	-0.265	0.208	-0.578	-0.427
CHROMIUM-T-mg/l	0.041	0.874	0.251	-0.068	-0.098	0.889	0.232	0.005
COBALT-D-mg/l	0.579	0.261	-0.208	-0.662	0.564	0.07	0.226	-0.746
COBALT-T-mg/l	0.573	0.402	-0.081	-0.64	0.518	0.267	0.383	-0.673
CONDUCTIVITY, LAB-N-us/cm	0.913	-0.345	0.061	0.152	0.942	-0.249	-0.036	0.194
COPPER-D-mg/l	-0.011	-0.055	-0.267	0.15	-0.098	0.226	0.086	0.268
COPPER-T-mg/l	0.116	0.199	0.034	0.363	0.158	0.928	0.17	0.157
FLUORIDE-D-mg/l	0.194	-0.374	0.449	0.335	0.314	-0.324	0.416	0.435
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	0.9	-0.358	0.047	0.172	0.939	-0.248	-0.08	0.201
IRON-D-mg/l	0.214	0.45	-0.549	0.435	0.287	0.425	-0.762	0.057
IRON-T-mg/l	0.211	0.845	0.423	0.051	0.057	0.916	0.291	0.075
LEAD-D-mg/l	0.383	0.19	-0.574	0.439	0.402	0.131	-0.532	0.235
LEAD-T-mg/l	0.15	0.859	0.325	0.057	0.024	0.918	0.237	0.115
LITHIUM-D-mg/l	0.883	-0.228	0.213	0.126	0.906	-0.068	0.137	0.176
LITHIUM-T-mg/l	0.889	-0.212	0.21	0.127	0.911	-0.057	0.129	0.165
MAGNESIUM-T-mg/l	0.91	-0.324	0.076	0.189	0.946	-0.201	-0.055	0.219
MANGANESE-D-mg/l	0.748	0.123	0.294	-0.223	0.648	0.135	0.494	-0.201
MANGANESE-T-mg/l	0.575	0.46	0.445	-0.168	0.416	0.524	0.58	-0.098
MERCURY-D-mg/l	-0.159	-0.037	0.013	0.331	0.047	-0.137	0.122	0.208
MERCURY-T-mg/l	0.103	0.71	0.426	0.006	-0.058	0.933	0.201	0.106
MOLYBDENUM-D-mg/l	0.811	-0.213	-0.01	-0.165	0.839	-0.177	0.042	-0.155
MOLYBDENUM-T-mg/l	0.824	-0.194	-0.004	-0.167	0.847	-0.165	0.025	-0.169
NICKEL-D-mg/l	0.942	0.07	-0.059	-0.214	0.922	0.101	0.041	-0.301
NICKEL-T-mg/l	0.948	0.128	-0.013	-0.2	0.921	0.171	0.081	-0.272
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	0.845	-0.222	0.352	0.236	0.85	-0.095	0.269	0.374
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	0.893	-0.157	0.101	-0.26	0.843	-0.198	0.368	-0.226
NITROGEN, AMMONIA (AS N)-N-mg/l	0.372	0.102	-0.183	-0.512	0.389	-0.167	-0.025	-0.418
ORTHO-PHOSPHATE-N-mg/l	-0.428	0.356	0.03	-0.203	-0.53	0.384	0.027	-0.326
pH, LAB-N-ph units	-0.305	-0.191	0.506	-0.186	-0.378	-0.29	0.776	0.11
PHOSPHORUS-N-mg/l	0.017	0.788	0.396	-0.029	-0.128	0.911	0.313	0.049
POTASSIUM-T-mg/l	0.964	-0.127	0.131	0.083	0.972	0.009	0.087	0.1
SELENIUM-D-mg/l	0.784	-0.279	0.37	0.387	0.835	-0.083	0.126	0.508
SELENIUM-T-mg/l	0.783	-0.283	0.363	0.394	0.835	-0.085	0.118	0.508
SILVER-D-mg/l	0.426	0.272	-0.717	0.447	0.499	0.269	-0.797	0.078
SILVER-T-mg/l	0.29	0.48	-0.174	0.426	0.272	0.441	0.026	0.477
SODIUM-T-mg/l	0.708	0.043	-0.208	-0.532	0.604	-0.096	0.261	-0.617
STRONTIUM-D-mg/l	0.629	-0.135	-0.313	-0.59	0.586	-0.329	0.144	-0.627
STRONTIUM-T-mg/l	0.637	-0.145	-0.317	-0.575	0.597	-0.35	0.123	-0.601
SULFATE (AS SO ₄)-D-mg/l	0.913	-0.311	0.131	0.127	0.933	-0.213	0.107	0.207
THALLIUM-D-mg/l	0.712	0.106	-0.586	-0.123	0.767	0.014	-0.46	-0.357
THALLIUM-T-mg/l	0.637	0.641	-0.203	-0.145	0.605	0.654	-0.244	-0.279
TIN-D-mg/l	0.409	0.276	-0.712	0.468	0.472	0.277	-0.806	0.116
TIN-T-mg/l	0.392	0.237	-0.586	0.333	0.506	0.008	-0.447	0.298
TITANIUM-D-mg/l	0.068	0.23	0.164	-0.011	n/a	n/a	n/a	n/a
TITANIUM-T-mg/l	0.121	0.429	0.131	-0.112	0.096	0.431	0.056	-0.243
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.907	-0.357	0.05	0.155	0.942	-0.252	-0.05	0.19
TOTAL KJELDAHL NITROGEN-N-mg/l	0.708	0.026	0.322	0.084	0.703	0.141	0.322	0.235
TOTAL ORGANIC CARBON-T-mg/l	0.21	0.754	0.314	0.214	0.202	0.853	0.008	0.022
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.28	0.765	0.312	0.18	0.278	0.865	-0.049	0.186
TURBIDITY, LAB-N-ntu	0.35	0.733	0.36	0.132	0.327	0.867	0.051	0.152
URANIUM-D-mg/l	0.91	-0.289	0.151	0.147	0.936	-0.183	0.08	0.213
URANIUM-T-mg/l	0.91	-0.281	0.149	0.155	0.934	-0.181	0.066	0.22
VANADIUM-D-mg/l	0.413	0.276	-0.712	0.464	0.476	0.276	-0.805	0.111
VANADIUM-T-mg/l	0.171	0.84	0.258	0.139	0.077	0.928	0.215	0.117
ZINC-D-mg/l	0.285	0.177	0.036	-0.016	0.276	0.237	-0.069	-0.053
ZINC-T-mg/l	0.378	0.753	0.182	-0.074	0.245	0.816	0.257	0.045

Notes:

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; ntu = nephelometric turbidity units; PC = principle component; "-T-" = total concentration; µg/l = micrograms per litre.

n/a = parameter not included in analysis because concentrations were the same in all samples.

PCA scores for each test are provided in Appendix D.

Shaded value = component loading not between -0.6 and 0.6.

APPENDIX F

Spearman Rank Analysis

Table F-1: Spearman Rank Order Correlation for *C. dubia* Reproduction

Parameter	Rs ¹		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? ²	Retain Parameter for Concentration-Response Analysis? ³
	2015 to 2018 Dataset	2018 Dataset		
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	-0.260	-0.409	No WQG	No - parameter included in TDS
ALUMINUM-D-mg/l	-0.223	-0.005	No	-
ANTIMONY-T-mg/l	-0.401	-0.632	No	-
ARSENIC-T-mg/l	-0.308	-0.184	No	-
BARIUM-T-mg/l	0.050	-0.122	-	-
BERYLLIUM-T-mg/l	0.101	-0.148	-	-
BISMUTH-T-mg/l	-0.022	-0.237	-	-
BORON-T-mg/l	-0.261	-0.414	No	-
BROMIDE-D-mg/l	-0.116	-0.184	-	-
CADMIUM-D-mg/l	-0.266	-0.332	No	Yes
CALCIUM-T-mg/l	-0.276	-0.529	No WQG	No - parameter included in TDS
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.229	0.047	No WQG	Yes
CHLORIDE-D-mg/l	-0.207	-0.490	No	-
CHROMIUM-T-mg/l	-0.150	0.068	Yes	Yes
COBALT-T-mg/l	-0.560	-0.600	Yes	Yes
CONDUCTIVITY, LAB-N-us/cm	-0.334	-0.536	No WQG	No - parameter included in TDS
COPPER-T-mg/l	-0.322	-0.164	No	-
FLUORIDE-D-mg/l	0.086	0.080	-	-
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	-0.289	-0.494	No WQG	No - parameter included in TDS
IRON-D-mg/l	-0.169	-0.037	No	-
IRON-T-mg/l	-0.302	-0.039	Yes	Yes
LEAD-T-mg/l	-0.319	-0.131	No	-
LITHIUM-T-mg/l	-0.346	-0.509	No WQG	Yes
MAGNESIUM-T-mg/l	-0.294	-0.494	No WQG	No - parameter included in TDS
MANGANESE-T-mg/l	-0.454	-0.335	No	-
MERCURY-T-mg/l	0.003	0.053	-	-
MOLYBDENUM-T-mg/l	-0.333	-0.581	No	-
NICKEL-T-mg/l	-0.552	-0.670	Yes	Yes
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	-0.334	-0.556	Yes	Yes
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	-0.357	-0.484	No	-
NITROGEN, AMMONIA (AS N)-N-mg/l	-0.217	-0.136	No	-
ORTHO-PHOSPHATE-N-mg/l	0.152	0.167	-	-
pH, LAB-N-ph units	-0.055	-0.004	-	-
PHOSPHORUS-N-mg/l	-0.143	0.019	No WQG	Yes
POTASSIUM-T-mg/l	-0.416	-0.539	No WQG	No - parameter included in TDS
SELENIUM-T-mg/l	-0.242	-0.406	Yes	Yes
SILVER-T-mg/l	-0.207	-0.186	No	-
SODIUM-T-mg/l	-0.312	-0.455	No WQG	No - parameter included in TDS
STRONTIUM-T-mg/l	-0.316	-0.581	No WQG	Yes
SULFATE (AS SO ₄)-D-mg/l	-0.341	-0.516	Yes	Yes
THALLIUM-T-mg/l	-0.547	-0.492	No	-
TIN-T-mg/l	-0.008	-0.237	-	-
TITANIUM-T-mg/l	-0.032	-	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.308	-0.488	No WQG	Yes
TOTAL KJELDAHL NITROGEN-N-mg/l	-0.344	-0.496	No WQG	Yes
TOTAL ORGANIC CARBON-T-mg/l	-0.276	-0.005	No WQG	Yes
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.305	-0.085	No WQG	Yes
TURBIDITY, LAB-N-ntu	-0.326	-0.247	No WQG	Yes
URANIUM-T-mg/l	-0.346	-0.549	Yes	Yes
VANADIUM-T-mg/l	-0.273	-0.168	No WQG	Yes
ZINC-T-mg/l	-0.270	-0.302	No	-
ΣTU-WQGs	-0.462	-0.600	No WQG	Yes
ΣTU-WQGs/Benchmarks	-0.515	-0.621	No WQG	Yes
PC1 (all years)	-0.446	-	No WQG	Yes
PC2 (all years)	-0.330	-	No WQG	Yes
PC3 (all years)	-0.340	-	No WQG	Yes
PC4 (all years)	0.017	-	-	-
PC1 (2018)	-	-0.653	No WQG	Yes
PC2 (2018)	-	-0.123	-	-
PC3 (2018)	-	-0.366	No WQG	Yes
PC4 (2018)	-	0.119	-	-

Notes:

- (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ($\alpha < 0.05$; $r_s < -0.132$) and 2018 dataset ($\alpha < 0.05$; $r_s < -0.24$) are bolded. Strong negative correlations ($R_s < -0.4$) are shaded. - = r_s could not be calculated because parameter concentration was the same in all tests or parameter was not applicable to the dataset. Principle components with significant positive correlations are bolded ($\alpha < 0.05$; combined dataset: $r_s > 0.132$; 2018 dataset: $r_s > 0.24$); principle components with strong positive correlations are shaded ($\alpha < 0.05$; $r_s > 0.4$).
- (2) Parameters are screened against BC WQGs in Appendix C.
- (3) Parameters were retained for graphical analysis if they met one of the following conditions: 1) order constituent, 2) significant negative correlation and concentration was greater than the chronic BC WQG, or 3) significant negative correlation and there is no chronic BC WQG.
- (4) Of 48 samples, one had a detected concentration of boron (Table D-1).

Abbreviations

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; µg/l = micrograms per litre; WQG = water quality guideline.

Table F-2: Spearman Rank Order Correlation for *P. subcapitata* Cell Yield

Parameter	Rs ¹		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? ²	Retain Parameter for Concentration-Response Analysis? ³
	2015 to 2018 Dataset	2018 Dataset		
ALKALINITY, TOTAL (As CaCO ₃), lab measured.-N-mg/l	-0.023	-0.142	-	-
ALUMINUM-D-mg/l	-0.036	0.092	-	-
ANTIMONY-T-mg/l	-0.139	-0.306	No	-
ARSENIC-T-mg/l	-0.044	-0.013	-	-
BARIUM-T-mg/l	0.057	-0.051	-	-
BERYLLIUM-T-mg/l	-0.306	-0.025	No	-
BISMUTH-T-mg/l	-0.252	-0.253	No WQG	No - low detection frequency ⁴
BORON-T-mg/l	-0.155	-0.267	No	-
BROMIDE-D-mg/l	-0.176	-0.421	No WQG	No - low detection frequency ⁵
CADMIUM-D-mg/l	-0.067	-0.134	-	Yes
CALCIUM-T-mg/l	-0.142	-0.254	No WQG	No - parameter included in TDS
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.153	-0.181	No WQG	Yes
CHLORIDE-D-mg/l	-0.103	-0.195	-	-
CHROMIUM-T-mg/l	0.043	-0.007	-	-
COBALT-T-mg/l	-0.146	-0.179	No	-
CONDUCTIVITY, LAB-N-us/cm	-0.108	-0.201	-	-
COPPER-T-mg/l	-0.069	-0.005	-	-
FLUORIDE-D-mg/l	-0.152	-0.188	-	-
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	-0.133	-0.251	No WQG	No - parameter included in TDS
IRON-D-mg/l	0.083	0.155	-	-
IRON-T-mg/l	-0.025	-0.131	-	-
LEAD-T-mg/l	-0.069	0.042	-	-
LITHIUM-T-mg/l	-0.150	-0.287	No WQG	Yes
MAGNESIUM-T-mg/l	-0.125	-0.227	-	-
MANGANESE-T-mg/l	-0.105	-0.249	No	-
MERCURY-T-mg/l	-0.101	0.106	-	-
MOLYBDENUM-T-mg/l	-0.085	-0.253	No	-
NICKEL-T-mg/l	-0.210	-0.334	Yes	Yes
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	-0.127	-0.209	-	Yes
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	-0.140	-0.348	No	-
NITROGEN, AMMONIA (AS N)-N-mg/l	-0.147	-0.501	No	-
ORTHO-PHOSPHATE-N-mg/l	0.154	0.140	-	-
pH, LAB-N-ph units	0.006	0.081	-	-
PHOSPHORUS-N-mg/l	0.044	-0.044	-	-
POTASSIUM-T-mg/l	-0.178	-0.378	No WQG	No - parameter included in TDS
SELENIUM-T-mg/l	-0.119	-0.186	-	Yes
SILVER-T-mg/l	-0.090	-0.072	-	-
SODIUM-T-mg/l	-0.038	-0.030	-	-
STRONTIUM-T-mg/l	0.012	-0.035	-	-
SULFATE (AS SO ₄)-D-mg/l	-0.129	-0.264	Yes	Yes
THALLIUM-T-mg/l	-0.177	-0.208	No	-
TIN-T-mg/l	-0.175	-0.253	No	-
TITANIUM-T-mg/l	-0.163	-	No	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.140	-0.253	No WQG	Yes
TOTAL KJELDAHL NITROGEN-N-mg/l	0.018	-0.002	-	-
TOTAL ORGANIC CARBON-T-mg/l	-0.108	-0.204	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.027	-0.016	-	-
TURBIDITY, LAB-N-ntu	0.038	-0.146	-	-
URANIUM-T-mg/l	-0.143	-0.290	Yes	Yes
VANADIUM-T-mg/l	-0.202	-0.002	No WQG	Yes
ZINC-T-mg/l	-0.190	-0.134	No	-
ΣTU-WQGs	-0.254	-0.370	No WQG	Yes
ΣTU-WQGs/Benchmarks	-0.290	-0.349	No WQG	Yes
PC1 (all years)	-0.154	-	No WQG	Yes
PC2 (all years)	-0.078	-	-	-
PC3 (all years)	0.079	-	-	-
PC4 (all years)	-0.104	-	-	-
PC1 (2018)	-	-0.237	-	-
PC2 (2018)	-	-0.168	-	-
PC3 (2018)	-	-0.389	No WQG	Yes
PC4 (2018)	-	-0.070	-	-

Notes:

(1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ($\alpha < 0.05$; $r_s < -0.133$) and 2018 dataset ($\alpha < 0.05$; $r_s < -0.246$) are bolded. Strong negative correlations ($R_s < -0.4$) are shaded. - = r_s could not be calculated because parameter concentration was the same in all tests or parameter was not applicable to the dataset. Principle components with significant positive correlations are bolded ($\alpha < 0.05$; combined dataset: $r_s > 0.133$; 2018 dataset: $r_s > 0.246$); principle components with strong positive correlations are shaded ($\alpha < 0.05$; $r_s > 0.4$).

(2) Parameters are screened against BC WQGs in Appendix C.

(3) Parameters were retained for graphical analysis if they met one of the following conditions: 1) order constituent, 2) significant negative correlation and concentration was greater than the chronic BC WQG, or 3) significant negative correlation and there is no chronic BC WQG.

(4) Of 46 samples, zero had detected concentrations of bismuth (Table D-2).

(5) Of 46 samples, three had detected concentrations of bromide (Table D-2).

Abbreviations

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; µg/l = micrograms per litre; WQG = water quality guideline.

Table F-3: Spearman Rank Order Correlation for H. azteca Survival and Dry Weight

Parameter	Survival Rs ¹		Dry Weight Rs ¹		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? ²	Retain Parameter for Concentration-Response Analysis? ³	
	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset		Survival	Dry Weight
ALKALINITY, TOTAL (As CaCO ₃), lab measured -N-mg/	-0.275	-0.407	-0.397	-0.509	No WQG	No - parameter included in TDS	
ALUMINIUM-D-mg/l	0.293	0.196	0.239	0.220	-	-	-
ANTIMONY-T-mg/l	-0.259	-0.245	-0.311	-0.252	No	-	-
ARSENIC-T-mg/l	-0.086	0.049	-0.027	0.190	-	-	-
BARIUM-T-mg/l	-0.056	-0.095	-0.151	-0.184	-	-	-
BERYLLIUM-T-mg/l	0.074	0.158	0.007	0.258	-	-	-
BISMUTH-T-mg/l	-0.185	-0.294	-0.165	-0.302	No WQG	No - low detection frequency ⁴	
BORON-T-mg/l	-0.399	-0.469	-0.404	-0.382	No	-	-
BROMIDE-D-mg/l	-0.096	-0.152	-0.158	-0.322	No WQG	-	No - low detection frequency ⁴
CADMIUM-D-mg/l	-0.045	-0.022	-0.076	0.052	-	Yes	Yes
CALCIUM-T-mg/l	-0.308	-0.425	-0.434	-0.538	No WQG	No - parameter included in TDS	
CARBON, DISSOLVED ORGANIC-D-mg/l	0.251	0.285	0.286	0.450	-	-	-
CHLORIDE-D-mg/l	-0.305	-0.436	-0.418	-0.507	No	-	-
CHROMIUM-T-mg/l	0.028	0.048	-0.025	0.096	-	-	-
COBAL-T-mg/l	-0.161	-0.230	-0.194	-0.158	Yes	-	Yes
CONDUCTIVITY, LAB-N-us/cm	-0.304	-0.448	-0.419	-0.517	No WQG	No - parameter included in TDS	
COPPER-T-mg/l	0.139	0.127	0.093	0.221	-	-	-
FLUORIDE-D-mg/l	0.066	0.097	0.154	0.042	-	-	-
Hardness, Total or Dissolved CaCO ₃ -N-mg/	-0.290	-0.436	-0.412	-0.491	No WQG	No - parameter included in TDS	
IRON-D-mg/l	0.071	-0.042	0.143	0.073	-	-	-
IRON-T-mg/l	0.225	0.283	0.209	0.380	-	-	-
LEAD-T-mg/l	0.249	0.314	0.198	0.392	-	-	-
LITHIUM-T-mg/l	-0.163	-0.266	-0.272	-0.272	No WQG	-	Yes
MAGNESIUM-T-mg/l	-0.272	-0.409	-0.390	-0.471	No WQG	No - parameter included in TDS	
MANGANESE-T-mg/l	0.041	0.108	-0.006	0.152	-	-	-
MERCURY-T-mg/l	0.104	0.394	0.174	0.455	-	-	-
MOLYBDENUM-T-mg/l	-0.287	-0.384	-0.353	-0.416	No	-	-
NICKEL-T-mg/l	-0.244	-0.255	-0.304	-0.225	Yes	Yes	Yes
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	-0.101	-0.244	-0.248	-0.341	Yes	Yes	Yes
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	-0.292	-0.336	-0.388	-0.348	Yes	Yes	Yes
NITROGEN, AMMONIA (AS N)-N-mg/l	-0.232	-0.245	-0.255	-0.211	No	-	-
ORTHO-PHOSPHATE-N-mg/l	0.171	0.228	0.228	0.378	-	-	-
pH LAB-N-ph units	0.173	0.378	0.210	0.370	-	-	-
PHOSPHORUS-N-mg/l	0.238	0.412	0.265	0.528	-	-	-
POTASSIUM-T-mg/l	-0.223	-0.264	-0.286	-0.238	No WQG	No - parameter included in TDS	
SELENIUM-T-mg/l	-0.108	-0.236	-0.227	-0.294	Yes	Yes	Yes
SILVER-T-mg/l	0.199	0.171	0.267	0.262	-	-	-
SODIUM-T-mg/l	-0.387	-0.501	-0.448	-0.413	No WQG	No - parameter included in TDS	
STRONTIUM-T-mg/l	-0.392	-0.602	-0.533	-0.647	No WQG	Yes	Yes
SULFATE (AS SO ₄)-D-mg/l	-0.310	-0.450	-0.423	-0.504	Yes	Yes	Yes
THALLIUM-T-mg/l	-0.074	-0.051	-0.120	0.021	-	-	-
TIN-T-mg/l	-0.298	-0.294	-0.281	-0.302	No WQG	No - low detection frequency ⁴	
TITANIUM-T-mg/l	0.053	-0.072	-0.038	0.132	-	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.292	-0.441	-0.413	-0.494	No WQG	Yes	Yes
TOTAL KJELDAHL NITROGEN-N-mg/l	-0.029	0.096	-0.129	-0.037	-	-	-
TOTAL ORGANIC CARBON-T-mg/l	0.269	0.324	0.363	0.489	-	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.221	0.308	0.240	0.449	-	-	-
TURBIDITY, LAB-N-ntu	0.160	0.233	0.139	0.308	-	-	-
URANIUM-T-mg/l	-0.233	-0.375	-0.357	-0.466	Yes	Yes	Yes
VANADIUM-T-mg/l	0.196	0.234	0.175	0.331	-	-	-
ZINC-T-mg/l	0.006	0.157	0.174	0.343	-	-	-
ΣTU-WQGs	-0.192	-0.190	-0.275	-0.223	No WQG	Yes	Yes
ΣTU-WQGs/Benchmarks	-0.204	-0.219	-0.275	-0.224	No WQG	Yes	Yes
PC1 (all years)	-0.335	-	-0.444	-	No WQG	Yes	Yes
PC2 (all years)	0.079	-	0.121	-	-	-	-
PC3 (all years)	0.317	-	0.291	-	No WQG	Yes	Yes
PC4 (all years)	0.251	-	0.252	-	No WQG	Yes	Yes
PC5 (all years)	0.086	-	-0.084	-	-	-	-
PC1 (2018)	-	-0.487	-	-0.541	No WQG	Yes	Yes
PC2 (2018)	-	0.144	-	0.211	-	-	-
PC3 (2018)	-	0.437	-	0.359	No WQG	Yes	Yes
PC4 (2018)	-	0.293	-	0.186	No WQG	Yes	-
PC5 (2018)	-	-0.070	-	-0.019	-	-	-

Notes:

- (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ($\alpha < 0.05$; $r_s < -0.174$) and 2018 dataset ($\alpha < 0.05$; $r_s < -0.271$) are bolded. Strong negative correlations ($R_s < -0.4$) are shaded. - = rs could not be calculated because parameter concentration was the same in all tests or parameter was not applicable to the dataset. Principle components with significant positive correlations are bolded ($\alpha < 0.05$; combined dataset: $r_s > 0.271$; 2018 dataset: $r_s > 0.174$); principle components with strong positive correlations are shaded ($\alpha < 0.05$; $r_s > 0.4$).
- (2) Parameters are screened against chronic BC WQGs in Appendix C.
- (3) Parameters were retained for graphical analysis if they met one of the following conditions: 1) order constituent, 2) significant negative correlation and concentration was greater than the chronic BC WQG, or 3) significant negative correlation and there is no chronic BC WQG.
- (4) Of 38 samples, zero had detected concentrations of bismuth (Table D-3).
- (5) Of 38 samples, two had detected concentrations of bromide (Table D-3).
- (6) Of 38 samples, zero had detected concentrations of tin (Table D-3).

Abbreviations

% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.

Table F-4: Spearman Rank Order Correlation for *O. mykiss* Survival, Viability, Length, and Weight

Parameter	Survival Rs ¹		Viability Rs ¹		Length Rs ¹		Weight Rs ¹		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? ²	Retain Parameter for Concentration-Response Analysis ³			
	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset		Survival	Viability	Length	Weight
ALKALINITY, TOTAL (As CaCO ₃), lab measured -N-mg/l	-0.436	-0.705	-0.426	-0.680	-0.365	-0.361	-0.161	-0.139	No WQG	No - parameter included in TDS			
ALUMINUM-D-mg/l	0.171	0.449	0.188	0.404	0.188	0.637	0.324	0.497	-	-	-	-	
ANTIMONY-T-mg/l	-0.166	-0.175	-0.185	-0.197	0.167	0.178	0.244	0.437	-	-	-	-	
ARSENIC-T-mg/l	0.221	0.272	0.253	0.230	0.615	0.593	0.598	0.530	-	-	-	-	
BARIUM-T-mg/l	-0.242	-0.337	-0.188	-0.305	-0.180	-0.064	-0.081	0.078	No	-	-	-	
BERYLLIUM-T-mg/l	-0.085	0.211	-0.132	0.145	-0.108	0.471	-0.181	0.399	-	-	-	-	
BISMUTH-T-mg/l	-0.230	-0.354	-0.218	-0.354	-0.177	-0.360	-0.231	-0.354	No WQG	No - low detection frequency ⁴			
BORON-T-mg/l	-0.162	-0.426	-0.187	-0.387	-0.128	0.028	-0.135	0.120	No	-	-	-	
BROMIDE-D-mg/l	-0.391	-0.513	-0.390	-0.454	-0.447	-0.389	-0.310	-0.235	No WQG	No - low detection frequency ⁴			
CADIUM-D-mg/l	-0.013	0.028	-0.049	0.007	0.297	0.373	0.334	0.620	-	Yes	Yes	Yes	
CALCIUM-T-mg/l	-0.476	-0.667	-0.481	-0.654	-0.307	-0.256	-0.135	-0.024	No WQG	No - parameter included in TDS			
CARBON, DISSOLVED ORGANIC-D-mg/l	0.262	0.364	0.292	0.320	0.655	0.614	0.598	0.525	-	-	-	-	
CHLORIDE-D-mg/l	-0.305	-0.366	-0.345	-0.328	-0.197	0.026	-0.070	0.231	No	-	-	-	
CHROMIUM-T-mg/l	0.365	0.533	0.382	0.457	0.515	0.566	0.442	0.457	-	-	-	-	
COBALT-T-mg/l	0.153	0.106	0.176	0.027	0.458	0.398	0.468	0.521	-	-	-	-	
CONDUCTIVITY, LAB-N-us/cm	-0.469	-0.697	-0.482	-0.687	-0.336	-0.315	-0.172	-0.063	No WQG	No - parameter included in TDS			
COPPER-T-mg/l	0.234	0.349	0.253	0.279	0.478	0.450	0.422	0.423	-	-	-	-	
FLUORIDE-D-mg/l	-0.075	0.109	-0.097	0.126	-0.164	0.013	-0.074	0.117	-	-	-	-	
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	-0.460	-0.693	-0.470	-0.677	-0.345	-0.303	-0.181	-0.059	No WQG	No - parameter included in TDS			
IRON-D-mg/l	0.155	0.120	0.159	0.081	0.227	0.375	0.174	0.335	-	-	-	-	
IRON-T-mg/l	0.201	0.405	0.212	0.335	0.581	0.543	0.504	0.482	-	-	-	-	
LEAD-T-mg/l	0.247	0.314	0.284	0.263	0.630	0.557	0.509	0.466	-	-	-	-	
LITHIUM-T-mg/l	-0.280	-0.452	-0.294	-0.451	-0.048	-0.090	0.052	0.165	No WQG	Yes	Yes	-	
MAGNESIUM-T-mg/l	-0.447	-0.671	-0.448	-0.657	-0.266	-0.267	-0.112	-0.016	No WQG	No - parameter included in TDS			
MANGANESE-T-mg/l	0.106	0.258	0.123	0.184	0.507	0.434	0.468	0.476	-	-	-	-	
MERCURY-T-mg/l	0.113	0.547	0.130	0.459	0.178	0.587	0.193	0.508	-	-	-	-	
MOLYBDENUM-T-mg/l	-0.200	-0.314	-0.211	-0.293	-0.128	-0.167	-0.047	0.001	-	-	-	-	
NICKEL-T-mg/l	-0.098	-0.082	-0.115	-0.100	0.228	0.269	0.315	0.494	-	-	-	-	
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	-0.358	-0.441	-0.372	-0.462	-0.132	-0.171	-0.013	0.110	Yes	Yes	Yes	Yes	
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	-0.432	-0.545	-0.423	-0.568	-0.128	-0.131	-0.049	0.095	No	-	-	-	
NITROGEN, AMMONIA (AS N)-N-mg/l	0.154	-0.577	0.232	-0.559	0.298	-0.241	0.083	-0.150	No	-	-	-	
ORTHO-PHOSPHATE-N-mg/l	0.291	0.170	0.354	0.185	0.448	0.534	0.364	0.395	-	-	-	-	
pH, LAB-N-ph units	-0.172	-0.276	-0.145	-0.259	-0.032	-0.007	-0.004	0.053	-	-	-	-	
PHOSPHORUS-N-mg/l	0.221	0.394	0.260	0.359	0.633	0.652	0.547	0.562	-	-	-	-	
POTASSIUM-T-mg/l	-0.335	-0.479	-0.329	-0.502	-0.019	-0.055	0.114	0.192	No WQG	No - parameter included in TDS			
SELENIUM-T-mg/l	-0.379	-0.528	-0.386	-0.530	-0.199	-0.194	-0.051	0.047	Yes	Yes	Yes	Yes	
SILVER-T-mg/l	0.225	0.154	0.277	0.104	0.473	0.279	0.410	0.275	-	-	-	-	
SODIUM-T-mg/l	-0.164	-0.343	-0.201	-0.332	0.025	0.084	0.123	0.283	-	-	-	-	
STRONTIUM-T-mg/l	-0.159	-0.349	-0.172	-0.292	-0.282	-0.217	-0.137	-0.189	-	-	-	-	
SULFATE (AS SO ₄)-D-mg/l	-0.436	-0.662	-0.453	-0.685	-0.283	-0.228	-0.129	0.033	Yes	Yes	Yes	Yes	
THALLIUM-T-mg/l	0.111	0.178	0.128	0.118	0.479	0.339	0.495	0.367	-	-	-	-	
TIN-T-mg/l	-0.082	-0.354	-0.073	-0.354	-0.053	-0.360	-0.057	-0.354	No WQG	No - low detection frequency ⁴			
TITANIUM-T-mg/l	-0.101	0.228	-0.116	0.237	0.016	0.189	0.023	0.168	-	-	-	-	
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.461	-0.661	-0.475	-0.652	-0.321	-0.282	-0.159	-0.036	No WQG	Yes	Yes	-	
TOTAL KJELDAHL NITROGEN-N-mg/l	0.030	-0.176	0.053	-0.219	0.433	0.087	0.449	0.291	-	-	-	-	
TOTAL ORGANIC CARBON-T-mg/l	0.235	0.393	0.256	0.348	0.659	0.666	0.595	0.556	-	-	-	-	
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.204	0.333	0.228	0.288	0.563	0.495	0.483	0.432	-	-	-	-	
TURBIDITY, LAB-N-ntu	0.164	0.240	0.174	0.178	0.555	0.479	0.535	0.461	-	-	-	-	
URANIUM-T-mg/l	-0.369	-0.499	-0.385	-0.489	-0.244	-0.253	-0.063	0.001	Yes	Yes	Yes	-	
VANADIUM-T-mg/l	0.221	0.400	0.258	0.316	0.558	0.492	0.456	0.434	-	-	-	-	
ZINC-T-mg/l	0.304	0.461	0.303	0.430	0.603	0.639	0.555	0.711	-	-	-	-	
XTU-WQGs	-0.199	-0.181	-0.190	-0.221	0.122	0.107	0.171	0.300	-	-	-	-	
XTU-WQGs/Benchmarks	-0.048	-0.048	-0.050	-0.104	0.252	0.227	0.294	0.402	-	-	-	-	
PC1 (all years)	-0.409	-	-0.436	-	-0.347	-	-0.196	-	No WQG	Yes	Yes	-	
PC2 (all years)	0.100	-	0.108	-	0.509	-	0.511	-	No WQG	-	Yes	Yes	
PC3 (all years)	-0.025	-	-0.022	-	0.378	-	0.436	-	No WQG	-	Yes	Yes	
PC4 (all years)	0.040	-	0.047	-	0.154	-	0.133	-	-	-	-	-	
PC2 (2018)	-	-0.612	-	-0.600	-	-0.335	-	-0.079	No WQG	Yes	Yes	-	
PC2 (2018)	-	0.175	-	0.125	-	0.490	-	0.535	No WQG	-	Yes	Yes	
PC3 (2018)	-	-0.132	-	-0.156	-	0.243	-	0.474	No WQG	-	-	Yes	
PC4 (2018)	-	-0.156	-	-0.185	-	-0.081	-	0.033	-	-	-	-	

Notes:
 (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ($\alpha < 0.05$, $r_s < -0.201$) and 2018 dataset ($\alpha < 0.05$, $r_s < -0.352$) are bolded. Strong correlations ($R_s < -0.4$) are shaded. - = r_s could not be calculated because parameter concentration was the same in all tests or parameter was not applicable to the dataset. Principle components with significant positive correlations are bolded ($\alpha < 0.05$; combined dataset: $r_s > 0.201$; 2018 dataset: $r_s > 0.352$); principle components with strong positive correlations are shaded ($\alpha < 0.05$; $r_s > 0.4$).
 (2) Parameters are screened against BC WQGs in Appendix C.
 (3) Parameters were retained for graphical analysis if they met one of the following conditions: 1) order constituent, 2) significant negative correlation and concentration was greater than the chronic BC WQG, or 3) significant negative correlation and there is no chronic BC WQG.
 (4) Of 23 samples, zero had detected concentrations of bismuth (Table D-4).
 (5) Of 23 samples, one had detected concentrations of bromide (Table D-4).
 (6) Of 23 samples, zero had detected concentrations of bromide (Table D-4).

Abbreviations
 % = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.

Table F-5: Spearman Rank Order Correlation for *P. promelas* Survival, Biomass, and Length

Parameter	Survival Rs ¹		Biomass Rs ¹		Length Rs ¹		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? ²	Retain Parameter for Concentration-Response Analysis? ³		
	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset	2015 to 2018 Dataset	2018 Dataset		Survival	Biomass	Length
ALKALINITY, TOTAL (As CaCO ₃), lab measured -N-mg/l	-0.395	-0.565	-0.142	-0.095	0.238	-0.043	No WQG	No - parameter included in TDS	-	-
ALUMINUM-D-mg/l	0.240	0.263	0.004	0.469	0.149	0.133	-	-	-	-
ANTIMONY-T-mg/l	-0.330	-0.493	0.004	-0.034	0.254	0.175	No	-	-	-
ARSENIC-T-mg/l	0.011	0.127	-0.057	0.048	0.027	-0.039	-	-	-	-
BARIUM-T-mg/l	-0.194	-0.206	-0.011	0.184	0.297	0.112	-	-	-	-
BERYLLIUM-T-mg/l	0.207	0.129	-0.059	0.193	0.051	-0.047	-	-	-	-
BISMUTH-T-mg/l	-0.097	-0.355	-0.167	-0.002	0.017	-0.172	No WQG	No - low detection frequency ⁴	-	-
BORON-T-mg/l	-0.146	-0.140	-0.005	-0.017	-0.024	-0.129	-	-	-	-
BROMIDE-D-mg/l	-0.426	-0.587	-0.218	-0.402	0.247	-0.006	No WQG	No - low detection frequency ⁵	-	-
CADMIUM-D-mg/l	0.043	-0.018	0.067	0.256	0.246	0.100	-	Yes	Yes	Yes
CALCIUM-T-mg/l	-0.375	-0.590	-0.057	-0.043	0.250	0.072	No WQG	No - parameter included in TDS	-	-
CARBON, DISSOLVED ORGANIC-D-mg/l	0.122	0.181	0.139	0.135	-0.039	0.031	-	-	-	-
CHLORIDE-D-mg/l	-0.279	-0.368	-0.128	-0.005	0.189	-0.085	No	-	-	-
CHROMIUM-T-mg/l	0.170	0.393	0.133	0.502	-0.037	0.033	-	-	-	-
COBALT-T-mg/l	-0.034	-0.129	0.041	0.094	0.121	0.084	-	-	-	-
CONDUCTIVITY, LAB-N-us/cm	-0.369	-0.546	-0.058	-0.022	0.259	0.052	No WQG	No - parameter included in TDS	-	-
COPPER-T-mg/l	0.213	0.267	-0.026	0.238	0.190	-0.031	-	-	-	-
FLUORIDE-D-mg/l	-0.177	-0.345	-0.238	-0.215	0.361	0.412	No	-	-	-
Hardness, Total or Dissolved CaCO ₃ -N-mg/l	-0.363	-0.570	-0.084	-0.078	0.245	0.076	No WQG	No - parameter included in TDS	-	-
IRON-D-mg/l	-0.065	0.010	0.012	0.264	0.141	-0.054	-	-	-	-
IRON-T-mg/l	0.105	-0.024	0.126	0.224	0.230	0.246	-	-	-	-
LEAD-T-mg/l	0.146	0.113	-0.012	0.142	0.129	0.074	-	-	-	-
LITHIUM-T-mg/l	-0.352	-0.488	-0.152	-0.232	0.182	-0.014	No WQG	Yes	-	-
MAGNESIUM-T-mg/l	-0.388	-0.563	-0.099	-0.091	0.286	0.096	No WQG	No - parameter included in TDS	-	-
MANGANESE-T-mg/l	0.021	-0.029	0.161	0.198	0.257	0.358	-	-	-	-
MERCURY-T-mg/l	0.319	0.308	0.131	0.177	-0.017	0.009	-	-	-	-
MOLYBDENUM-T-mg/l	-0.443	-0.538	-0.100	-0.072	0.180	0.054	No	-	-	-
NICKEL-T-mg/l	-0.196	-0.353	0.013	-0.005	0.204	0.069	Yes	Yes	-	-
NITRATE NITROGEN (NO ₃), AS N-N-mg/l	-0.329	-0.573	-0.099	-0.060	0.320	0.085	Yes	Yes	Yes	Yes
NITRITE NITROGEN (NO ₂), AS N-N-mg/l	-0.253	-0.533	-0.020	-0.164	0.204	0.078	Yes	Yes	-	-
NITROGEN, AMMONIA (AS N)-N-mg/l	0.030	-0.117	-0.149	-0.363	-0.141	0.072	No	-	-	-
ORTHO-PHOSPHATE-N-mg/l	0.285	0.593	-0.028	0.137	-0.063	-0.180	-	-	-	-
pH, LAB-N-ph units	0.211	0.254	0.027	0.036	-0.208	0.032	-	-	-	-
PHOSPHORUS-N-mg/l	0.249	0.339	0.100	0.133	0.169	0.056	-	-	-	-
POTASSIUM-T-mg/l	-0.364	-0.438	-0.074	-0.190	0.199	-0.087	No WQG	No - parameter included in TDS	-	-
SELENIUM-T-mg/l	-0.360	-0.569	-0.107	-0.081	0.337	0.130	Yes	Yes	Yes	Yes
SILVER-T-mg/l	-0.030	0.005	-0.096	0.106	0.113	-0.132	-	-	-	-
SODIUM-T-mg/l	-0.112	-0.084	-0.038	0.035	0.020	-0.156	-	-	-	-
STRONTIUM-T-mg/l	-0.292	-0.449	-0.009	-0.081	-0.015	-0.015	No WQG	Yes	-	-
SULFATE (AS SO ₄)-D-mg/l	-0.382	-0.564	-0.065	-0.015	0.267	0.095	Yes	Yes	Yes	Yes
THALLIUM-T-mg/l	-0.013	-0.083	-0.032	0.022	0.140	0.033	-	-	-	-
TIN-T-mg/l	-0.163	-0.355	-0.034	-0.002	0.090	-0.172	No WQG	No - low detection frequency ⁶	-	-
TITANIUM-T-mg/l	0.202	0.200	-0.080	0.067	-0.044	-0.089	No WQG	-	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.388	-0.579	-0.096	-0.085	0.258	0.070	No WQG	Yes	-	-
TOTAL KJELDAHL NITROGEN-N-mg/l	-0.289	-0.271	-0.120	-0.005	0.207	0.176	No WQG	Yes	-	-
TOTAL ORGANIC CARBON-T-mg/l	0.138	0.115	0.082	0.030	0.091	0.063	-	-	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.065	0.072	0.048	0.036	0.038	-0.003	-	-	-	-
TURBIDITY, LAB-N-ntu	0.134	0.096	0.098	0.087	0.069	-0.008	-	-	-	-
URANIUM-T-mg/l	-0.407	-0.624	-0.087	-0.110	0.284	0.130	Yes	Yes	-	-
VANADIUM-T-mg/l	0.091	0.062	-0.069	0.182	0.168	-0.014	-	-	-	-
ZINC-T-mg/l	0.114	0.109	-0.006	0.168	0.149	-0.106	-	-	-	-
ΣTU-WQGs	-0.238	-0.475	-0.007	-0.028	0.288	0.131	No WQG	Yes	-	-
ΣTU-WQGs/Benchmarks	-0.164	-0.353	-0.002	0.097	0.272	0.140	No WQG	Yes	-	-
PC1 (all years)	-0.339	-	-0.078	-	0.242	-	No WQG	Yes	-	Yes
PC2 (all years)	0.263	-	0.066	-	-0.148	-	No WQG	Yes	-	-
PC3 (all years)	0.051	-	0.094	-	0.253	-	No WQG	-	-	Yes
PC4 (all years)	-0.096	-	-0.137	-	0.231	-	No WQG	-	-	Yes
PC1 (2018)	-	-0.589	-	-0.060	-	0.008	No WQG	Yes	-	-
PC2 (2018)	-	0.214	-	0.111	-	-0.139	-	-	-	-
PC3 (2018)	-	-0.042	-	0.079	-	0.276	-	-	-	-
PC4 (2018)	-	-0.237	-	0.038	-	0.089	-	-	-	-

Notes:
(1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ($\alpha < 0.05$; $r_s < -0.224$) and 2018 dataset ($\alpha < 0.05$; $r_s < -0.352$) are bolded. - = r_s could not be calculated because parameter concentration was the same in all tests or parameter was not applicable to the dataset. Principle components with significant positive correlations are bolded ($\alpha < 0.05$; combined dataset: $r_s > 0.224$; 2018 dataset: $r_s > 0.352$); principle components with strong positive correlations are shaded ($\alpha < 0.05$; $r_s > 0.4$).
(2) Parameters are screened against BC WQGs in Appendix C.
(3) Parameters were retained for graphical analysis if they met one of the following conditions: 1) order constituent, 2) significant negative correlation and concentration was greater than the chronic BC WQG, or 3) significant negative correlation and there is no chronic BC WQG.
(4) Of 23 samples, zero had detected concentrations of bismuth (Table D-5).
(5) Of 23 samples, one had detected concentrations of bromide (Table D-5).
(6) Of 23 samples, zero had detected concentrations of tin (Table D-5).

Abbreviations
% = percent; CaCO₃ = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.



golder.com