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## Technical Report Overview

### **Report:** Chronic Toxicity Testing Program 2017 Report

**Overview:** This report presents the results of quarterly and semi-annual chronic toxicity tests undertaken in 2017 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:

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Future studies will be made available at [teck.com/elkvalley](http://teck.com/elkvalley)



**REPORT**

**2017 Chronic Toxicity Program  
Elk Valley Testing to Satisfy Permit Requirements**  
*Interpretive Report*

Submitted to:

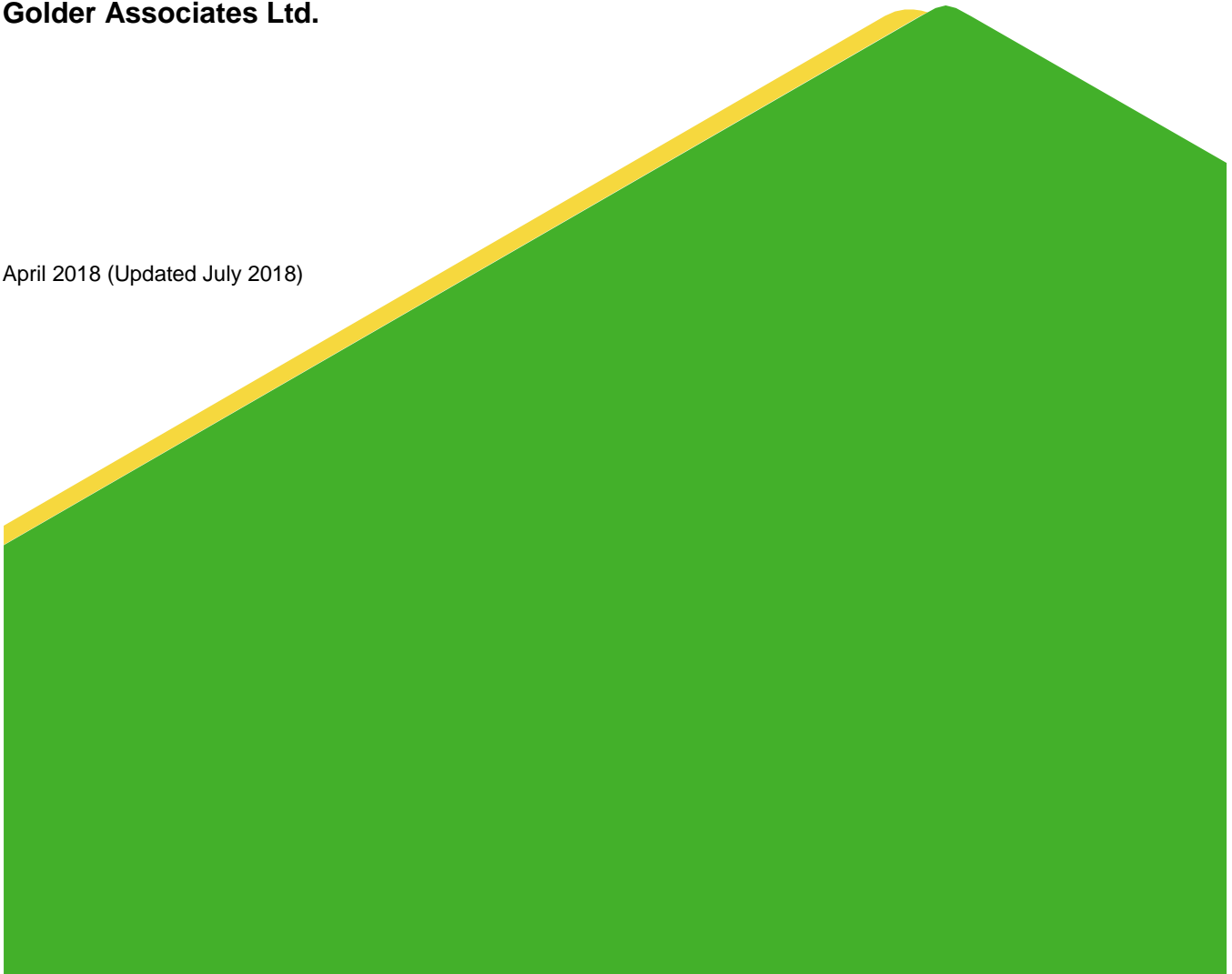
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## Abbreviations

%	percent
~	approximately
<	less than
>	greater than
±	plus or minus
∑TU	sum of toxic units
µg/L	micrograms per litre
AMP	Adaptive Management Plan
BC	British Columbia
BC WQG	British Columbia water quality guideline
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
e.g.	for example
ECx	concentration resulting in x percent effect
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
ICx	concentration resulting in x percent inhibition
LC_LCDSSLCC	Test site on Line Creek downstream of South Line Creek (EMS E297110)
LCx	concentration resulting in x percent lethality
mg	milligrams
mg/L	milligrams per litre
mL	millilitres
mm	millimetres
MoE	British Columbia Ministry of Environment
n	sample size
NaBr	sodium bromide
N	Nitrogen
NaCl	sodium chloride
NR	normal range
NTU	Nephelometric Turbidity Units
<i>O. mykiss</i>	<i>Oncorhynchus mykiss</i>
PCA	principal component analysis
PC	principal components
<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
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 2017 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. The AMP identifies six Management Questions that will be re-evaluated at regular intervals as part of AMP updates throughout the duration of EVWQP implementation. For each Management Question, the AMP describes how the Management Question will be periodically re-evaluated, and how key uncertainties under the Management Question will be reduced. The chronic toxicity testing program discussed herein will support Management Question 2 (*"Will aquatic ecosystem health be protected by meeting the long-term SPOs?"*) and Management Question 5 (*"Does monitoring for mine-related effects indicate that the aquatic ecosystem is healthy?"*). These questions will be re-evaluated through periodic review to assess whether there is new information indicating that adjustments may be warranted.

The objective of this report was to present the results from 2017 chronic toxicity testing, evaluate the reliability of the test results for evaluating mine-related influence, 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.

The following bullets summarize the findings of 2017 quarterly and semi-annual toxicity testing:

- Statistically significant test site responses compared to at least one batch-specific reference water result were observed in toxicity tests conducted with *Ceriodaphnia dubia* (16 of 29 tests), *Pseudokirchneriella subcapitata* (6 of 29 tests), *Hyalella azteca* (6 of 12 tests), *Oncorhynchus mykiss* (9 of 14 tests), and *Pimephales promelas* (3 of 12 tests). Remaining test results could be confidently excluded (i.e., designated as non-toxic) based on this preliminary screening step.
- Of the tests for which a statistically significant response was identified in laboratory reports, approximately 33% (13 of 40 tests) showed a significant effect relative to one or more references in the batch, but had a mean response within the typical range of test organism performance in local reference waters (characterized as the local normal range [NR]) and an effect size less than 20%. These tests were categorized as no adverse response. Approximately 15% (6 of 40 tests) showed a significant effect relative to one or more references in the batch, but had mean response either 1) within the local NR and the effect size was between 20% and 50% or 2) within the typical range of test organism performance in regional reference waters (characterized as the regional NR). These tests were categorized as a possible adverse response. Tests in this category were considered to have elevated 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. For the remaining tests with significant results (21 of 40 tests), the mean result was either 1) within the local NR but the effect size was greater than 50% or 2) below the regional NR. These tests were categorized as a likely adverse response.
- Categories for 2017 test results are summarized by test species in Figure ES-1. All of the *P. subcapitata* tests (29 of 29) and the majority of *C. dubia* (16 of 29), *H. azteca* (7 of 12), and *P. promelas* (11 of 12) tests were categorized as no adverse response. Likely adverse responses were identified in one or more tests for

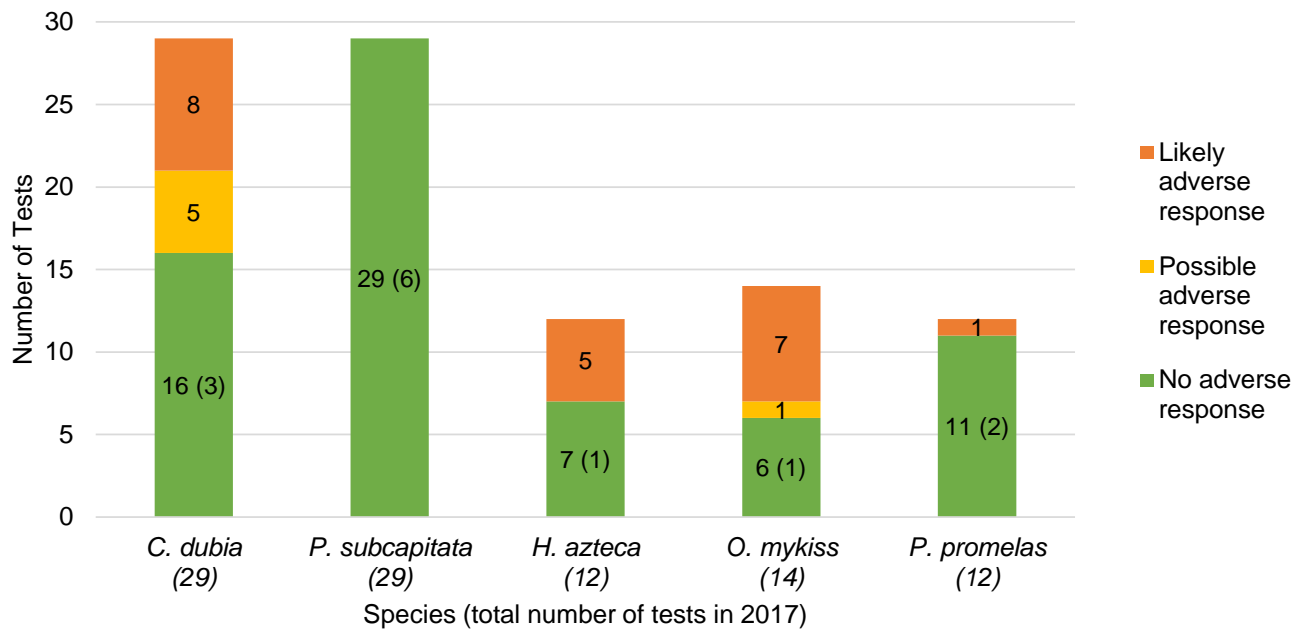
all species except *P. subcapitata*, including those for *C. dubia* (8 of 29), *H. azteca* (5 of 12), *O. mykiss* (7 of 12), and *P. promelas* (1 of 12). Fewer tests were categorized as possible, including those for *C. dubia* (5 of 29) and *O. mykiss* (1 of 14).

- Categories for 2017 test results are summarized by test site in Figure ES-2 to Figure ES-8. A summary of the results is provided below by test site.
  - **FR\_FRCP1.** No adverse responses were observed in the majority of test endpoints (10 of 14) (Figure ES-2). Likely adverse responses were observed in four of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* dry weight (Q1), and *O. mykiss* survival and viability (Q4). Nickel was identified as potentially contributing to the observed *C. dubia* responses in Q1 and Q4; no water quality parameter was identified as potentially contributing to observed responses in other *C. dubia* tests. Nitrate and selenium were identified as potentially contributing to the observed response for *H. azteca* dry weight in Q1. Sulphate and total dissolved solids were identified as potentially contributing to the observed response for *O. mykiss* survival and viability in Q4, although microbial effects may also have contributed to this response.
  - **GH\_FR1.** No adverse responses were observed in the majority of test endpoints (9 of 14) (Figure ES-3). Possible adverse responses were observed in two of 14 endpoints: *C. dubia* reproduction (Q3) and *P. promelas* biomass (Q2). Likely adverse responses were observed in three of 14 endpoints: *O. mykiss* survival and viability (Q4) and *P. promelas* survival (Q2). No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the *P. promelas* and *O. mykiss* tests.
  - **GH\_ERC.** No adverse responses were observed in the majority of test endpoints (5 of 7) (Figure ES-4). Possible adverse responses were observed in Q2 for *O. mykiss* survival and viability. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. Total suspended solids was identified as potentially contributing to the observed response on *O. mykiss* survival and viability in Q2. No water quality parameter was identified as potentially contributing to observed responses in Q4. There was evidence of microbial effects in the Q4 *O. mykiss* test.
  - **EV\_HC1.** No adverse responses were observed in the majority of test endpoints (4 of 7) (Figure ES-5). Possible adverse response was observed in Q2 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.
  - **CM\_MC2.** No adverse responses were observed in the majority of test endpoints (9 of 14) (Figure ES-6). Likely adverse responses were observed for five of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* survival (Q1 to Q3), *H. azteca* dry weight (Q1 to Q4), and *O. mykiss* survival and viability (Q4). Nickel was identified as potentially contributing to the observed responses in all *C. dubia* tests (Q1 to Q4) and the majority of *H. azteca* tests (Q1, Q3, Q4). No water quality parameter was identified as potentially contributing to observed responses in other tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.
  - **EV\_MC2.** No adverse responses were observed in the majority of test endpoints (4 of 7) (Figure ES-7). Possible adverse responses were observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. No water quality parameter was identified as

potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.

- LC\_LCDSSLCC.** No adverse responses were observed in the majority of test endpoints (4 of 7) (Figure ES-8). Possible adverse responses were observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.

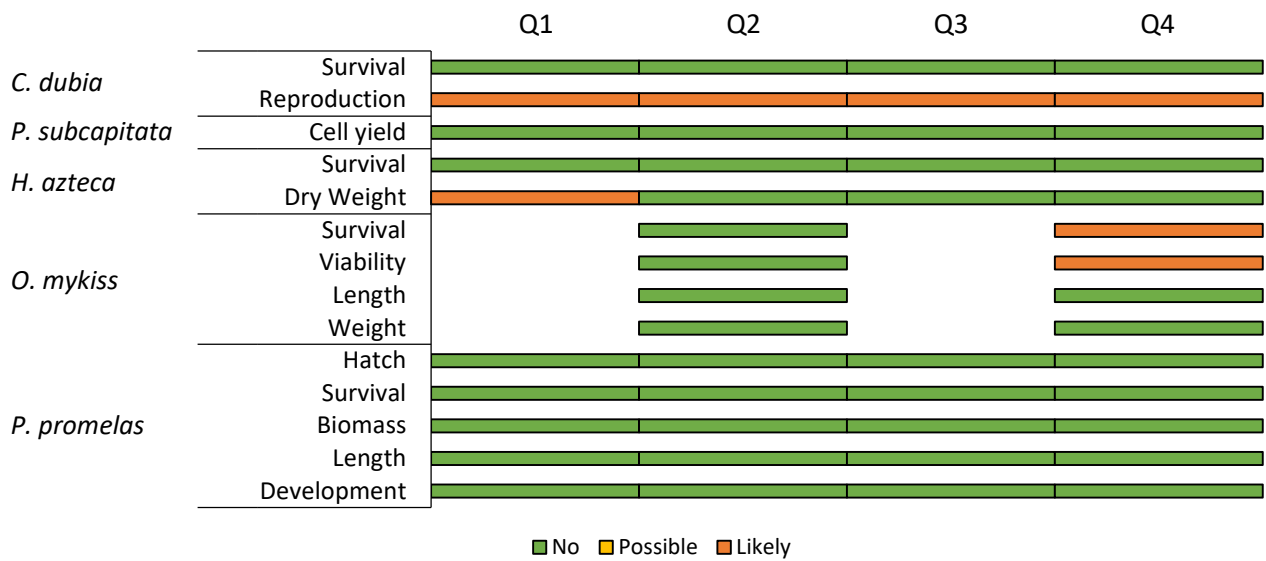
**Figure ES-1: Summary of 2017 test results by species.**



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.

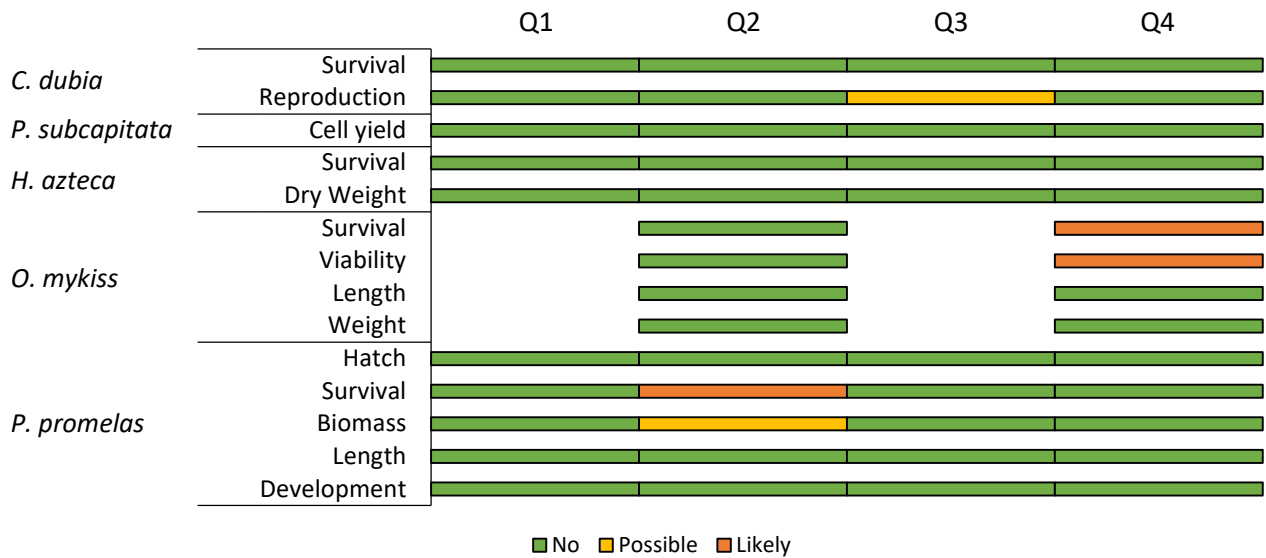


**Figure ES-2: Summary of 2017 test results by category at FR\_FRCP1.**



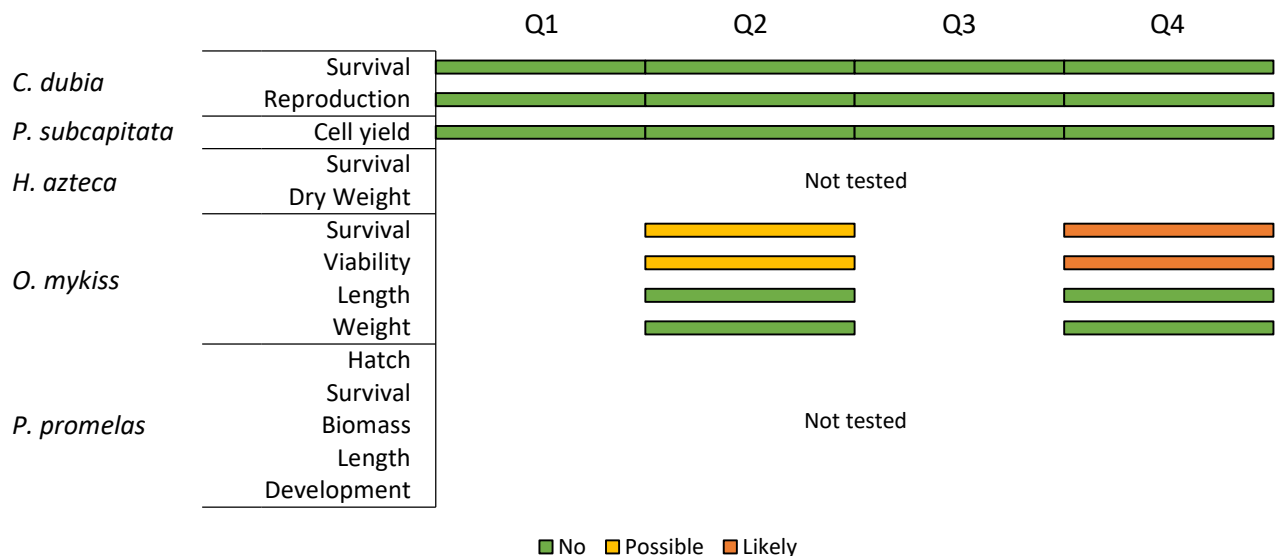
Note: Test results are categorized in Section 3.3.1.

**Figure ES-3: Summary of 2017 test results by category at GH\_FR1.**



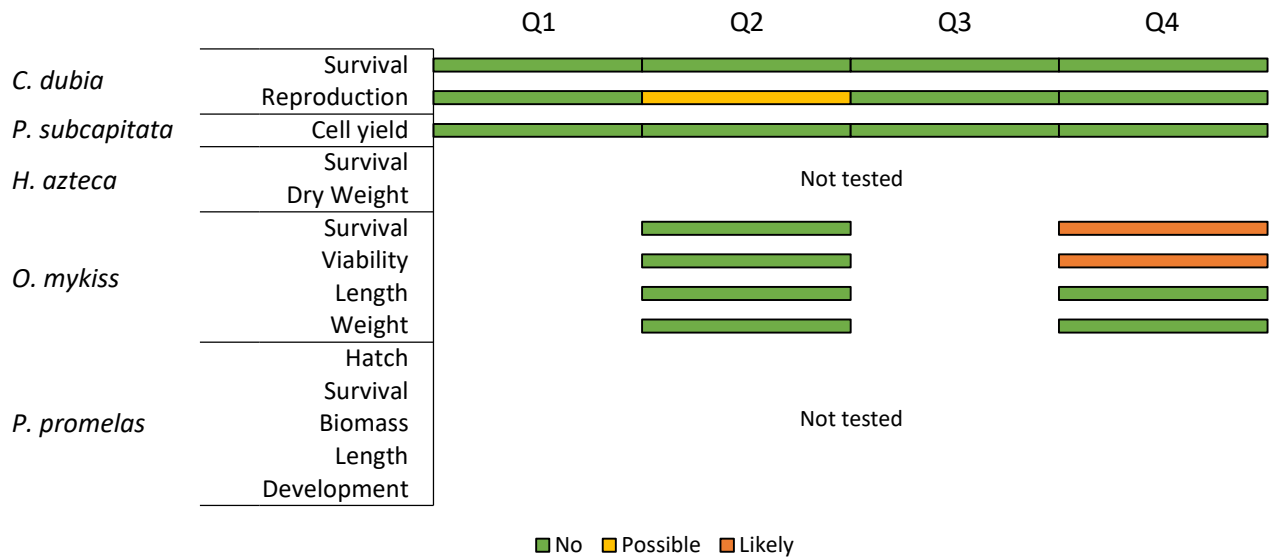
Note: Test results are categorized in Section 3.3.1.

**Figure ES-4: Summary of 2017 test results by category at GH\_ERC.**



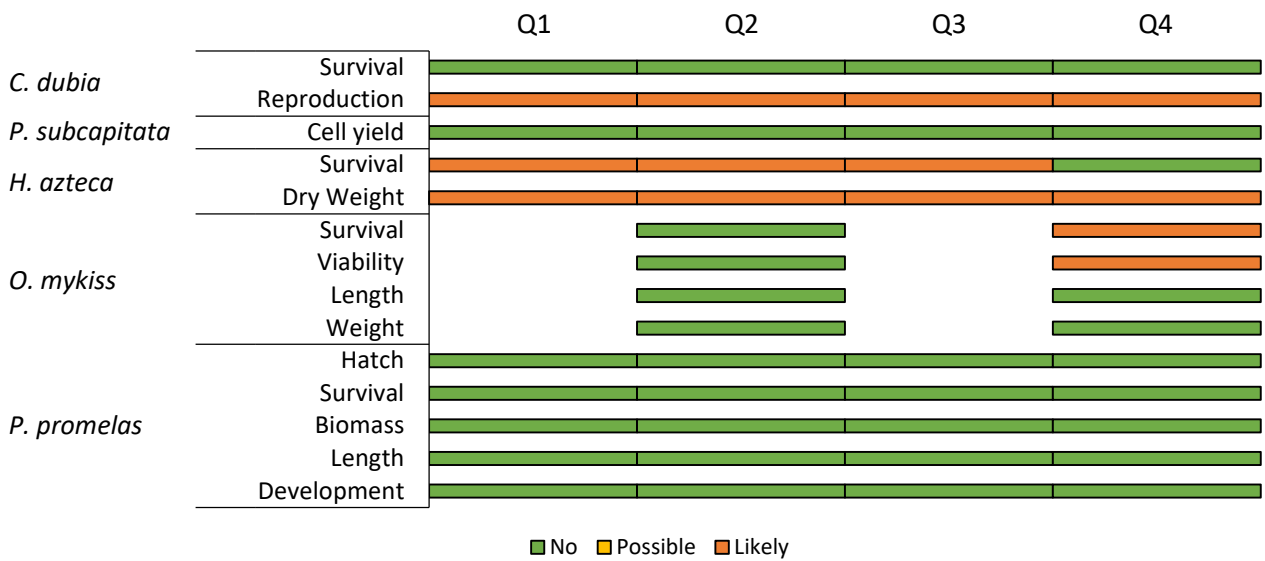
Note: Test results are categorized in Section 3.3.1.

**Figure ES-5: Summary of 2017 test results by category at EV\_HC1.**



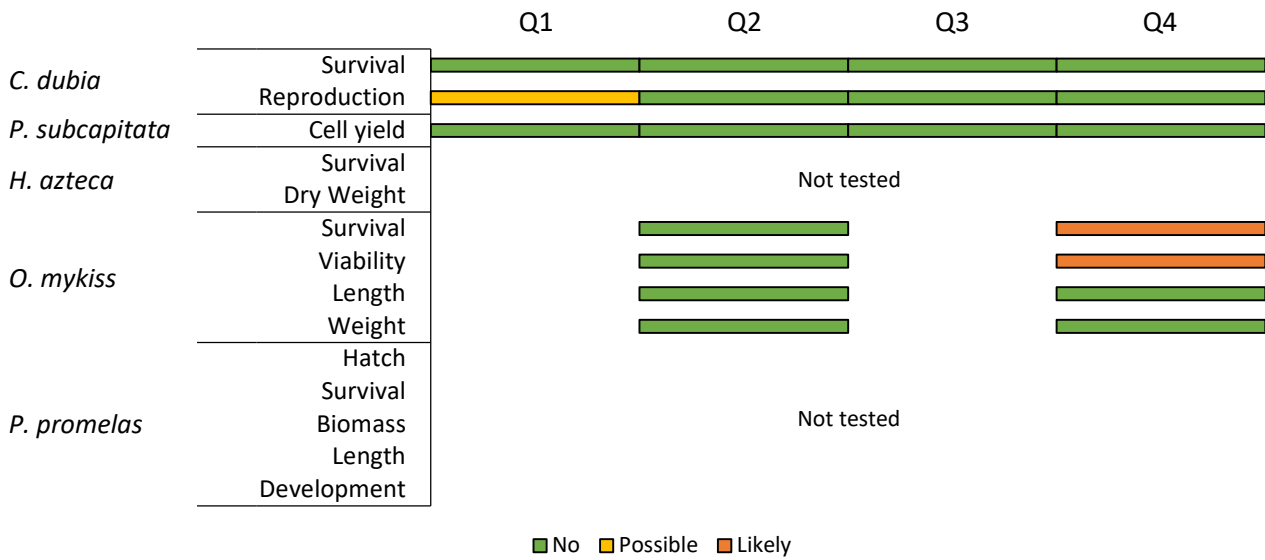
Note: Test results are categorized in Section 3.3.1.

**Figure ES-6: Summary of 2017 test results by category at CM\_MC2.**



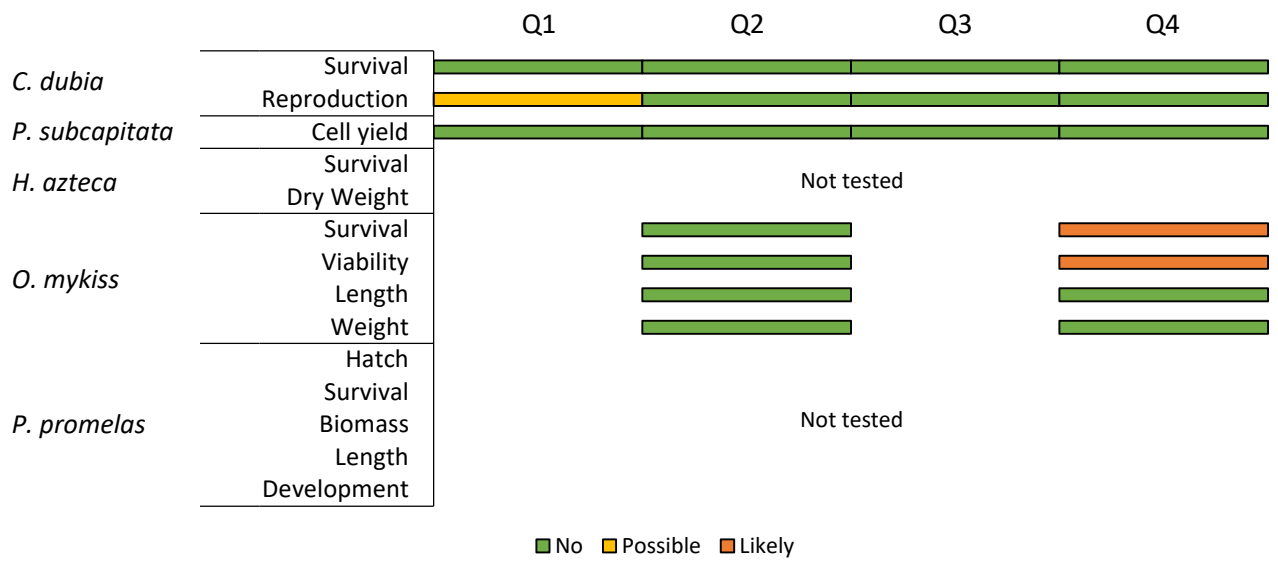
Note: Test results are categorized in Section 3.3.1.

**Figure ES-7: Summary of 2017 test results by category at EV\_MC2.**



Note: Test results are categorized in Section 3.3.1.

**Figure ES-8: Summary of 2017 test results by category at LC\_LCDSSLCC.**



Note: Test results are categorized in Section 3.3.1.

## Study Limitations

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# Table of Contents

<b>1.0 INTRODUCTION</b>	<b>1</b>
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 Objectives	5
1.4 Incorporating Feedback from the Environmental Monitoring Committee	5
1.5 Report Organization	5
<b>2.0 METHODS</b>	<b>7</b>
2.1 Field	7
2.2 Laboratory	7
2.3 Data Analysis	11
2.3.1 Quality Assurance/Quality Control	11
2.3.2 Sources of Variance in Test Water	11
2.3.2.1 Organism Performance	11
2.3.2.2 Organism Sensitivity	11
2.3.2.3 Background Conditions (Normal Ranges)	12
2.3.3 Evaluation of Test Results (Response Assessment)	12
2.3.4 Concentration-Response Analysis	16
2.3.5 Comparison of 2017 Results to Previous Years	19
<b>3.0 RESULTS</b>	<b>19</b>
3.1 Quality Assurance/Quality Control	19
3.2 Sources of Variance in Test Water	21
3.2.1 Organism Performance	21
3.2.2 Organism Sensitivity	21
3.2.3 Background Conditions (Normal Ranges)	22
3.2.3.1 Ceriodaphnia dubia	22
3.2.3.2 Pseudokirchneriella subcapitata	23
3.2.3.3 Hyalella azteca	24
3.2.3.4 Oncorhynchus mykiss	25

3.2.3.5	Pimephales promelas .....	28
3.3	Evaluation of 2017 Test Results .....	31
3.3.1	By Test Species .....	34
3.3.1.1	Ceriodaphnia dubia.....	34
3.3.1.2	Pseudokirchneriella subcapitata .....	38
3.3.1.3	Hyalella azteca.....	40
3.3.1.4	Oncorhynchus mykiss.....	43
3.3.1.5	Pimephales promelas .....	55
3.3.2	By Test Site .....	61
3.4	Concentration-Response Analysis .....	65
3.4.1	<i>Ceriodaphnia dubia</i> Reproduction .....	65
3.4.2	<i>Hyalella azteca</i> .....	76
3.4.3	<i>Oncorhynchus mykiss</i> Survival and Viability .....	86
3.4.4	<i>Pimephales promelas</i> Survival and Biomass.....	95
3.5	Comparison of 2017 Results to Previous Years .....	100
3.5.1	FR_FRCP1.....	112
3.5.2	GH_FR1 .....	113
3.5.3	GH_ERC .....	114
3.5.4	EV_HC1 .....	115
3.5.5	CM_MC2.....	116
3.5.6	EV_MC2.....	117
3.5.7	LC_LCDSSLCC .....	118
<b>4.0</b>	<b>SUMMARY .....</b>	<b>119</b>
4.1	2017 Results .....	119
4.2	Comparison of 2017 Results to Previous Years .....	122
<b>5.0</b>	<b>UNCERTAINTY .....</b>	<b>124</b>
<b>6.0</b>	<b>RECOMMENDATIONS .....</b>	<b>126</b>
<b>7.0</b>	<b>CLOSURE .....</b>	<b>127</b>
<b>8.0</b>	<b>REFERENCES .....</b>	<b>128</b>

**TABLES**

Table 2.1-1: Reference Locations and Tests Sites used in the Quarterly and Semi-Annual Toxicity Testing .....7

Table 2.2-1: Summary of Quarterly and Semi-Annual Toxicity Tests .....8

Table 2.2-2: Summary of Quarterly and Semi-Annual Tests Conducted in 2017 <sup>(a,b,c)</sup> ..... 10

Table 2.3-1: Reference and test site pairings used in the local NR comparison. .... 14

Table 3.3-1: Results of Quarterly and Semi-Annual Toxicity Tests—Raw Results <sup>(a)</sup> ..... 32

Table 3.3-2: Results of Quarterly and Semi-Annual Toxicity Tests—Control Normalized Results<sup>(a)</sup> ..... 33

Table 3.3-3: Summary of Untreated and Copper-Treated Tests with *O. mykiss* <sup>(a)</sup> .....52

**FIGURES**

Figure ES-1: Summary of 2017 test results by species. .... vi

Figure ES-2: Summary of 2017 test results by category at FR\_FRCP1. .... vii

Figure ES-3: Summary of 2017 test results by category at GH\_FR1. .... vii

Figure ES-4: Summary of 2017 test results by category at GH\_ERC. ....viii

Figure ES-5: Summary of 2017 test results by category at EV\_HC1. ....viii

Figure ES-6: Summary of 2017 test results by category at CM\_MC2. .... ix

Figure ES-7: Summary of 2017 test results by category at EV\_MC2. .... ix

Figure ES-8: Summary of 2017 test results by category at LC\_LCDSSLCC. .... x

Figure 1.1-1: Overview of Elk Valley Chronic Toxicity Testing Program .....2

Figure 1.2-1: Overview of Elk Valley Chronic Toxicity Testing Program Linkages to Management Question 2..... 4

Figure 2.3-1: Decision framework for inclusion of endpoints and parameters in the concentration-response analysis. .... 14

Figure 2.3-2: Example data plot for individual replicate results. .... 15

Figure 2.3-3: Example data plot for mean results. .... 15

Figure 2.3-4: Decision framework for inclusion of endpoints and parameters in the concentration-response analysis. .... 17

Figure 3.2-1: Reference toxicant data from 2017 laboratory reports (Appendix B). ....21

Figure 3.2-2: Mean results for *C. dubia* survival in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel). .... 22

Figure 3.2-3: Mean results for *C. dubia* reproduction in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel). .... 23

Figure 3.2-4: Mean results for *P. subcapitata* cell yield in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel). .... 23



Figure 3.2-5: Mean results for <i>H. azteca</i> survival in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	24
Figure 3.2-6: Mean results for <i>H. azteca</i> weight in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	25
Figure 3.2-7: Mean results for <i>O. mykiss</i> survival in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	26
Figure 3.2-8: Mean results for <i>O. mykiss</i> viability in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	27
Figure 3.2-9: Mean results for <i>O. mykiss</i> length in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	27
Figure 3.2-10: Mean results for <i>O. mykiss</i> weight in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	28
Figure 3.2-11: Mean results for <i>P. promelas</i> hatch in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	29
Figure 3.2-12: Mean results for <i>P. promelas</i> survival in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	29
Figure 3.2-13: Mean results for <i>P. promelas</i> biomass in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	30
Figure 3.2-14: Mean results for <i>P. promelas</i> length in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	30
Figure 3.2-15: Mean results for <i>P. promelas</i> development in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel).	31
Figure 3.3-1: Individual replicate and mean results for <i>C. dubia</i> survival in reference (Ref) and test site waters.	35
Figure 3.3-2: Mean results for <i>C. dubia</i> survival in the Fording River reference and its paired test site waters (left panel). Regional and Fording River normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	35
Figure 3.3-3: Mean results for <i>C. dubia</i> survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	36
Figure 3.3-4: Individual replicate and mean results for <i>C. dubia</i> reproduction in reference (Ref) and test site waters.	36
Figure 3.3-5: Mean results for <i>C. dubia</i> reproduction in the Fording River reference and its paired test site waters (left panel). Regional and Fording River normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	37

Figure 3.3-6: Mean results for <i>C. dubia</i> reproduction in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel).	37
Figure 3.3-7: Individual replicate and mean results for <i>P. subcapitata</i> cell yield in reference (Ref) and test site waters.	38
Figure 3.3-8: Mean results for <i>P. subcapitata</i> cell yield in the Fording River reference and its paired test site waters.	39
Figure 3.3-9: Mean results for <i>P. subcapitata</i> cell yield in the Elk River and Michel Creek references and their paired test site waters.	39
Figure 3.3-10: Individual replicate and mean results for <i>H. azteca</i> survival in reference (Ref) and test site waters.	41
Figure 3.3-11: Mean results for <i>H. azteca</i> survival in reference and test site waters.	41
Figure 3.3-12: Individual replicate and mean results for <i>H. azteca</i> dry weight in reference (Ref) and test site waters.	42
Figure 3.3-13: Mean results for <i>H. azteca</i> dry weight in reference and test site waters.	42
Figure 3.3-14: Individual replicate and mean results for <i>O. mykiss</i> survival in reference (Ref) and test site waters.	45
Figure 3.3-15: Mean results for <i>O. mykiss</i> survival in the Fording River reference and its paired test site waters.	45
Figure 3.3-16: Mean results for <i>O. mykiss</i> survival in the Elk River and Michel Creek references and their paired test site waters.	46
Figure 3.3-17: Individual replicate and mean results for <i>O. mykiss</i> viability in reference (Ref) and test site waters.	46
Figure 3.3-18: Mean results for <i>O. mykiss</i> viability in the Fording River reference and its paired test site waters.	47
Figure 3.3-19: Mean results for <i>O. mykiss</i> viability in the Elk River and Michel Creek references and their paired test site waters.	47
Figure 3.3-20: Individual replicate and mean results for <i>O. mykiss</i> length in reference (Ref) and test site waters.	48
Figure 3.3-21: Mean results for <i>O. mykiss</i> length in the Fording River reference and its paired test site waters.	48
Figure 3.3-22: Mean results for <i>O. mykiss</i> length in the Elk River and Michel Creek references and their paired test site waters.	49
Figure 3.3-23: Individual replicate and mean results for <i>O. mykiss</i> weight in reference (Ref) and test site waters.	49
Figure 3.3-24: Mean results for <i>O. mykiss</i> weight in the Fording River reference and its paired test site waters.	50
Figure 3.3-25: Mean results for <i>O. mykiss</i> weight in the Elk River and Michel Creek references and their paired test site waters.	50
Figure 3.3-26: Individual replicate and mean results for <i>O. mykiss</i> survival in reference (Ref) and test site waters (untreated and copper-treated).	53

Figure 3.3-27: Individual replicate and mean results for <i>O. mykiss</i> viability in reference (Ref) and test site waters (untreated and copper-treated).....	53
Figure 3.3-28: Individual replicate and mean results for <i>O. mykiss</i> length in reference (Ref) and test site waters (untreated and copper-treated).....	54
Figure 3.3-29: Individual replicate and mean results for <i>O. mykiss</i> weight in reference (Ref) and test site waters (untreated and copper-treated).....	54
Figure 3.3-30: Individual replicate and mean results for <i>P. promelas</i> hatch in reference (Ref) and test site waters.....	56
Figure 3.3-31: Mean results for <i>P. promelas</i> hatch in reference and test site waters.....	56
Figure 3.3-32: Individual replicate and mean results for <i>P. promelas</i> survival in reference (Ref) and test site waters.....	57
Figure 3.3-33: Mean results for <i>P. promelas</i> survival in reference and test site waters.....	57
Figure 3.3-34: Individual replicate and mean results for <i>P. promelas</i> biomass in reference (Ref) and test site waters.....	58
Figure 3.3-35: Mean results for <i>P. promelas</i> biomass in reference and test site waters.....	58
Figure 3.3-36: Individual replicate and mean results for <i>P. promelas</i> length in reference (Ref) and test site waters.....	59
Figure 3.3-37: Mean results for <i>P. promelas</i> length in reference and test site waters.....	59
Figure 3.3-38: Individual replicate and mean results for <i>P. promelas</i> normal development in reference (Ref) and test site waters.....	60
Figure 3.3-39: Mean results for <i>P. promelas</i> normal development in reference and test site waters.....	60
Figure 3.3-40: Summary of test results by category at FR_FRCP1.....	62
Figure 3.3-41: Summary of test results by category at GH_FR1.....	62
Figure 3.3-42: Summary of test results by category at GH_ERC.....	63
Figure 3.3-43: Summary of test results by category at EV_HC1.....	63
Figure 3.3-44: Summary of test results by category at CM_MC2.....	64
Figure 3.3-45: Summary of test results by category at EV_MC2.....	64
Figure 3.3-46: Summary of test results by category at LC_LCDSSLCC.....	65
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).....	70
Figure 3.4-2: Mean <i>C. dubia</i> reproduction versus concentrations of dissolved organic carbon (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right).....	71
Figure 3.4-3: Mean <i>C. dubia</i> reproduction versus concentrations of phosphorus (top left), total dissolved solids (top right), total Kjeldahl nitrogen (bottom left), and total organic carbon (bottom right).....	72
Figure 3.4-4: Mean <i>C. dubia</i> reproduction versus concentrations of total suspended solids (top left), turbidity (top right), and total vanadium (bottom left).....	73
Figure 3.4-5: Mean <i>C. dubia</i> reproduction versus sum of toxic units calculated using BC WQGs only (top left), sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top right), PC1 using the 2017 dataset (bottom left), and PC2 using the 2017 dataset (bottom right).....	74

Figure 3.4-6: Mean <i>C. dubia</i> reproduction versus PC1 (top left), PC2 (top right), and PC3 (bottom left) using the combined dataset. ....	75
Figure 3.4-7: Mean <i>H. azteca</i> survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	78
Figure 3.4-8: Mean <i>H. azteca</i> survival versus concentrations of nitrite (top left), total strontium (top right), total dissolved solids (bottom left), and PC1 for the combined dataset (bottom right). ....	79
Figure 3.4-9: Mean <i>H. azteca</i> survival versus concentration of total nickel (left) and PC1 for the 2017 dataset (right). ....	80
Figure 3.4-10: Mean <i>H. azteca</i> dry weight versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	83
Figure 3.4-11: Mean <i>H. azteca</i> dry weight versus concentrations of total cobalt (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right). ....	84
Figure 3.4-12: Mean <i>H. azteca</i> dry weight versus concentrations of total strontium (top left), total dissolved solids (top right), total Kjeldahl nitrogen (bottom left), and total uranium (bottom right). ....	85
Figure 3.4-13: Mean <i>H. azteca</i> dry weight versus PC1 for the combined dataset (left) and 2017 dataset (right). ....	86
Figure 3.4-14: Mean <i>O. mykiss</i> survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	90
Figure 3.4-15: Mean <i>O. mykiss</i> survival versus concentrations of total lithium (top left), total dissolved solids (top right), and total strontium (bottom left). ....	91
Figure 3.4-16: Mean <i>O. mykiss</i> survival versus PC1 of the combined dataset (left) and PC1 of the 2017 only dataset (right). ....	92
Figure 3.4-17: Mean <i>O. mykiss</i> viability versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	93
Figure 3.4-18: Mean <i>O. mykiss</i> viability versus concentrations of total lithium (top left), total strontium (top right), and total dissolved solids (bottom left). ....	94
Figure 3.4-19: Mean <i>O. mykiss</i> viability versus PC1 for the combined dataset (left) and 2017 dataset (right). ....	95
Figure 3.4-20: Mean <i>P. promelas</i> survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	97
Figure 3.4-21: Mean <i>P. promelas</i> survival versus concentrations of total dissolved solids. ....	98
Figure 3.4-22: Mean <i>P. promelas</i> biomass versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right). ....	99
Figure 3.4-23: Mean <i>P. promelas</i> biomass versus PC4 for the combined dataset. ....	100
Figure 3.5-1: Mean results for <i>C. dubia</i> survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel). ....	101
Figure 3.5-2: Mean results for <i>C. dubia</i> survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel). ....	102
Figure 3.5-3: Mean results for <i>C. dubia</i> reproduction in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5 <sup>th</sup> to 97.5 <sup>th</sup> percentile) are shown as bars (right panel). ....	102

Figure 3.5-4: Mean results for *C. dubia* reproduction in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 103

Figure 3.5-5: Mean results for *P. subcapitata* cell yield in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 103

Figure 3.5-6: Mean results for *P. subcapitata* cell yield in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 104

Figure 3.5-7: Mean results for *H. azteca* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 104

Figure 3.5-8: Mean results for *H. azteca* dry weight in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 105

Figure 3.5-9: Mean results for *O. mykiss* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 105

Figure 3.5-10: Mean results for *O. mykiss* survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 106

Figure 3.5-11: Mean results for *O. mykiss* viability in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 106

Figure 3.5-12: Mean results for *O. mykiss* viability in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 107

Figure 3.5-13: Mean results for *O. mykiss* length in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 107

Figure 3.5-14: Mean results for *O. mykiss* length in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 108

Figure 3.5-15: Mean results for *O. mykiss* weight in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 108

Figure 3.5-16: Mean results for *O. mykiss* weight in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 109

Figure 3.5-17: Mean results for *P. promelas* hatch in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 109

Figure 3.5-18: Mean results for *P. promelas* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 110

Figure 3.5-19: Mean results for *P. promelas* biomass in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 110

Figure 3.5-20: Mean results for *P. promelas* length in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel)..... 111

Figure 3.5-21: Mean results for *P. promelas* development in the Fording River reference and its paired test site waters between..... 111

Figure 3.5-22: Summary of test results by category at FR\_FRCP1..... 112

Figure 3.5-23: Summary of test results by category at GH\_FR1. .... 113

Figure 3.5-24: Summary of test results by category at GH\_ERC..... 114

Figure 3.5-25: Summary of test results by category at EV\_HC1..... 115

Figure 3.5-26: Summary of test results by category at CM\_MC2. .... 116

Figure 3.5-27: Summary of test results by category at EV\_MC2. .... 117

Figure 3.5-28: Summary of test results by category at LC\_LCDSSLCC..... 118

Figure 4.1-1: Summary of 2017 test results by species. .... 121

## APPENDICES

### APPENDIX A

Summary of Legal Requirements for Chronic Toxicity Testing

### APPENDIX B

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

Appendix B-1 First Quarter 2017 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca* and *Pimephales promelas*

Appendix B-2 Second Quarter 2017 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca*, *Pimephales promelas* and *Oncorhynchus mykiss*

Appendix B-3 Third Quarter 2017 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca* and *Pimephales promelas*

Appendix B-4 Fourth Quarter 2017 Results: Toxicity testing on Elk Valley samples with *Ceriodaphnia dubia*, *Pseudokirchneriella subcapitata*, *Hyalella azteca* and *Pimephales promelas*

Appendix B-5 Summary of 2017 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 2017 for Teck's coal mining operations in the Elk Valley. This study represents the third full year of chronic toxicity testing and interpretation to satisfy legal requirements under permits and associated regulatory approvals.

### 1.1 Context and Background

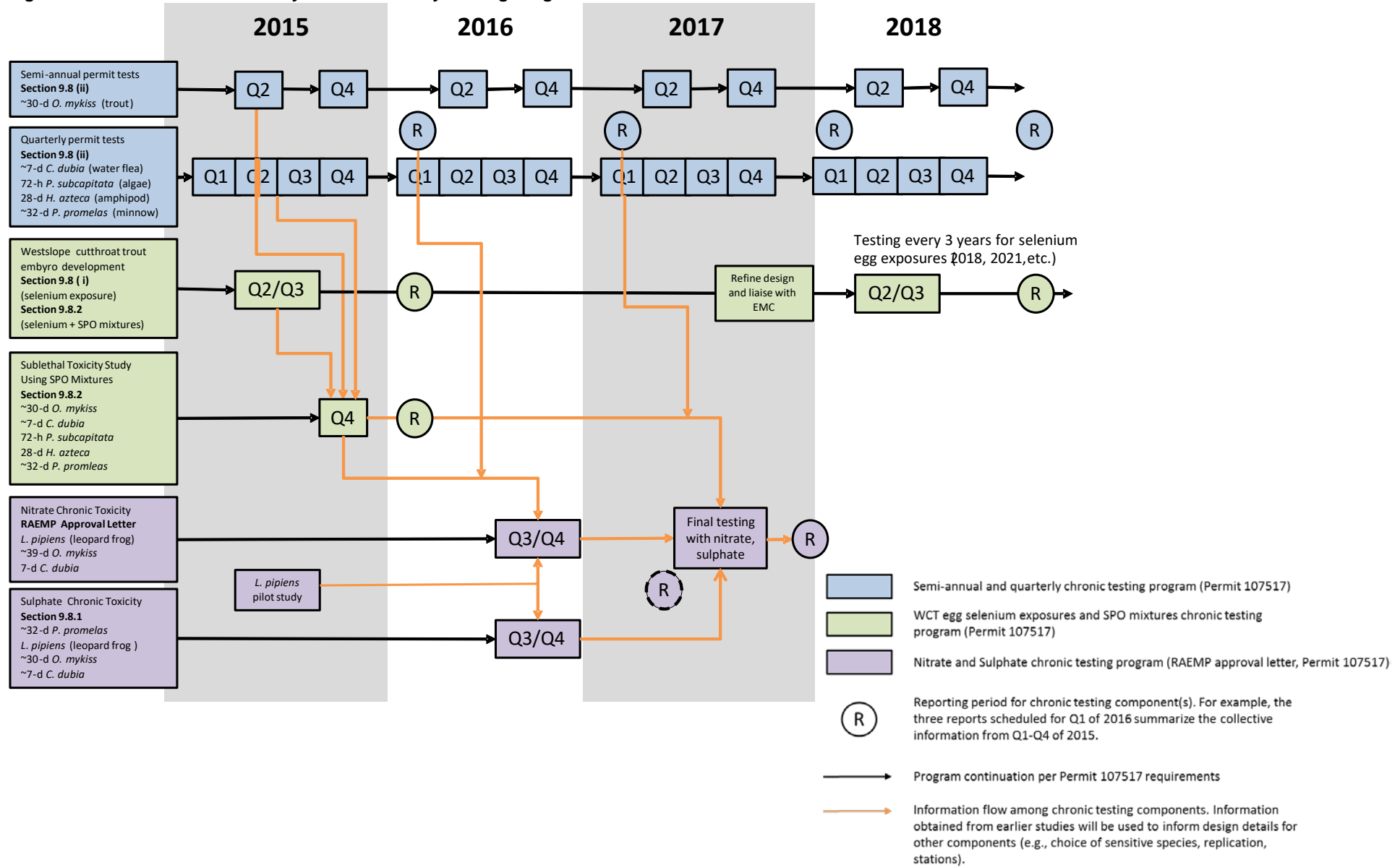
Requirements for chronic toxicity testing associated with Teck's coal mining operations in the Elk Valley are specified in Section 9.8 of Permit 107517 issued under the *Environmental Management Act* (the Permit) and a 14 November 2014 letter from the British Columbia Ministry of Environment (MoE, now Ministry of Environment and Climate Change [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 program, depicted in blue shading in Figure 1.1-1, 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 stations. This subprogram addresses requirements in Section 9.8(ii) of the Permit.
- **Westslope Cutthroat Trout Gamete Study and Sublethal Toxicity Study Using Site Performance Objectives Mixtures.** This supporting study, depicted in green shading in Figure 1.1-1, included chronic toxicity tests required in sections 9.8(i) and 9.8.2 of the Permit. This program was implemented in previous years, including cutthroat trout studies in Summer of 2015 and Site Performance Objectives (SPO) mixtures in Fall 2016; future cycles of gamete toxicity testing with cutthroat trout are expected to be removed from future testing based on discussions with the Environmental Monitoring Committee (EMC).
- **Nitrate and Sulphate Toxicity Studies.** This supporting study, depicted in purple shading in Figure 1.1-1, addressed requirements for additional chronic testing of nitrate and sulphate at high hardness levels. This supporting study, as it applies to fish and invertebrate testing, has now been completed, with amphibian testing scheduled for Spring of 2018. Requirements for additional nitrate testing are specified in the RAEMP approval letter and requirements for additional sulphate testing are specified in Section 9.8.1 of the Permit.



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 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. Teck has authored this section of the present report to provide a consistent approach to describing linkages between Adaptive Management and related programs and reports.

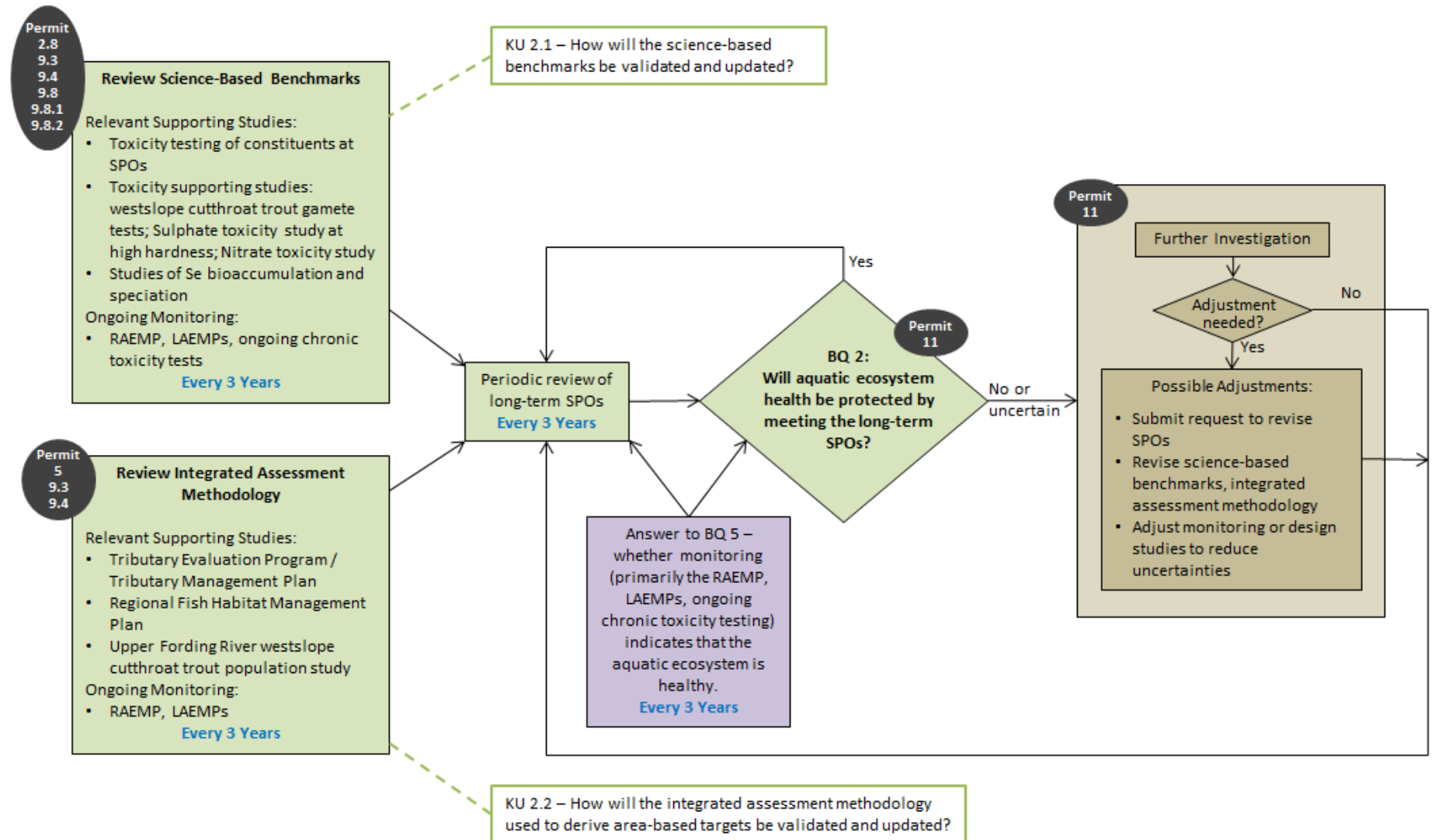
Following an adaptive management framework, the AMP identifies six Management Questions that will be re-evaluated at regular intervals as part of AMP updates throughout the duration of EVWQP implementation. For each Management Question, the AMP describes how the Management Question will be periodically re-evaluated, and how key uncertainties under the Management Question will be reduced. The response framework for toxicity testing outcomes (i.e., “triggers”) is currently under development, including liaison with EMC.

The AMP was submitted to the EMC and ENV Director on 31 July 2016, as required. Study designs for many programs were established before the document was submitted. Teck is working to embed elements of the AMP within each program through reviews of monitoring programs at the study design and annual report stages. Gaps identified in review of 2017 annual reports will inform study design updates as required.

The chronic toxicity testing program will support Management Question 2 (“*Will aquatic ecosystem health be protected by meeting the long-term SPOs?*”) and Management Question 5 (“*Does monitoring for mine-related effects indicate that the aquatic ecosystem is healthy?*”). These questions will be re-evaluated through periodic review to assess whether there is new information indicating that adjustments may be warranted.

Figure 1.2-1 shows inputs and information flow for Management Question 2 and adjustments that work under Management Question 2 would inform. There are two main inputs to the periodic review of long-term SPOs: i) information from supporting studies and ongoing monitoring of science-based environment benchmarks (e.g., chronic toxicity testing); and ii) information from supporting studies and ongoing monitoring related to the integrated assessment methodology (e.g., tributary evaluation program). Review of the long-term SPOs will occur every three years as part of the 3-year AMP update, unless the results of evaluations that support this Management Question (e.g., toxicity testing of constituents at SPOs) indicate that an earlier review is needed. The date of the next 3-year AMP update will be specified in the updated AMP that is planned for submission in December 2018. This chronic toxicity interpretive report supports the re-evaluation of Management Question 2 by providing ongoing information and reducing uncertainty related to the relationships between water chemistry and toxicity, and will therefore be directly relevant to ongoing evaluation of the science-based benchmarks under a range of conditions. The information from this report will be reviewed to inform key uncertainty 2.1 (“*How will science based benchmarks be validated and updated?*”).

Figure 1.2-1: Overview of Elk Valley Chronic Toxicity Testing Program Linkages to Management Question 2



Note: Figure is from Teck 2016a (Figure 9).

Figure 1.2-2 shows inputs and information flow for Management Question 5 and adjustments under Management Question 5 would inform. Routine monitoring under the RAEMP is the main source of information for answering Management Question 5, but other monitoring programs (e.g., chronic toxicity testing) and supporting studies also provide important information. This chronic toxicity interpretive report provides one line of evidence in support of the re-evaluation of Management Question 5 by providing ongoing information on spatial and temporal patterns of chronic toxicity observed in tests conducted with mine-influenced water, and will therefore be directly relevant to ongoing evaluation of the health of the aquatic ecosystem.

### 1.3 Objectives

The purpose of this interpretive report is to present results from 2017 chronic testing, interpret test results by evaluating correspondence between water chemistry and toxicological responses, and identify recommendations for revision or augmentation of planned future programs. This report is submitted to meet the chronic toxicity related reporting requirements of Permit 107517 Section 10.3 (amended 13 October 2017).

### 1.4 Incorporating Feedback from the Environmental Monitoring Committee

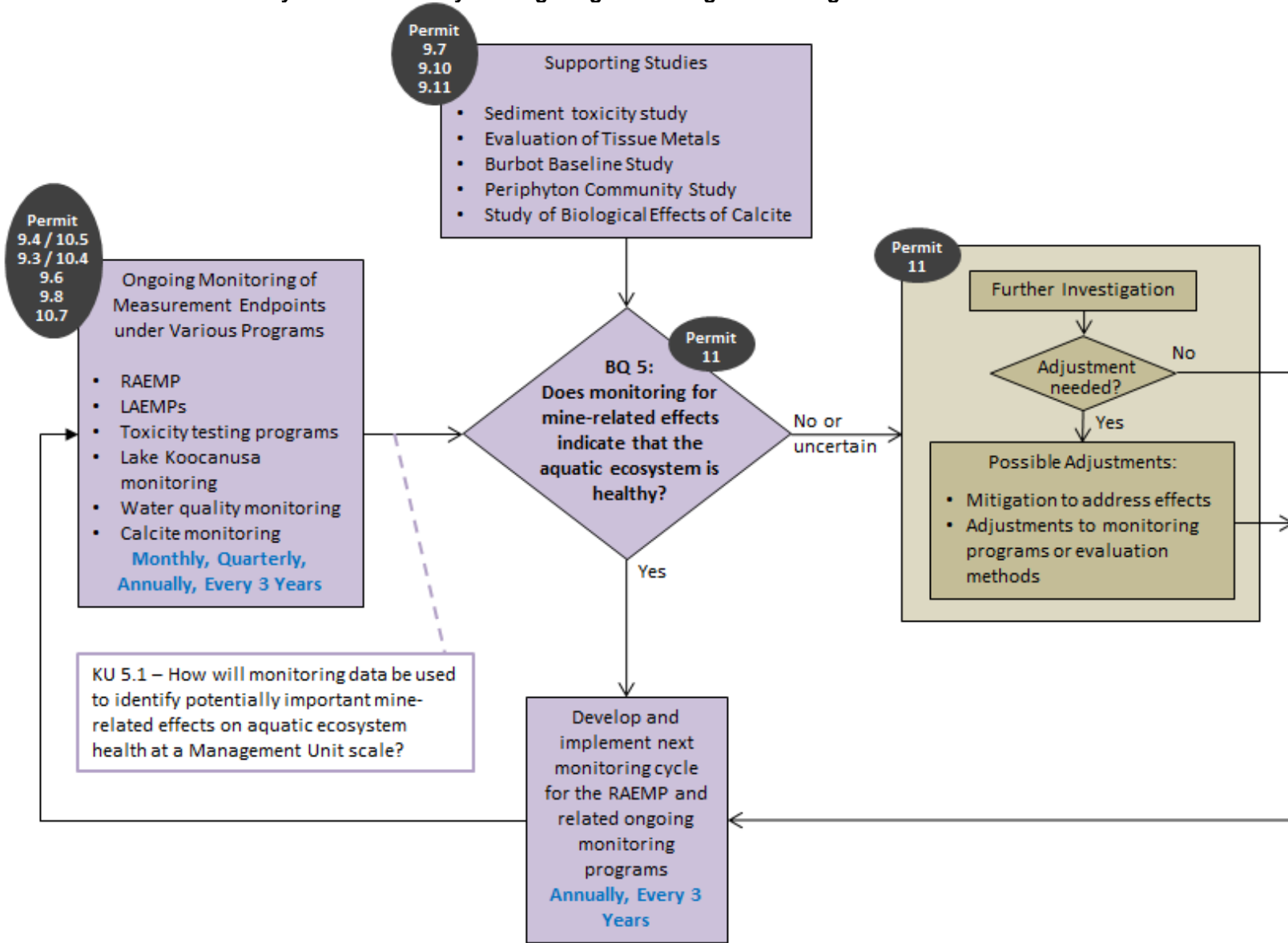
Feedback was provided by EMC members on the 2016 chronic toxicity interpretive report via written feedback and subsequent discussions during the 23 October 2017 meeting and 5 February 2018 and 5 March 2018 conference calls. Key changes made in response to feedback were:

- Control-normalize endpoints to reduce variation in test responses related to variable test organism performance among test batches (Section 2.3.2)
- Develop local and regional normal ranges (NRs) for reference waters (Section 2.3.2)
- Match test sites with reference locations for comparison to local NRs, in consideration of geographical matching and sample size (Section 2.3.2)
- Use the sum of toxic units ( $\sum TU$ ) as a metric characterizing potential mixture effects for correlation with response variables (Section 2.3.4)
- Tabulate negative laboratory control results (Section 3.3)
- Present results by test endpoint and by test site (Section 3.3)
- Screen water chemistry results for weekly refresh samples against British Columbia (BC) water quality guidelines, rather than solely relying on the mean concentration from multi-week tests. Coefficient of variation was also calculated for multi-week tests (Appendix C).

### 1.5 Report Organization

The remaining sections of this report present the methods (Section 2.0), results (Section 3.0), summary of findings (Section 4.0), uncertainty assessment (Section 5.0), and recommendations (Section 6.0) for the 2017 quarterly and semi-annual chronic toxicity testing program. A summary of the acute toxicity testing conducted in 2017 is presented in Appendix B.

Figure 1.2-2: Overview of Elk Valley Chronic Toxicity Testing Program Linkages to Management Question 5



Note: Figure is from Teck 2016a (Figure 18).

## 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, BC 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 initial and refresh samples were collected. Water collection dates and maps of reference and test sites are provided in Appendix B.

**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 <sup>(a)</sup>	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
		GH_FR1	200378	Upper Fording River downstream of Josephine Falls [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
		EV_MC2	E300091	Michel Creek at Highway 3 Bridge
Harmer Creek		EV_HC1	E102682	Harmer Spillway at Elk Valley Operations
Line Creek		LC_LCDSSLCC	E297110	Line Creek downstream of South Line Creek

<sup>(a)</sup> Stations are listed from upstream to downstream for each watercourse.

### 2.2 Laboratory

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 <sup>(a)</sup>	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 <sup>(b)</sup>	Survival, hatch, length, biomass, normal development	US EPA (1996) and ASTM (2013)	4	Quarterly

<sup>(a)</sup> 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).

<sup>(b)</sup> 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 2017 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 all test sites (i.e., non-reference) stations listed in Table 2.1-1. The Fording River reference location (FR\_UFR1), Elk River reference location (GH\_ER2), and Michel Creek reference location (CM\_MC1) were incorporated by Teck to provide information on responses in Elk Valley waters for samples upstream of the zone of mine influence. The Fording River reference site (FR\_UFR1) was tested in all four quarters (Q1–Q4), whereas the Elk River reference site (GH\_ER2) and Michel Creek reference sites were 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. These two tests were performed in all four quarters using water collected from the Fording River reference (FR\_UFR1) and three test sites (CM\_MC2, FR\_FRCP1, GH\_FR1). Additional reference water testing was added to the program by Teck in 2017—in Q2, Q3, and Q4, *H. azteca* and *P. promelas* tests were conducted using water collected from the Elk River reference (GH\_ER2), and in Q3 and Q4 the tests were also conducted using water collected from the Michel Creek reference (CM\_MC1). Laboratory control water tests were also conducted for each species and test date, as specified in Appendix B.

*Pimephales promelas* tests in 2017 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 EMC<sup>1</sup> and subsequent approval by ENV<sup>2</sup>, 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.

Supplemental *O. mykiss* tests were also conducted in copper-amended water in 2017 to evaluate potential effects of microbes on test responses. 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 copper-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 copper-amended results for rainbow trout considered separately for insight into causation. Copper-amended tests were conducted at a subset of sites including two references (Fording, Michel [Q4 only]) and three test sites (FR\_FRCP1, GH\_FR1, CM\_MC2 [Q2 and Q4]), and applied 10 micrograms per litre (µg/L) copper addition. Results of these supplemental tests are not presented in Appendix B but are summarized herein (Section 3.3).

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<sup>1</sup> EMC conference call on 30 November 2016; summary of the conference call is provided in Teck (2016b).

<sup>2</sup> 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 2017** <sup>(a,b,c)</sup>

Watercourse	Reference 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> <sup>(c)</sup>
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
		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	Q2, Q3, Q4	Q2, Q3, Q4	Q2, Q4	Q2, Q3, Q4	Q2, Q3, Q4
	Test Site	GH_ERC	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	—	—
Michel Creek	Reference	CM_MC1	Q2, Q3, Q4	Q2, Q3, Q4	Q4	Q3, Q4	Q3, Q4
	Test Site	CM_MC2	Q1, Q2 <sup>(x2)</sup> , Q3, Q4	Q1, Q2 <sup>(x2)</sup> , Q3, Q4	Q2, Q4	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4
		EV_MC2	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	—	—
Harmer Creek	Test Site	EV_HC1	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	—	—
Line Creek		LC_LCDSSLCC	Q1, Q2, Q3, Q4	Q1, Q2, Q3, Q4	Q2, Q4	—	—
<b>Total number of tests per species</b>			<b>39</b>	<b>39</b>	<b>19</b>	<b>21</b>	<b>21</b>

<sup>(a)</sup> Stations are listed from upstream to downstream for each watercourse.

<sup>(b)</sup> 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. One exception is for Q2 CM\_MC2 tests with *C. dubia* and *P. subcapitata* which were run twice (Appendix B-2). “—” indicates that the test is not required under Permit 107517.

<sup>(c)</sup> *P. promelas* tests were conducted using copper-amended samples (Appendix B).

## 2.3 Data Analysis

### 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 in Test Water

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 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 three sources of variance. The approach used to evaluate toxicity is described in Sections 2.3.3 and 2.3.4.

#### 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-normalized<sup>3</sup> 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 the 5 February 2018 conference call with the EMC. Algal cell yield was excluded from this step because 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

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<sup>3</sup>  $control - normalized\ response = \left( \frac{site\ water\ response}{control\ response} \right) \times 100$

sensitivity were considered qualitatively in the evaluation of test results to assess whether variation in test responses might be confounded by variation in test organism sensitivity among test batches.

### 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 for this site).
- **Regional NR**—The regional NR was inclusive of findings from multiple batches and multiple reference locations.

NRs were developed using the 2015 to 2017 quarterly results from Elk River and Fording River reference sites and the 2017 quarterly results from the Michel Creek reference site. Per discussions with the EMC at the February 2018 meeting, NRs were defined as the 2.5<sup>th</sup> to 97.5<sup>th</sup> 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 Michel Creek reference tests for *C. dubia*) or the variance in reference test results was low (e.g., control-normalized survival for *C. dubia* was 100% in 19 of 24 reference tests). Although normality was not met in all datasets, NRs were still considered to be useful for informing the typical range of responses observed in reference waters. Responses in reference waters tested in 2015, 2016, and 2017 were also plotted for visual assessment.

Because of the small number of Michel Creek reference tests for all species ( $n = 1$  to 3) and Elk River reference tests for *H. azteca* and *P. promelas* ( $n = 3$ ), local NRs in these cases were considered preliminary and were not used in the evaluation of test results.

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.

### 2.3.3 Evaluation of Test Results (Response Assessment)

The response assessment included 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 significantly ( $p < 0.05$ ) lower than the mean response in associated Fording River, Elk River, and Michel 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.

Methods used in the response assessment are summarized in Figure 2.3-1. 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 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 elevated 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

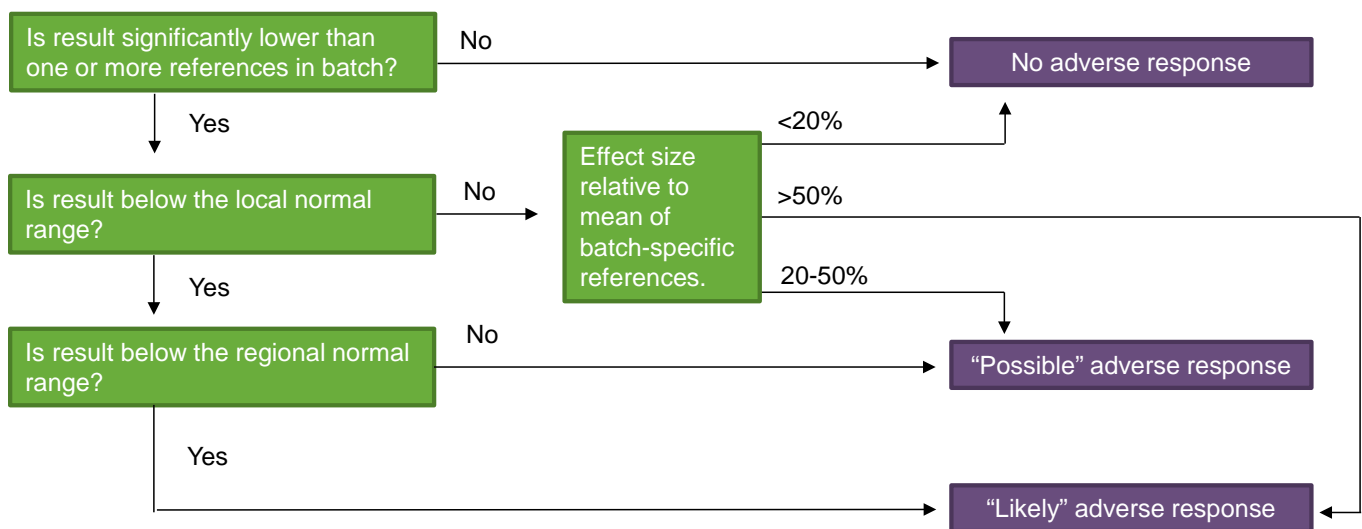
Any endpoint categorized as a possible or likely adverse response in one or more tests was carried forward to the concentration response analysis to evaluate causation (Section 2.3.4). If an endpoint was carried forward, then all available tests for that endpoint were included in the analysis (i.e.,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

The incorporation of effect size in the above categorization represents a refinement to the analysis conducted in previous years. 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 that might be of greater ecological consequence, 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.**

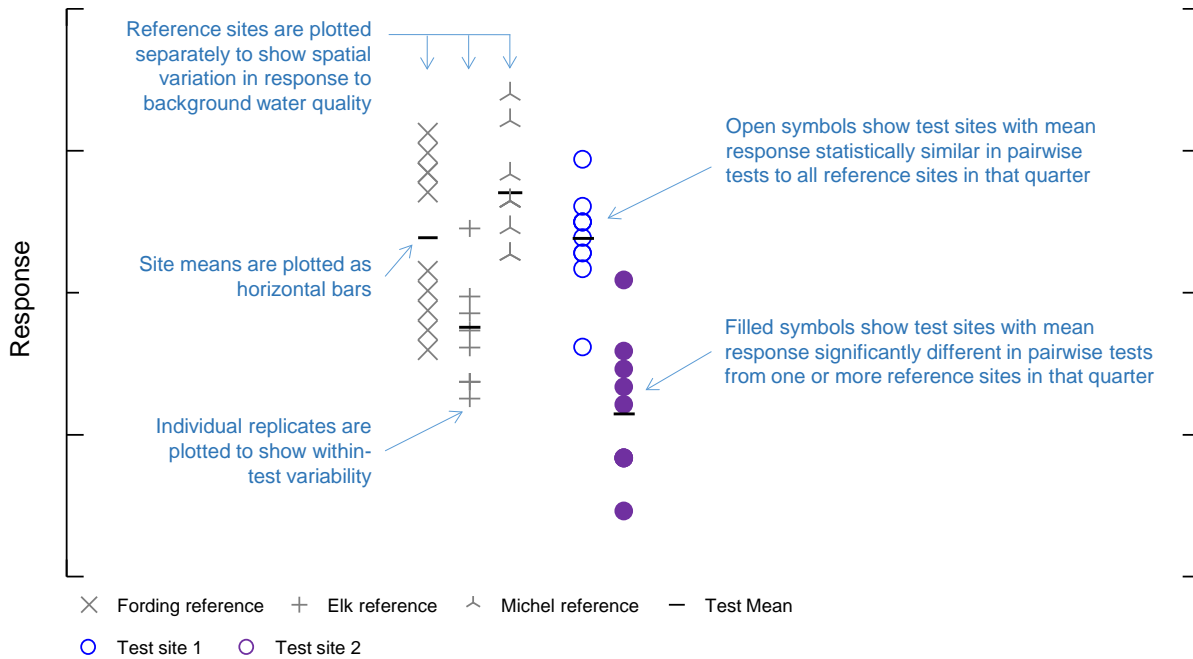
Test Site	Reference	Rationale
FR_FRCP1	Fording River (FR_UR1)	Reference is located on the same watercourse.
GH_FR1		
LC_LCDSSLCC		Line Creek is tributary to Fording River.
GH_ERC	Elk River (GH_ER2)	Reference is located on the same watercourse.
EV_HC1		Harmer Creek (via Grave Creek) is a tributary to Elk River.
EV_MC2	Elk River (GH_ER2) for <i>C. dubia</i> , <i>P. subcapitata</i> , and <i>O. mykiss</i> ; Fording River (FR_UR1) for <i>H. azteca</i> and <i>P. promelas</i> .	Insufficient Michel Creek reference tests (all species) and Elk River reference tests ( <i>H. azteca</i> and <i>P. promelas</i> ) to develop reliable normal range.
CM_MC2		

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

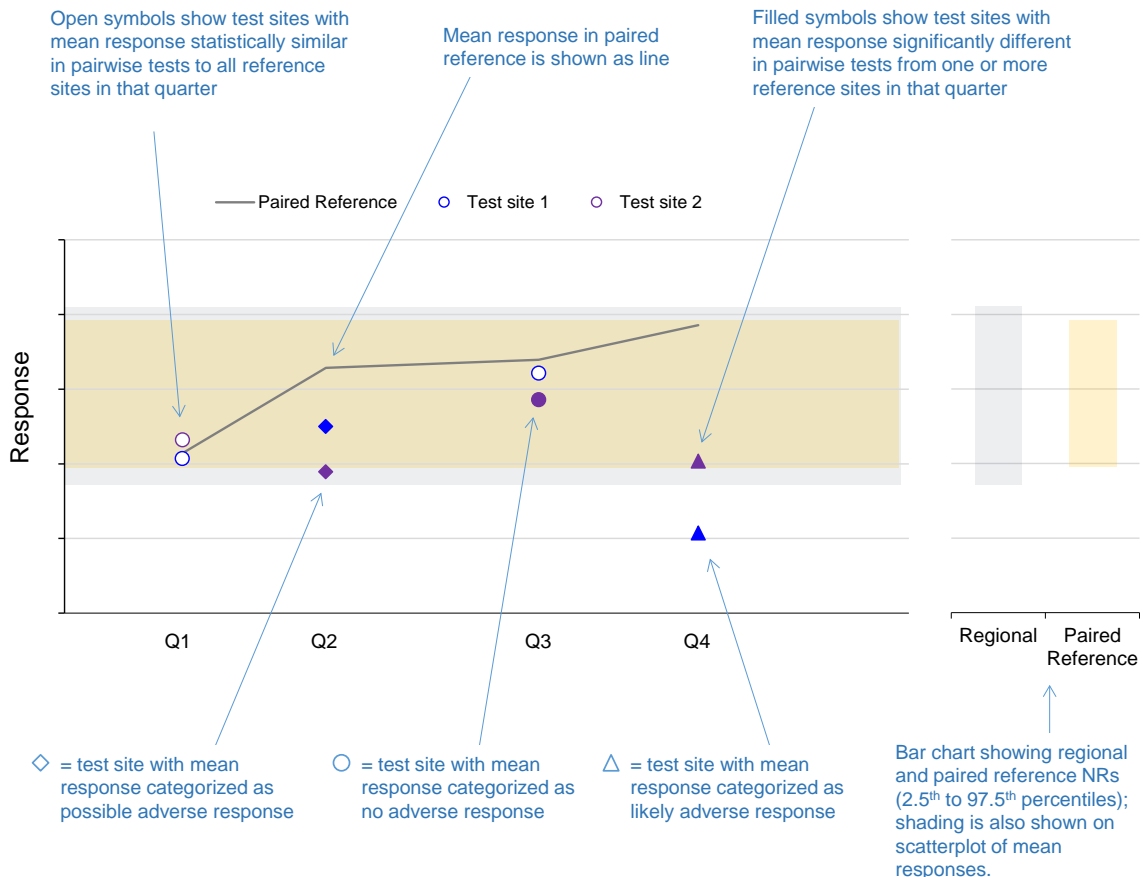


Individual replicate and mean results were plotted for all endpoints. Local and regional NRs developed using the approach described in the previous section were shown on plots with mean results to illustrate the normal range of test organism responses observed in reference waters tested in 2015, 2016, and 2017. Test sites were paired with a single reference for comparison to the local NR as indicated in Table 2.3-1. Therefore, two plots were made for each endpoint: one for the Fording River reference and its paired test sites and one for the Elk River reference and its paired test sites. Regional NRs were shown on both plots. 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.

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



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



### 2.3.4 Concentration-Response Analysis

A concentration-response analysis was conducted to examine potential causes of adverse responses observed in 2017 quarterly and semi-annual tests. Methods used in the concentration-response analysis are summarized in Figure 2.3-4. Additional details are provided below.

The analysis was conducted for all endpoints for which one or more “possible” or “likely” adverse responses were identified. 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, and 2017 quarterly and semi-annual test results for reference locations and test sites.

To conduct the correlation analysis, effects data were paired with matching water chemistry data. The selection of matched (concurrent and co-located<sup>4</sup>) chemistry data depended on the duration of the test, as some tests entailed multiple measurements of chemical parameters. *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. Coefficient of variations (CV) were calculated for the mean concentrations and reviewed to assess whether there was high variability in weekly concentrations. If a concentration was below the reported detection limit, the full detection limit was used. The CV is a measure of relative variability, calculated as the ratio of the standard deviation to the arithmetic mean.

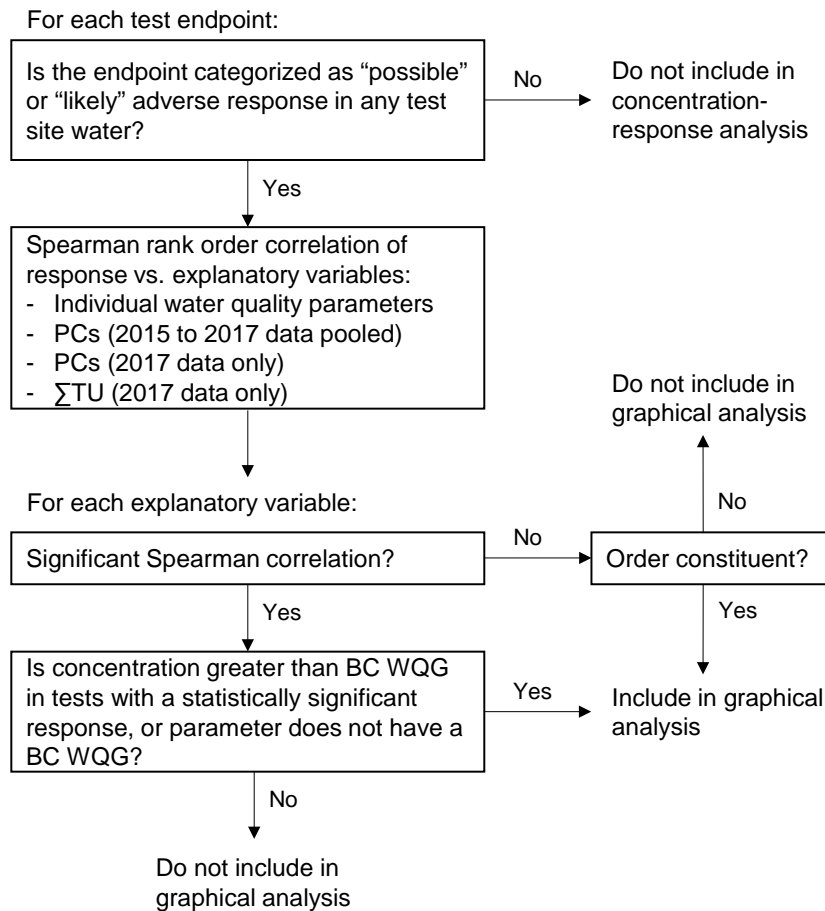
The examination of potential causes of responses in the quarterly and semi-annual tests followed three steps:

- 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

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<sup>4</sup> There were two exceptions: 1) In Q2 at GH\_ER2, toxicity testing for *C. dubia*, *P. subcapitata*, *H. azteca*, and *P. promelas* was conducted with water collected on 24 April 2017. Field parameters, total suspended solids, and turbidity were measured on 24 April 2017. Due to a sampling error, the remaining parameters were measured in a sample collected on 25 April 2017 (i.e., one day after water was collected for toxicity testing). 2) In Q2 at GH\_ER2, GH\_ERC, and GH\_FR1, refresh samples for *O. mykiss* tests were collected on 6 June 2017. Due to a sampling error, water chemistry was not available on this date. A resample, which was collected on 11 June 2017, was used to calculate the mean concentration in these tests (i.e., five days after water was collected for toxicity testing).

**Figure 2.3-4-: Decision framework for inclusion of endpoints and parameters in the concentration-response analysis.**



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 ( $\Sigma$ 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 ( $\Sigma$ TU), in addition to testing individual water quality parameters. 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.<sup>5</sup> Water quality variables were log<sub>10</sub> transformed prior to conducting the PCA. PCA was conducted with the 2017 water quality dataset only and with the pooled 2015 to 2017 water quality datasets. PCAs were conducted with separate datasets (i.e., 2017 only versus pooled 2015 to 2017) to evaluate whether the relationship between test responses and PCs (i.e., indicators of overall mine influence) differed in 2017 relative to the pooled dataset. For example, as water quality differed slightly in 2017 relative to previous years, then the relationship between test responses and PCs may be different for 2017 relative to the pooled dataset. For each PC, component loadings (i.e., the water quality parameters that are strongly correlated with the PC) were reviewed to identify similarities and differences between the two datasets.

- $\Sigma$ 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 µg/L was used in the denominator. 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, dissolved cadmium, and total selenium<sup>6</sup>).  $\Sigma$ TUs were calculated with the 2017 water quality dataset only.

Parameters 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  $\Sigma$ TUs with significant correlations with a test response ( $p < 0.05$ ) were carried forward to the graphical analysis.<sup>7</sup>

For parameters with significant correlations, concentrations in tests categorized as possible or likely were screened against chronic BC WQGs. Parameters with concentrations lower than the chronic BC WQG were not carried forward.<sup>8</sup> If the concentration was greater than a chronic BC WQG or if the parameter did not have a chronic BC WQG, then the parameter was carried forward to the graphical analysis.

Graphical analysis was conducted for all Order constituents (cadmium, selenium, nitrate, sulphate), 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  $\Sigma$ 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 ( $\Sigma$ TUs). For parameters that lack a chronic BC WQG but are commonly assessed as a component of total dissolved solids (TDS) (e.g., calcium), responses were plotted against the concentration of TDS. Concentration-response plots were visually examined to assess the consistency of correspondence between parameter concentrations and test responses.

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<sup>5</sup> 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.

<sup>6</sup> Selenium benchmarks reflect bioaccumulation-based exposures to over long periods. They do not reflect potential for effects in standardized toxicity tests for fish and invertebrates. When  $\Sigma$ TU values were correlated with a test endpoint, the  $\Sigma$ TU value was reviewed to evaluate the relative contribution of the selenium hazard quotient. The  $\Sigma$ TU without the selenium contribution was then compared to references and test sites categorized as no adverse responses.

<sup>7</sup> 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.

<sup>8</sup> 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.

Water chemistry in tests categorized as possible or likely was also inspected to identify parameters that may have contributed to the observed response in that test. If the concentration of a parameter in tests categorized as possible or likely was lower than concentrations measured in tests categorized as no adverse response, then that parameter was considered unlikely to be causing toxicity. If the concentration of a parameter in tests categorized as possible or likely was higher than concentrations measured in tests categorized as no adverse response, then published toxicity data were reviewed to evaluate whether the parameter could be contributing to observed effects.

### 2.3.5 Comparison of 2017 Results to Previous Years

Similarities and differences were summarized between test results in the 2017 program and programs in 2015 and 2016, focusing on the incidence of adverse responses by season and station. The purpose of this comparison was to identify potential seasonal patterns (i.e., were adverse responses observed in the same quarter and test species in 2017 and previous years) and to evaluate broad consistencies in the concentration-response analysis (i.e., were adverse responses attributed to the same constituents in 2017 and previous years). The repeatability of toxicity responses (or lack thereof) in samples tested under similar water quality conditions among years was used in evaluating whether observed responses are likely to reflect test organism sensitivity to toxicants or some other source of variance.

Mean results were plotted for all endpoints. As was done for 2017 results, responses observed in 2015 and 2016 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, and 2017. As was done for the evaluation of 2017 test results (Section 2.3.3), test sites were paired with a single reference for comparison to the local NR. Therefore, two plots were made for each endpoint: one for the Fording River reference and its paired test sites and one for the Elk River reference and its paired test sites. Regional NRs were shown on both plots. An example data plot is shown in Figure 2.3-3 and is annotated to explain how data plots were interpreted in Section 3.5. 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 2017 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.

## 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 parameters remained within ranges specified in the protocol throughout the tests.
- Tests met all control acceptability criteria.
- 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 in Q1 and Q2; 10 µg/L [all sites] and 20 µg/L in Q3 [FR\_FRCP1 and CM\_MC2] and Q4 [FR\_FRCP1, GH\_FR1, and CM\_MC2]) to reduce potential adverse effects caused by fungi and microbes in the samples (Appendix B). The 20 µg/L addition was used in Q3 and Q4 because 10 µg/L was insufficient to curtail microbial effects (Appendix B). Unamended and copper-amended laboratory control results were similar, except in Q3 when the copper-treated laboratory controls had a significant reduction in biomass and length relative to the negative laboratory control (Appendix B).
  - *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.
- Amending site water with copper successfully curtailed fungal growth in *P. promelas* tests, except for the tests discussed below. In these tests, adverse responses occurred primarily between Day 6 and 13 exposure, which is consistent with the pattern of adverse responses that has previously been attributed to fungal or microbial growth.
  - Q1 FR\_FRCP1 test. One replicate had 0% survival (Appendix B-1). Survival in the other three replicates for this sample was  $86.7 \pm 11.5\%$ , which was similar to reference performance. This result suggested that 10 µg/L copper was inadequate and contributed to the decision to increase copper in Q3 and Q4 testing.
  - Q2 GH\_FR1 test. One replicate had 46.7% survival (Appendix B-2). Fungal growth was noted on some of the mortalities in this replicate. Survival in the other three replicates for this sample was  $66.7 \pm 23.1\%$ , which was still below reference performance. Similar to the above result, this result suggested that 10 µg/L copper was inadequate.
  - Q3 and Q4 FR\_FRCP1 and CM\_MC2 tests (Appendix B-3, B-4). In tests amended with 10 µg/L copper, adverse responses were observed on survival (Q3 and Q4) and biomass (Q4 only). In Q4, the reduction in biomass was related to reduced survival, rather than an effect on growth of the surviving fish (Appendix B-4). When tests were repeated with the addition of 20 µg/L copper, there were no significant adverse responses between these test sites amended with 20 µg/L and the reference sites. 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

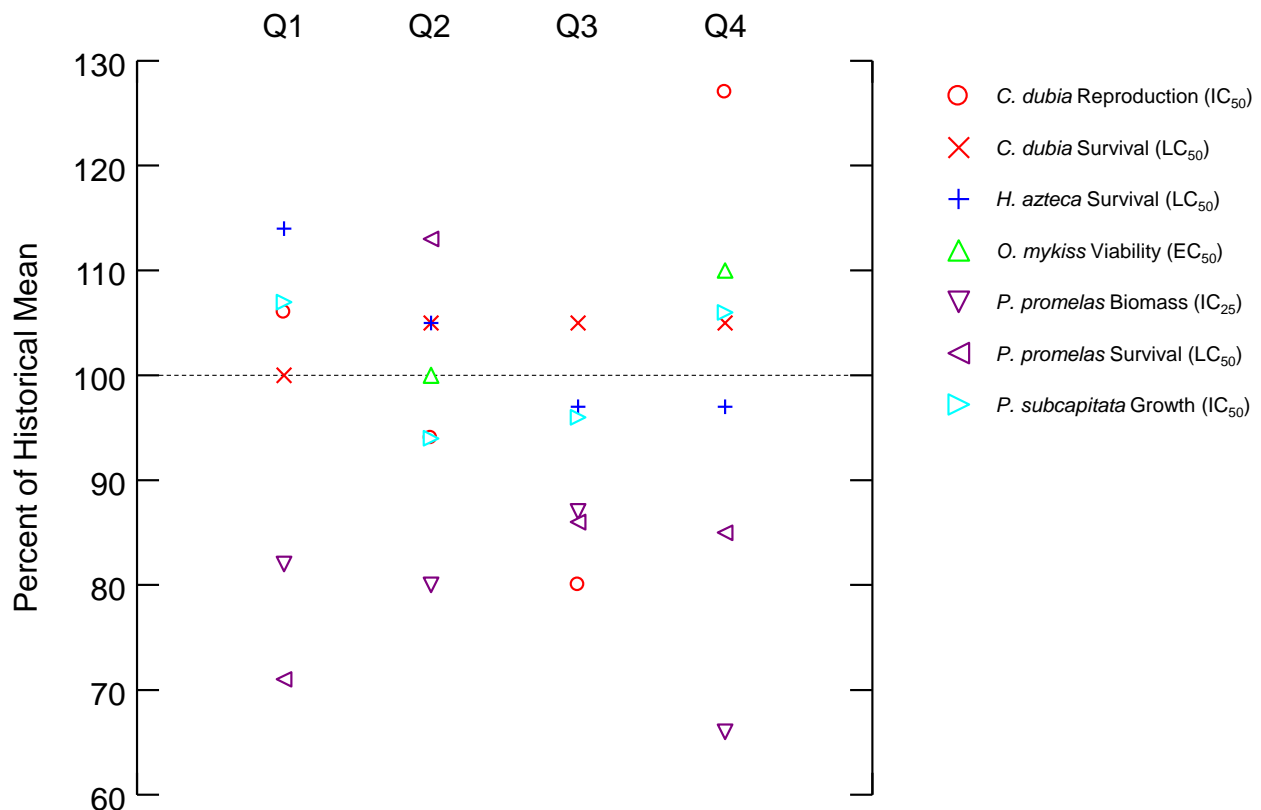
Raw results and control-normalized results (for all endpoints except *P. subcapitata* cell yield) are presented in Section 3.3. Analyses presented herein are based on control-normalized results.

### 3.2.2 Organism Sensitivity

Effect concentrations from 2017 reference toxicant tests are plotted in Figure 3.2-1 as a percentage of the historical mean reference toxicant effect concentration. Reference toxicant results were within two standard deviations of the historical mean (Appendix B).

Most effect concentrations 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 Q4 for *C. dubia* reproduction (127% of the historical mean) and the largest negative deviation was observed in Q4 for *P. promelas* biomass (66% of the historical mean). *P. promelas* endpoints were between 10% and 35% lower than the historical mean, indicating that test organisms in 2017 were consistently more sensitive than historical responses. However, given that reference toxicant results were within two standard deviations of the historical mean, *P. promelas* sensitivity is not expected to be a confounding factor. Overall, test organism sensitivity does not appear to be a confounding factor of variability in the interpretation of toxicity testing results among test batches.

Figure 3.2-1: Reference toxicant data from 2017 laboratory reports (Appendix B).



Note: IC<sub>50</sub> = concentration resulting in 50% inhibition; IC<sub>25</sub> = concentration resulting in 25% inhibition; LC<sub>50</sub> = concentration resulting in 50% lethality; EC<sub>50</sub> = concentration resulting in 50% effect. Dashed line indicates effect concentration is equal to the mean historical effect concentration.

### 3.2.3 Background Conditions (Normal Ranges)

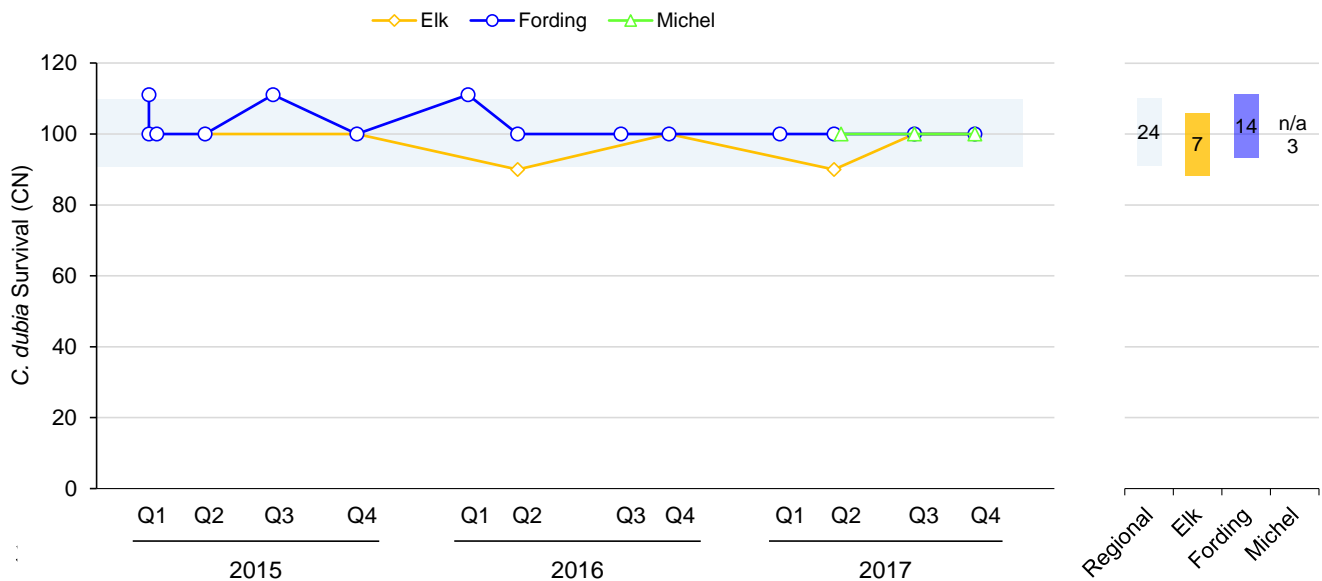
As outlined in Section 2.3.2, local and regional NRs were developed for mean responses in reference waters. Development of NRs was intended to address potential confounding effects of background water quality and its effect on test responses. The following sections present the results of the evaluation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

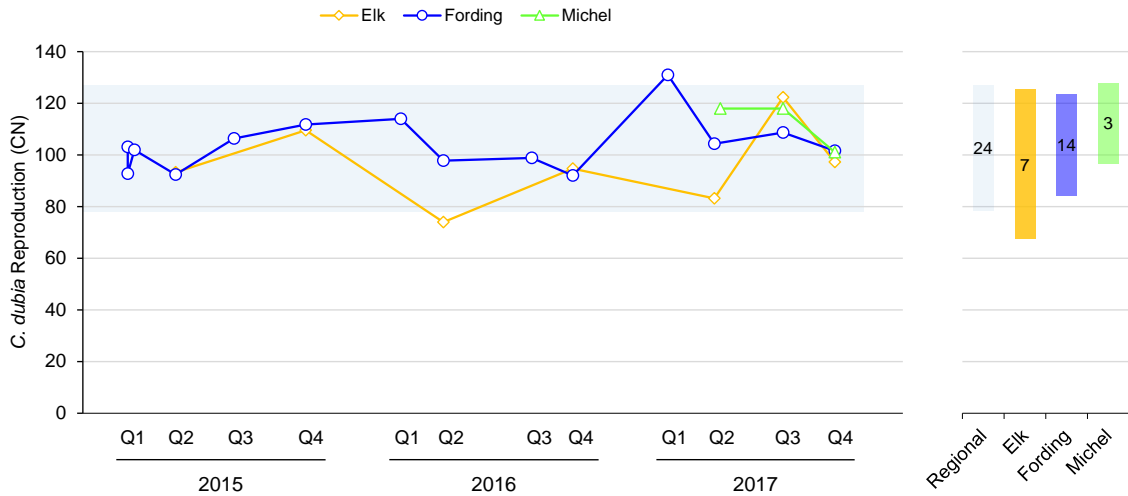
- Mean survival ranged from 90% to 111% in reference tests (Figure 3.2-2). Mean survival was similar across references, which resulted in broad overlap in the regional NR (91 to 110%) and the local NRs for the Elk (88 to 106%) and Fording (93 to 111%). A local NR for Michel Creek could not be calculated because only three values are available and mean survival was 100% in all tests.
- Mean reproduction ranged from 74% to 131% in reference tests (Figure 3.2-3). Mean reproduction was similar across references, except in Q2 2016 and Q2 2017 when reproduction in the Elk River reference was approximately 20% lower than the Fording River reference. Lower reproduction in these quarters contributed to the local NR for the Elk (67 to 125%) extending below the local NR for the Fording (84 to 124%) and the regional NR (78 to 127%). A local NR for Michel Creek is shown on Figure 3.2-3 (97 to 128) 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, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Michel Creek reference envelope could not be calculated because control-normalized survival was 100% in all tests. 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, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**

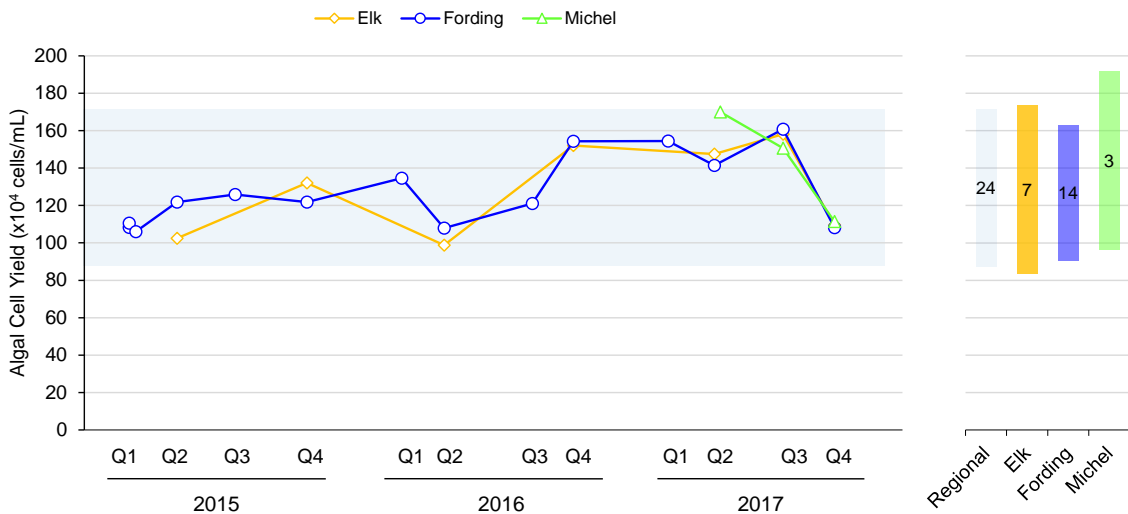


Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

### 3.2.3.2 *Pseudokirchneriella subcapitata*

Mean cell yield extended from 99–170 ×10<sup>4</sup> cells/mL in reference tests (Figure 3.2-4). Mean cell yield was similar across references, except in Q2 2017 when cell yield in the Michel Creek reference was approximately 30% higher than the Elk and Fording references. Higher cell yield in this quarter contributed to the local NR for Michel Creek (96–192 ×10<sup>4</sup> cells/mL) extending above the local NR for the Elk (83–174 ×10<sup>4</sup> cells/mL), the local NR for the Fording (91–163 ×10<sup>4</sup> cells/mL), and the regional NR (88–172 ×10<sup>4</sup> cells/mL). The local NR for Michel Creek 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, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



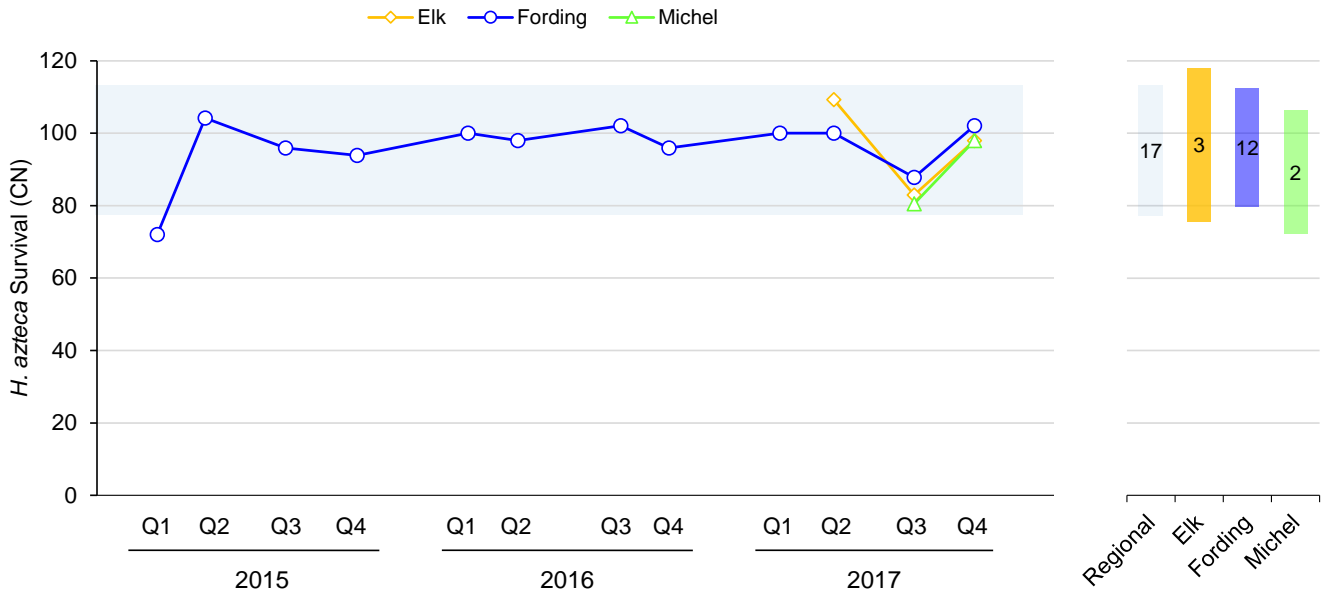
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

### 3.2.3.3 *Hyalella 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:

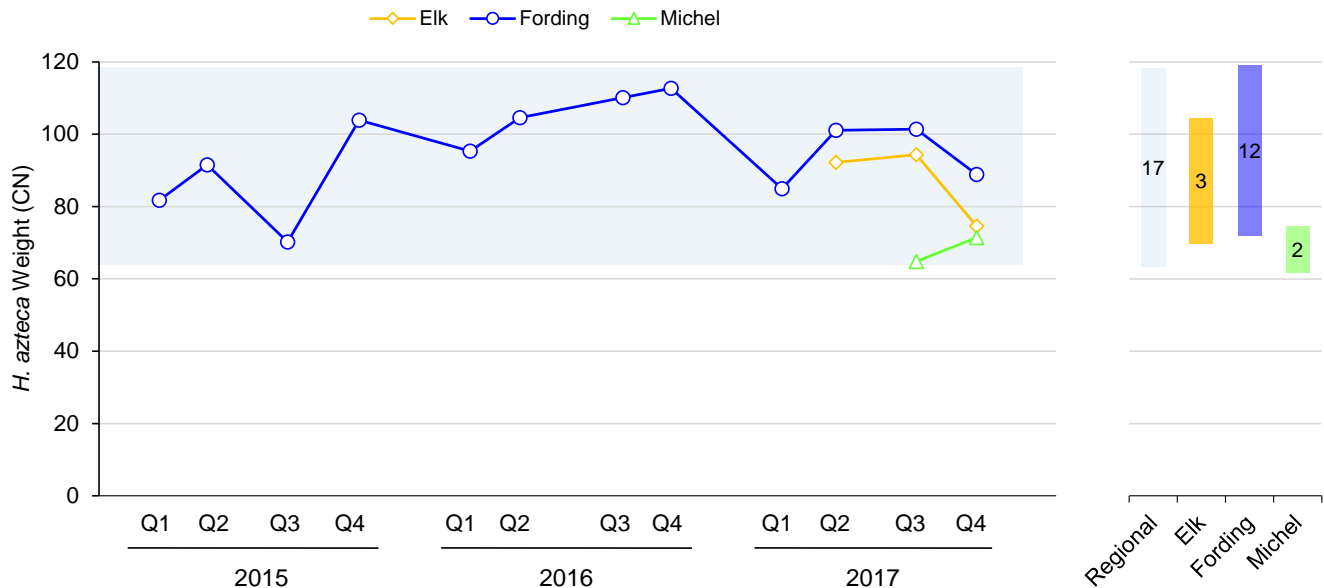
- Mean survival extended from 72% to 109% in reference tests (Figure 3.2-5). Mean survival was similar across references, which resulted in broad overlap in the regional NR (77% to 113%) and the local NRs for the Elk (76% to 118%), Fording (80% to 112%), and Michel (72% to 106%). The local NRs for Michel Creek and the Elk River should be considered preliminary because only two (Michel) or three (Elk) values are available.
- Mean weight extended from 65% to 113% in reference tests (Figure 3.2-6). Mean weight was higher in Fording River tests in comparison to Elk and Michel tests, but this is based on only two (Michel) or three (Elk) values. The regional NR (63 to 118%) and local NR for the Fording (72% to 119%) were similar. In comparison, the local NRs for the Elk (70% to 104%) and Michel (62% to 75%) were lower. The local NRs for Michel Creek and the Elk River should be considered preliminary because only two (Michel) or three (Elk) values are available.

**Figure 3.2-5: Mean results for *H. azteca* survival in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> 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, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> 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 35% to 103% in reference tests (Figure 3.2-7). Although mean survival was variable in reference waters tested in the same quarter, the regional NR (44% to 118%) and local NRs for the Elk (48% to 122%) and Fording (69% to 99%) had broad overlap. A local NR for Michel Creek could not be calculated because only one value was available (35%).

In Q4 2017 when mean survival was lowest for each reference, the laboratory noted that it is likely that adverse responses were related to naturally-occurring microbes (Appendix B-4). When the Fording River and Michel Creek references were tested in Q4 2017 with the addition of copper, mean survival improved but was still lower than the paired laboratory control. Based on these findings, the NRs for *O. mykiss* survival should be considered preliminary and potentially biased low due to microbial effects. The regional and local NRs were still considered useful in the interpretation of results, as microbial effects may have contributed similarly to adverse responses observed in test site waters, but uncertainty (high variance) is introduced through the apparent influence of microbes.

- Mean viability extended from 36% to 106% in reference tests (Figure 3.2-8). Although mean viability was variable in reference waters tested in the same quarter, the regional NR (45% to 119%) and local NRs for the Elk (50% to 123%) and Fording (74% to 97%) had broad overlap. A local NR for Michel Creek could not be calculated because only one value was available (36%).

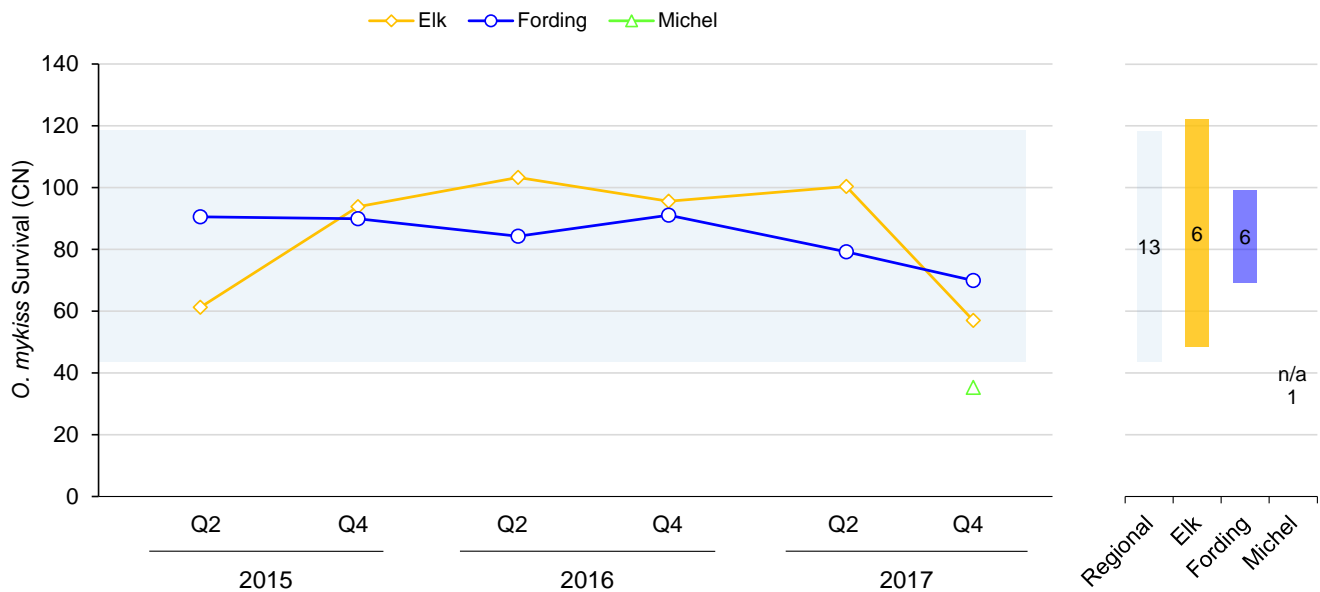
In Q4 2017 when mean viability was lowest for each reference, the laboratory noted that it is likely that adverse responses were related to naturally-occurring microbes (Appendix B-4). When the Fording River



and Michel Creek references were tested in Q4 2017 with the addition of copper, mean survival improved but was still lower than the paired laboratory control. Based on these findings, the NRs for *O. mykiss* viability should be considered preliminary and potentially biased low due to microbial effects. As with the survival endpoint, the regional and local NRs were still considered useful in the interpretation of results, as microbial effects may have contributed similarly to adverse responses observed in test site waters.

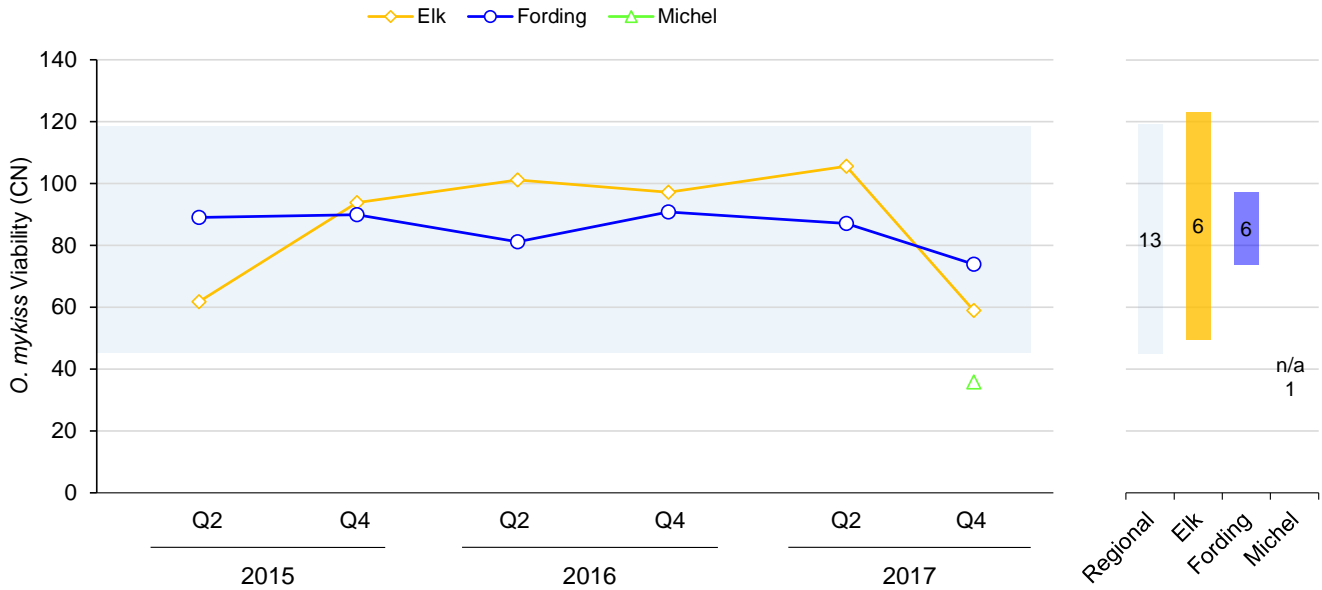
- Mean length extended from 97% to 110% in reference tests (Figure 3.2-9). Mean length was similar across references, which resulted in broad overlap in the regional NR (95% to 108%) and the local NRs for the Elk (96% to 106%) and Fording (94% to 110%). A local NR for Michel Creek could not be calculated because only one value was available (98%).
- Mean weight extended from 98% to 111% in reference tests (Figure 3.2-10). Mean length was similar across references, which resulted in broad overlap in the regional NR (96% to 110%) and the local NRs for the Elk (96% to 110%) and Fording (95% to 111%). A local NR for Michel Creek could not be calculated because only one value was available (103%).

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



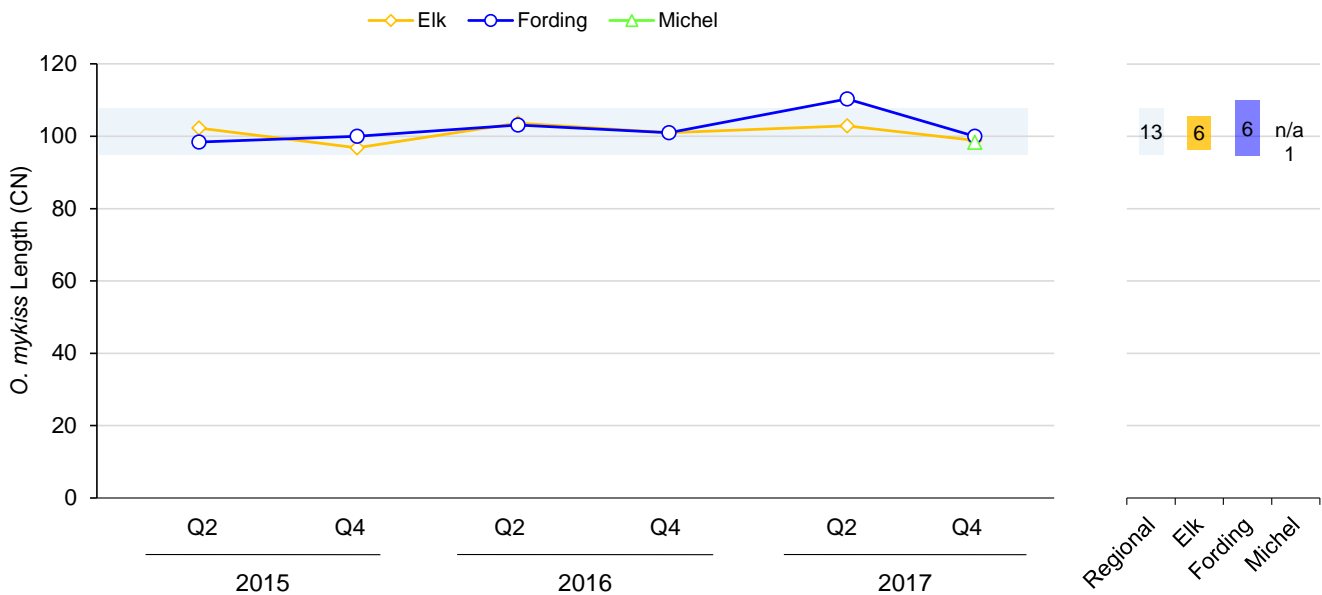
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

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



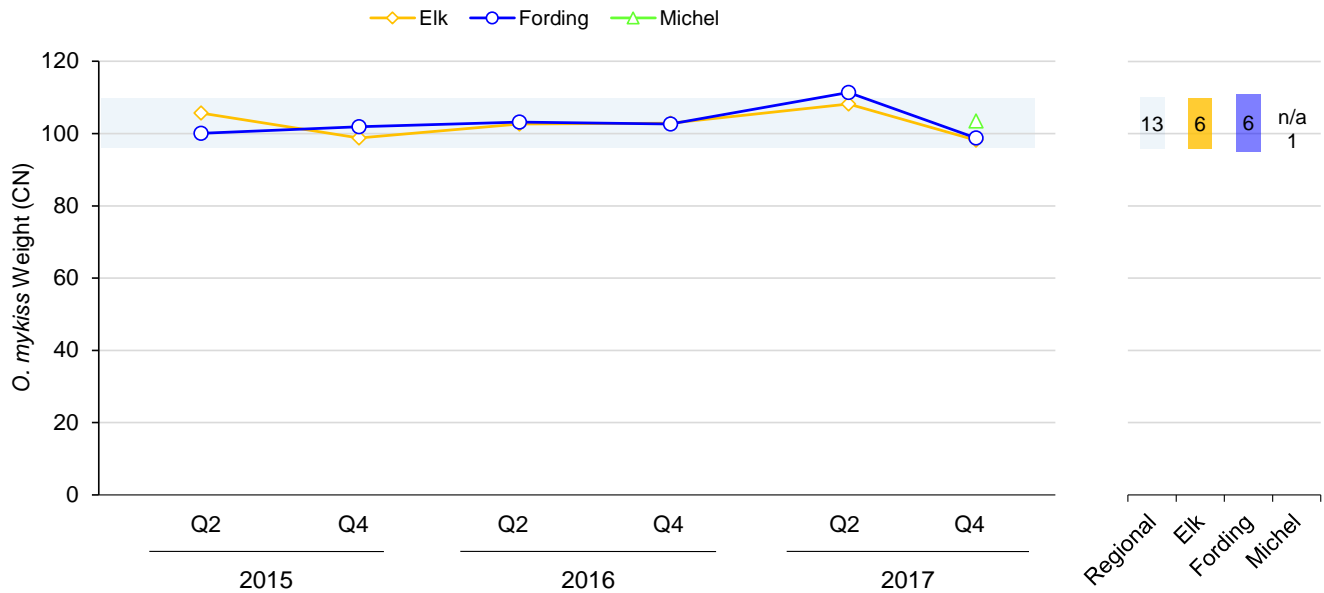
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. Sample size for each normal range is provided on the bar chart.

**Figure 3.2-9: Mean results for *O. mykiss* length in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> 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 3.2-10: Mean results for *O. mykiss* weight in Elk River reference, Fording River reference, and Michel Creek reference tests (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> 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.

### 3.2.3.5 *Pimephales promelas*

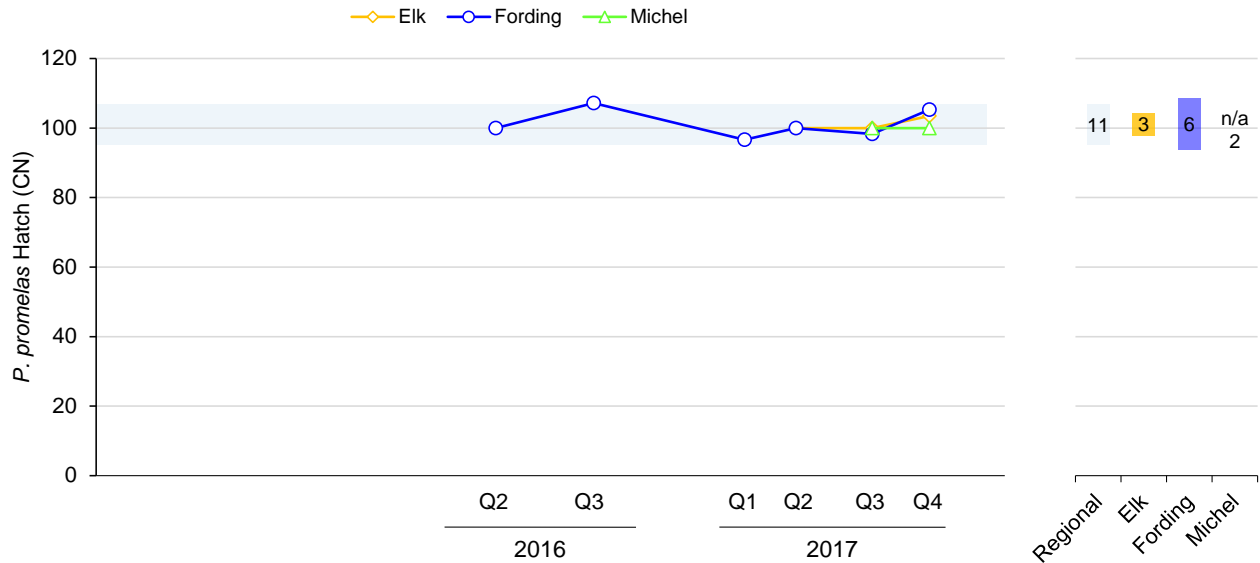
Mean control-normalized responses for *P. promelas* tests in reference waters are plotted in Figure 3.2-11 (hatch), Figure 3.2-12 (survival), Figure 3.2-13 (biomass), Figure 3.2-14 (length), and Figure 3.2-15 (normal development). These figures show results of copper-amended tests only. Local NRs for *P. promelas* endpoints should be considered preliminary because of the limited values for the Fording ( $n = 6$ ), Elk ( $n = 3$ ), and Michel ( $n = 2$ ).

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 (95 to 107%) and the local NRs for the Elk (98% to 104%) and Fording (94% to 109%). A local NR for Michel Creek could not be calculated because only two values are available and mean hatch was 100% in all tests.
- Mean survival extended from 78 to 104% in reference tests (Figure 3.2-12). Mean survival was similar in Fording River reference tests. In Q3 2017 and Q4 2017, mean survival was lower in the Elk (Q3 only) and Michel (Q3 and Q4) tests. Lower reproduction in Michel Creek tests contributed to the local NR for Michel (72% to 98%) extending below the regional NR (81% to 109%), the Elk NR (80% to 105%), and the Fording NR (94% to 104%).
- Mean biomass extended from 85% to 130% in reference tests (Figure 3.2-13). Mean biomass was similar across references, which resulted in broad overlap in the regional NR (75 to 137%) and the local NRs for the Elk (70% to 143%), Fording (78% to 130%), and Michel (73% to 146%).
- Mean length extended from 82 to 107% in reference tests (Figure 3.2-14). Mean length was similar across references, which resulted in broad overlap in the regional NR (79% to 109%) and the local NRs for the Elk (80% to 104%), Fording (82% to 111%), and Michel (74% to 105%).

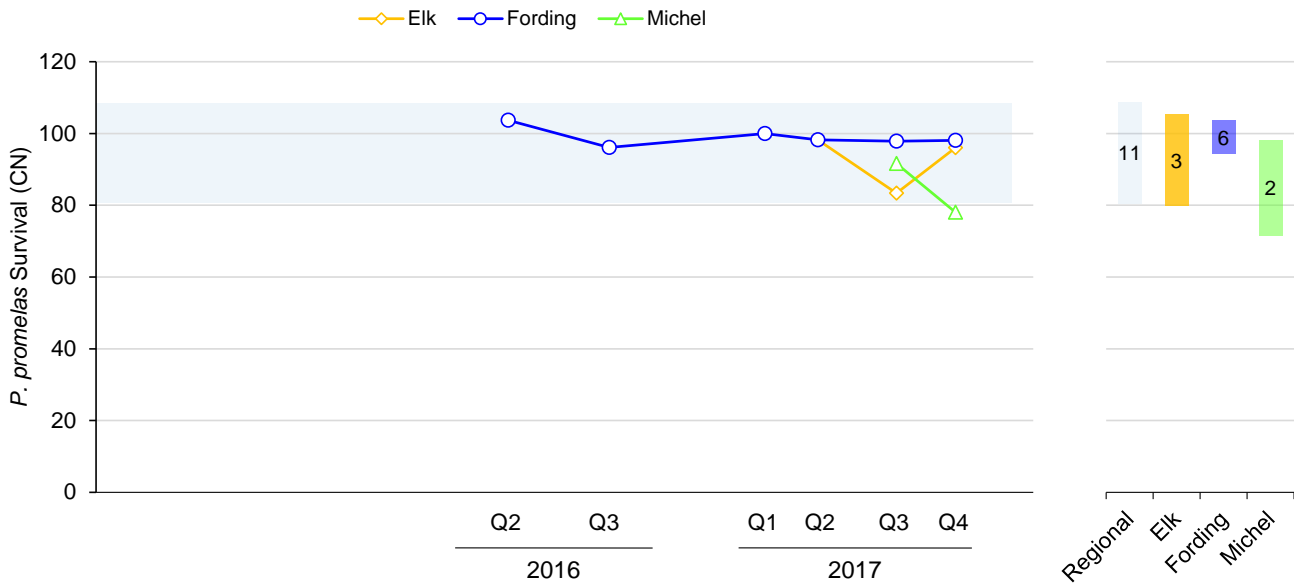
- Mean normal development was 100% in all reference water tests (Figure 3.2-15), except for one Elk River test and one Fording River test that had a mean response of 98%. Given the limited variance in normal development, NRs were not developed for this endpoint.

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



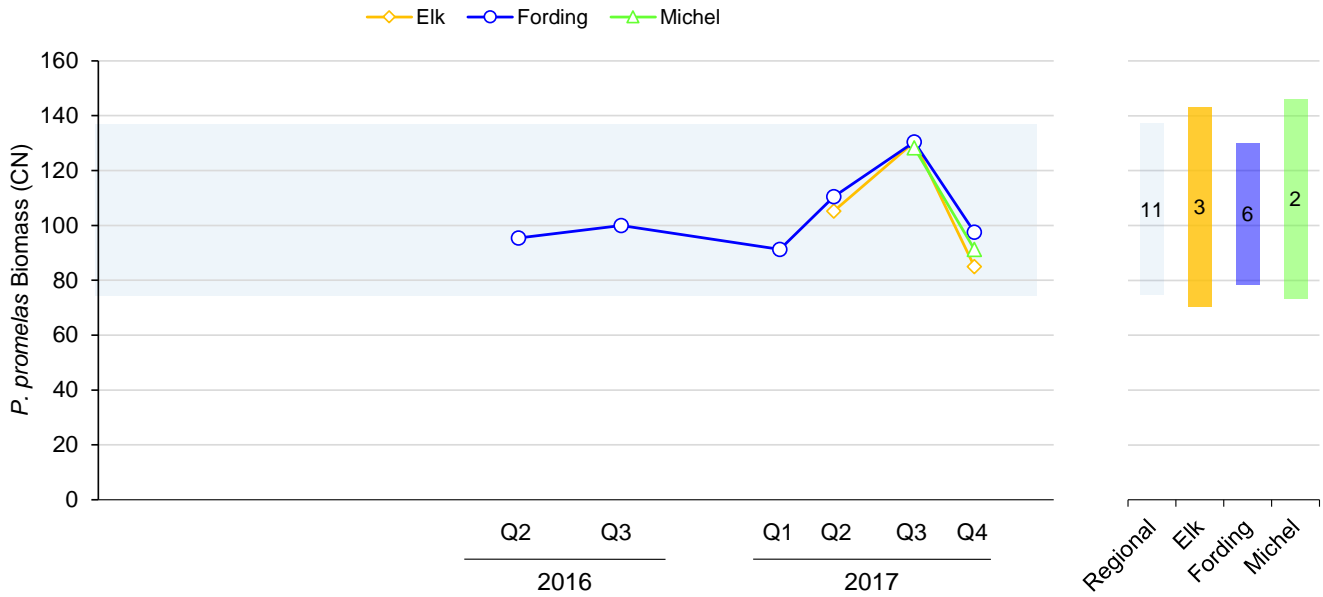
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2016 Fording River test was not included in the reference envelope calculations because dissolved oxygen concentrations fell below typical levels for this test (Golder 2017). Sample size for each normal range is provided on the bar chart.

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



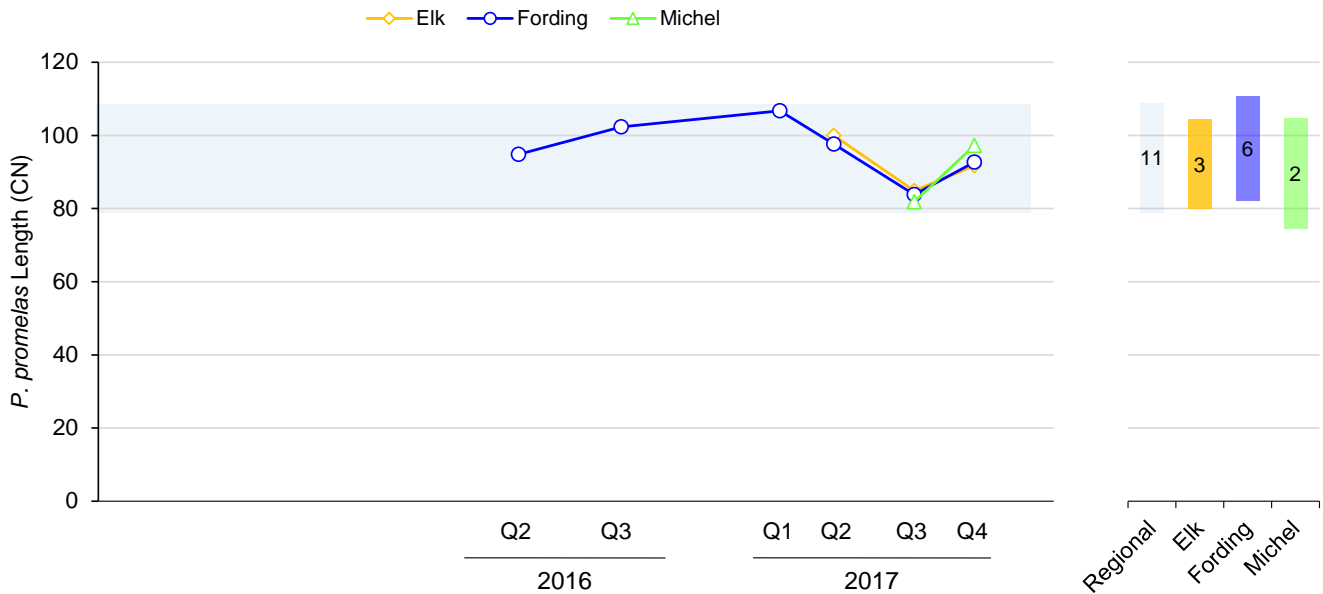
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2016 Fording River test was not included in the reference envelope calculations because dissolved oxygen concentrations fell below typical levels for this test (Golder 2017). Sample size for each normal range is provided on the bar chart.

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



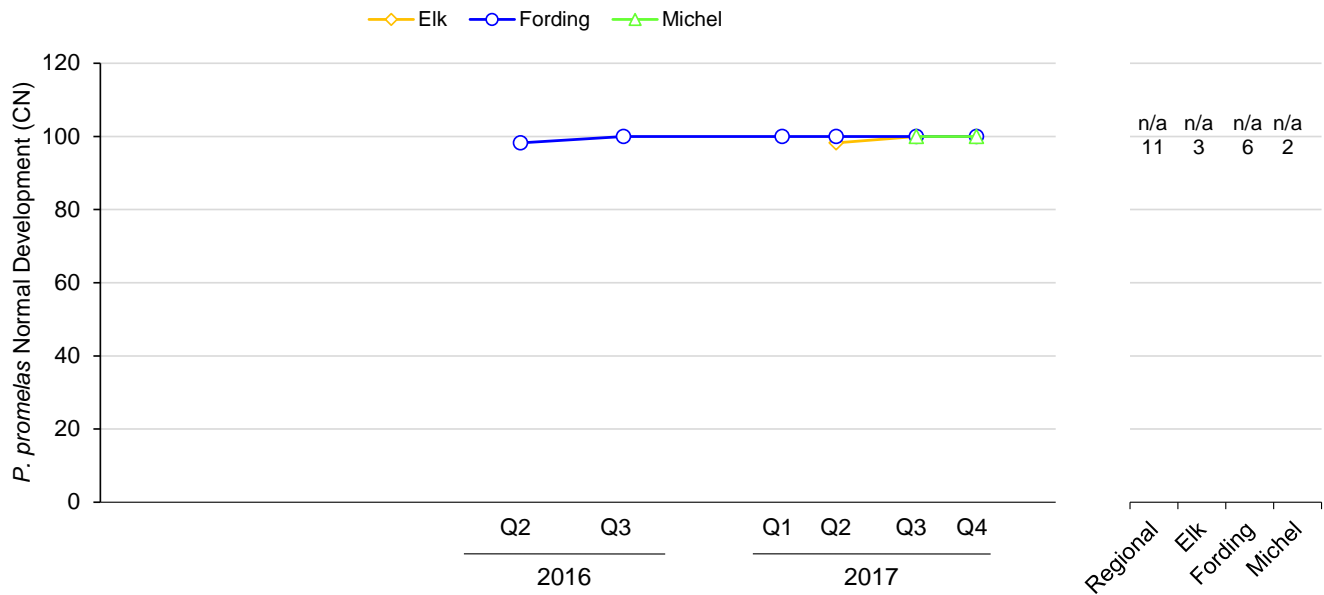
Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2016 Fording River test was not included in the reference envelope calculations because dissolved oxygen concentrations fell below typical levels for this test (Golder 2017). Sample size for each normal range is provided on the bar chart.

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



Notes: CN = control-normalized. Blue shading on scatterplot is the regional normal range. The Q4 2016 Fording River test was not included in the reference envelope calculations because dissolved oxygen concentrations fell below typical levels for this test (Golder 2017). 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, and Michel Creek reference tests (left panel).**



Notes: CN = control-normalized. No envelopes were developed for this endpoint. The Q4 2016 Fording River test is not shown because dissolved oxygen concentrations fell below typical levels for this test (Golder 2017). Sample size is provided on the bar chart.

### 3.3 Evaluation of 2017 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. Results are discussed below by test species (Section 3.3.1) and by test site (Section 3.3.2).

Table 3.3-1: Results of Quarterly and Semi-Annual Toxicity Tests—Raw Results <sup>(a)</sup>

Quarter	Station	<i>C. dubia</i>		<i>P. subcapitata</i>	<i>H. azteca</i>		<i>P. promelas</i> <sup>(b)</sup>				<i>O. mykiss</i>				
		% Survival	Reproduction	Cell Yield [x 10 <sup>4</sup> 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	16.8 ± 6.4	29 ± 2.8	96 ± 5.5	0.86 ± 0.03	98.3 ± 3.3	80 ± 17.2	1.15 ± 0.12	8.9 ± 0.2	100 ± 0				
	Fording River reference	100	22 ± 3.9	154.4 ± 8.2	96 ± 5.5	0.73 ± 0.15	95 ± 6.4	80 ± 18	1.05 ± 0.09	9.5 ± 0.7	100 ± 0				
	FR_FRCP1	100	<b>11.2 ± 3.2</b>	169.3 ± 6.2	96 ± 5.5	<b>0.48 ± 0.14</b>	100 ± 0	65 ± 44.4	0.83 ± 0.56	10.2 ± 1.1	100 ± 0				
	GH_FR1	100	18.2 ± 4	139 ± 11	100 ± 0	0.7 ± 0.18	100 ± 0	91.7 ± 6.4	1.22 ± 0.04	8.8 ± 0.3	100 ± 0				
	GH_ERC	100	21.1 ± 3.1	175.3 ± 8.5		—			—						
	EV_MC2	100	<b>15.8 ± 3.3</b>	216.3 ± 13.3		—			—						
	EV_HC1	100	20.4 ± 2.2	253.8 ± 13.8		—			—						
	CM_MC2	100	<b>6.8 ± 4.6</b>	171.8 ± 7.4	<b>64 ± 41.6</b>	<b>0.2 ± 0.03</b>	96.7 ± 3.8	90 ± 8.6	1.19 ± 0.06	<b>8.4 ± 0.2</b>	100 ± 0				
LC_LCDSSLCC	100	<b>15.5 ± 6.3</b>	211.8 ± 15.4		—			—							
Q2	Laboratory control	100	20.8 ± 3.5	28.4 ± 1.8	86 ± 5.5	0.9 ± 0.06	100 ± 0	96.7 ± 6.7	0.76 ± 0.03	8.4 ± 0.1	100 ± 0	78.5 ± 10.4	67.6 ± 10.1	17.4 ± 0.5	72.1 ± 6
	Pooled Batch References	95	19.5 ± 4.9	144 ± 8.2	90 ± 9	0.87 ± 0.05	100 ± 0	95 ± 4.7	0.82 ± 0.06	8.3 ± 0.2	99 ± 2.5	70 ± 17	65 ± 16	19 ± 0.9	79 ± 5
	Fording River reference	100	21.7 ± 4.1	141.4 ± 5.4	86 ± 11.4	0.91 ± 0.04	100 ± 0	95 ± 6.4	0.84 ± 0.08	8.2 ± 0.3	100 ± 0	<b>62.2 ± 17.1</b>	58.9 ± 16.3	19.2 ± 0.8	80.3 ± 6.7
	Elk River reference	90	<b>17.3 ± 4.7</b>	147.5 ± 9.7	94 ± 5.5	<b>0.83 ± 0.04</b>	100 ± 0	95 ± 3.3	0.80 ± 0.03	8.4 ± 0.1	98.2 ± 3.6	78.8 ± 12	71.4 ± 13.2	<b>17.9 ± 0.4</b>	78.0 ± 4
	FR_FRCP1	100	<b>8.5 ± 2.5</b>	145 ± 7.2	86 ± 11.4	<b>0.8 ± 0.1</b>	100 ± 0	95 ± 6.4	<b>0.74 ± 0.05</b>	8.3 ± 0.2	98.2 ± 3.6	<b>63.8 ± 14.4</b>	58.8 ± 11.6	18.8 ± 0.7	81.2 ± 7.1
	GH_FR1	100	<b>17.6 ± 3.3</b>	144 ± 5	86 ± 11.4	0.89 ± 0.07	100 ± 0	<b>61.7 ± 21.3</b>	<b>0.64 ± 0.07</b>	8.9 ± 0.6	100 ± 0	71.7 ± 10.9	67.8 ± 12.6	20.4 ± 0.8	91.7 ± 5.5
	GH_ERC	100	20.3 ± 2.5	141.3 ± 6.3		—			—			<b>49.6 ± 23.7</b>	<b>46.8 ± 23.3</b>	20.0 ± 0.8	88.7 ± 8.1
	EV_MC2	90	<b>16.7 ± 4.1</b>	139.5 ± 9.3		—			—			79.8 ± 17.1	73.1 ± 14.6	19.1 ± 0.8	86.1 ± 7.2
	EV_HC1	100	<b>14.9 ± 3.1</b>	144.3 ± 7.1		—			—			80.5 ± 8.3	70.5 ± 10.2	18.5 ± 0.9	82.8 ± 8.5
	CM_MC2	90	<b>10.5 ± 3.8</b>	<b>129 ± 7.4</b>	<b>50 ± 18.7</b>	<b>0.14 ± 0.02</b>	100 ± 0	91.7 ± 3.3	0.84 ± 0.05	8.4 ± 0.2	100 ± 0	76.2 ± 5.2	62.9 ± 11.6	18.5 ± 0.9	84.3 ± 7
	LC_LCDSSLCC	100	25.7 ± 2.4	134 ± 4.2		—			—			77.9 ± 6.5	63.1 ± 12.5	18.6 ± 1	90.5 ± 7.3
	Laboratory control	100	18.9 ± 1.4	29.9 ± 1.6		—			—			78.5 ± 10.4	67.6 ± 10.1	17.4 ± 0.5	72.1 ± 6
Michel Creek reference	100	22.3 ± 1.9	170 ± 11.6		—			—			70 ± 17	65 ± 16	19 ± 0.9	79 ± 5	
CM_MC2	100	<b>14.3 ± 5.1</b>	<b>151.8 ± 11</b>		—			—			<b>62.2 ± 17.1</b>	58.9 ± 16.3	19.2 ± 0.8	80.3 ± 6.7	
Q3	Laboratory control <sup>(c)</sup>	100	18.4 ± 3.1	37.6 ± 2.7	82 ± 13	0.71 ± 0.27	10Cu: 100 ± 0 20Cu: 98.3 ± 3.3	10Cu: 80 ± 5.4 20Cu: 80 ± 18	10Cu: 0.46 ± 0.03 20Cu: 0.47 ± 0.11	10Cu: 9.9 ± 0.1 20Cu: 9.6 ± 0.2	10Cu: 100 ± 0 20Cu: 100 ± 0				
	Pooled Batch References	100	21.4 ± 2.7	157 ± 11	69 ± 15	0.62 ± 0.21	99 ± 2	73 ± 19	0.6 ± 0.1	8.3 ± 0.4	100 ± 0				
	Fording River reference	100	20.0 ± 1.8	160.8 ± 10.8	72 ± 17.9	0.72 ± 0.12	98.3 ± 3.3	78.3 ± 17.5	0.6 ± 0.06	8.3 ± 0.5	100 ± 0				
	Elk River reference	100	22.5 ± 2.7	158.1 ± 9.2	68 ± 13	0.67 ± 0.23	100 ± 0	66.7 ± 21.1	0.6 ± 0.15	8.4 ± 0.3	100 ± 0				
	Michel Creek reference	100	21.7 ± 3.2	150.6 ± 10.2	66 ± 16.7	0.46 ± 0.17	100 ± 0	73.3 ± 21.1	0.59 ± 0.09	8.1 ± 0.4	100 ± 0				
	FR_FRCP1 <sup>(c)</sup>	100	<b>13.8 ± 6.3</b>	<b>134.8 ± 6.1</b>	68 ± 14.8	0.77 ± 0.05	100 ± 0	66.7 ± 27.2	0.46 ± 0.18	9.9 ± 1.2	100 ± 0				
	GH_FR1	100	<b>16.7 ± 4</b>	155.5 ± 4.7	64 ± 25.1	0.76 ± 0.07	100 ± 0	73.3 ± 31.7	0.54 ± 0.22	8.9 ± 1.4	100 ± 0				
	GH_ERC	100	17.5 ± 5.2	156.5 ± 12.5		—			—						
	EV_MC2	100	<b>17.7 ± 2</b>	157 ± 12.1		—			—						
	EV_HC1	100	19.3 ± 2.9	158.3 ± 9.6		—			—						
CM_MC2 <sup>(c)</sup>	70	<b>6.0 ± 3.7</b>	<b>131 ± 8.8</b>	<b>0 ± 0</b>	<b>0 ± 0</b>	100 ± 0	76.7 ± 15.9	0.56 ± 0.07	9.2 ± 0.4	100 ± 0					
LC_LCDSSLCC	100	19.2 ± 4.5	146.8 ± 10.1		—			—							
Q4	Laboratory control	100	18.4 ± 2.4	29.2 ± 1.8	98 ± 4.5	0.63 ± 0.03	10Cu: 95 ± 6.4 20Cu: 95 ± 6.4	10Cu: 83.3 ± 11.6 20Cu: 81.7 ± 10	10Cu: 0.8 ± 0.07 20Cu: 0.82 ± 0.13	10Cu: 10.9 ± 0.4 20Cu: 10.6 ± 0.3	10Cu: 100 ± 0 20Cu: 100 ± 0	89.7 ± 8.3	83.8 ± 6.3	18 ± 0.3	71.9 ± 4.2
	Pooled Batch References	100	18.4 ± 3.5	110 ± 7.3	97 ± 6	0.49 ± 0.15	98 ± 4	76 ± 16	0.73 ± 0.08	10 ± 0.5	100 ± 0	49 ± 39	47 ± 38	18 ± 0.4	72 ± 5
	Fording River reference	100	18.7 ± 4.7	108.1 ± 7.4	100 ± 0	0.56 ± 0.07	100 ± 0	81.7 ± 12.6	0.78 ± 0.04	10.1 ± 0.2	100 ± 0	62.7 ± 41.8	61.9 ± 41.1	18 ± 0.3	71 ± 7.4
	Elk River reference	100	17.9 ± 2.9	109.6 ± 8.2	96 ± 5.5	0.47 ± 0.17	98.3 ± 3.3	80 ± 9.4	0.68 ± 0.03	10.0 ± 0.3	100 ± 0	<b>51.1 ± 36.2</b>	<b>49.4 ± 35.6</b>	17.8 ± 0.7	70.6 ± 1.3
	Michel Creek reference	100	18.6 ± 2.7	111.4 ± 6.7	96 ± 8.9	0.45 ± 0.2	95 ± 6.4	65 ± 22	0.73 ± 0.13	10.6 ± 0.8	100 ± 0	<b>31.7 ± 41.8</b>	<b>30 ± 41.9</b>	17.7 ± 0.2	74.4 ± 5.1
	FR_FRCP1	100	<b>9.9 ± 1.1</b>	<b>97.8 ± 4.6</b>	94 ± 5.5	0.48 ± 0.07	95 ± 3.3	78.3 ± 10	0.89 ± 0.07	10.7 ± 0.2	100 ± 0	<b>24.2 ± 46.1</b>	<b>24.2 ± 46.1</b>	17.2 ± 1.1	75.7 ± 8.1
	GH_FR1	100	21.3 ± 1.8	116.3 ± 9.3	100 ± 0	0.48 ± 0.09	91.7 ± 6.4	76.7 ± 12.8	0.83 ± 0.1	10.4 ± 0.4	100 ± 0	<b>20.7 ± 41.4</b>	<b>19 ± 37.9</b>	16.5 ± 0	77.9 ± 0
	GH_ERC	100	18.6 ± 4.9	128.8 ± 2.5		—			—			<b>20.5 ± 34</b>	<b>18.8 ± 32.8</b>	16.4 ± 0.5	69.0 ± 3.3
	EV_MC2	100	23.1 ± 2.6	107.8 ± 7		—			—			<b>21.8 ± 41.4</b>	<b>19.4 ± 38.7</b>	16.4 ± 1.2	73.1 ± 4.4
	EV_HC1	100	18.4 ± 2	109.8 ± 8.2		—			—			<b>30.8 ± 33.5</b>	<b>28.3 ± 31.1</b>	16.2 ± 0.4	66.4 ± 7.8
	CM_MC2	80	<b>7.6 ± 4.9</b>	105 ± 3.4	88 ± 16.4	<b>0.27 ± 0.06</b>	93.3 ± 7.7	66.7 ± 9.4	0.78 ± 0.08	10.3 ± 0.4	100 ± 0	<b>20.7 ± 41.4</b>	<b>19 ± 37.9</b>	20.3 ± 0	91.7 ± 0
	LC_LCDSSLCC	100	23.4 ± 2.8	103.5 ± 4.4		—			—			<b>36.4 ± 39.8</b>	<b>34.6 ± 36.8</b>	19.5 ± 0.6	85.6 ± 3.4

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. In Q3, laboratory control results are provided for laboratory control + 10 µg/L copper (Cu) and laboratory control + 20 µg/L Cu (Appendix B-3).
  - (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.

**Table 3.3-2: Results of Quarterly and Semi-Annual Toxicity Tests—Control Normalized Results<sup>(a)</sup>**

Quarter	Station	<i>C. dubia</i>		<i>H. azteca</i>		<i>P. promelas</i> <sup>(b)</sup>				<i>O. mykiss</i>				
		% Survival	Reproduction	% Survival	Dry weight [mg]	% Hatch	% Survival	Biomass [mg]	Length [mm]	% Normal Development	% Survival	% Viability	Length [mm]	Wet Weight [mg]
Q1	Laboratory control	100 ± 0	100 ± 38	100 ± 6	100 ± 3	100 ± 3	100 ± 22	100 ± 10	100 ± 2	100 ± 0	—	—	—	—
	Fording River reference	100 ± 0	131 ± 23	100 ± 6	85 ± 17	97 ± 6	100 ± 23	91 ± 8	107 ± 8	100 ± 0				
	FR_FRCP1	100 ± 0	<b>67 ± 19</b>	100 ± 6	<b>56 ± 16</b>	102 ± 0	81 ± 55	73 ± 49	86 ± 58	75 ± 50				
	GH_FR1	100 ± 0	108 ± 24	104 ± 0	82 ± 21	102 ± 0	115 ± 8	107 ± 3	99 ± 3	100 ± 0				
	GH_ERC	100 ± 0	126 ± 18	—	—	—	—	—	—	—				
	EV_MC2	100 ± 0	<b>94 ± 20</b>	—	—	—	—	—	—	—				
	EV_HC1	100 ± 0	121 ± 13	—	—	—	—	—	—	—				
	CM_MC2	100 ± 0	<b>40 ± 27</b>	<b>67 ± 43</b>	<b>19 ± 11</b>	98 ± 4	113 ± 11	104 ± 6	<b>95 ± 2</b>	100 ± 0				
LC_LCDSSLCC	100 ± 0	<b>92 ± 38</b>	—	—	—	—	—	—	—					
Q2	Laboratory control	100 ± 0	100 ± 17	100 ± 6	100 ± 7	100 ± 0	100 ± 7	100 ± 4	100 ± 1	100 ± 0	100 ± 13	100 ± 15	100 ± 3	100 ± 8
	Pooled Batch References	95 ± 22	94 ± 23	105 ± 11	97 ± 6	100 ± 0	98 ± 5	108 ± 8	99 ± 3	99 ± 3	90 ± 21	96 ± 23	107 ± 5	110 ± 8
	Fording River reference	100 ± 0	104 ± 20	100 ± 13	101 ± 4	100 ± 0	98 ± 7	110 ± 10	98 ± 3	100 ± 0	<b>79 ± 22</b>	87 ± 24	110 ± 4	111 ± 9
	Elk River reference	90 ± 32	<b>83 ± 23</b>	109 ± 6	<b>92 ± 4</b>	100 ± 0	98 ± 3	105 ± 4	99 ± 1	98 ± 4	100 ± 15	106 ± 20	<b>103 ± 3</b>	108 ± 6
	FR_FRCP1	100 ± 0	<b>41 ± 12</b>	100 ± 13	<b>89 ± 12</b>	100 ± 0	98 ± 7	<b>97 ± 6</b>	98 ± 3	98 ± 4	<b>81 ± 18</b>	87 ± 17	108 ± 4	112 ± 10
	GH_FR1	100 ± 0	<b>85 ± 16</b>	100 ± 13	100 ± 8	100 ± 0	<b>64 ± 22</b>	<b>84 ± 9</b>	106 ± 7	100 ± 0	91 ± 14	100 ± 19	117 ± 5	127 ± 8
	GH_ERC	100 ± 0	98 ± 12	—	—	—	—	—	—	—	<b>63 ± 30</b>	<b>69 ± 34</b>	115 ± 5	123 ± 11
	EV_MC2	90 ± 32	<b>80 ± 20</b>	—	—	—	—	—	—	—	102 ± 22	108 ± 22	110 ± 5	119 ± 10
	EV_HC1	100 ± 0	<b>72 ± 15</b>	—	—	—	—	—	—	—	103 ± 11	104 ± 15	106 ± 5	115 ± 12
	CM_MC2	90 ± 32	<b>50 ± 18</b>	<b>58 ± 22</b>	<b>15 ± 2</b>	100 ± 0	95 ± 3	110 ± 7	100 ± 2	100 ± 0	97 ± 7	93 ± 17	106 ± 5	117 ± 10
	LC_LCDSSLCC	100 ± 0	124 ± 11	—	—	—	—	—	—	—	99 ± 8	93 ± 18	107 ± 6	125 ± 10
	Laboratory control	100 ± 0	100 ± 7	—	—	—	—	—	—	—	<b>63 ± 30</b>	<b>69 ± 34</b>	115 ± 5	123 ± 11
	Michel Creek reference	100 ± 0	118 ± 10	—	—	—	—	—	—	—	102 ± 22	108 ± 22	110 ± 5	119 ± 10
CM_MC2	100 ± 0	<b>76 ± 27</b>	—	—	—	—	—	—	—	103 ± 11	104 ± 15	106 ± 5	115 ± 12	
Q3	Laboratory control <sup>(c)</sup>	100 ± 0	100 ± 17	100 ± 16	100 ± 38	10Cu: 100 ± 0 20Cu: 100 ± 3	10Cu: 100 ± 7 20Cu: 100 ± 23	10Cu: 100 ± 7 20Cu: 100 ± 24	10Cu: 100 ± 1 20Cu: 100 ± 2	10Cu: 100 ± 0 20Cu: 100 ± 0	—	—	—	—
	Pooled Batch References	100 ± 0	116 ± 15	84 ± 18	87 ± 29	99 ± 2	91 ± 23	129 ± 21	84 ± 4	100 ± 0				
	Fording River reference	100 ± 0	109 ± 10	88 ± 22	102 ± 16	98 ± 3	98 ± 22	130 ± 12	84 ± 5	100 ± 0				
	Elk River reference	100 ± 0	122 ± 15	83 ± 16	94 ± 33	100 ± 0	83 ± 26	130 ± 32	85 ± 3	100 ± 0				
	Michel Creek reference	100 ± 0	118 ± 17	80 ± 20	64 ± 25	100 ± 0	92 ± 26	127 ± 20	82 ± 4	100 ± 0				
	FR_FRCP1 <sup>(c)</sup>	100 ± 0	<b>75 ± 34</b>	83 ± 18	109 ± 7	102 ± 0	83 ± 34	98 ± 39	103 ± 13	100 ± 0				
	GH_FR1	100 ± 0	<b>91 ± 22</b>	78 ± 31	106 ± 9	100 ± 0	92 ± 40	118 ± 47	90 ± 15	100 ± 0				
	GH_ERC	100 ± 0	95 ± 28	—	—	—	—	—	—	—				
	EV_MC2	100 ± 0	<b>96 ± 11</b>	—	—	—	—	—	—	—				
	EV_HC1	100 ± 0	105 ± 16	—	—	—	—	—	—	—				
	CM_MC2 <sup>(c)</sup>	70 ± 48	<b>33 ± 20</b>	<b>0 ± 0</b>	<b>0 ± 0</b>	102 ± 0	96 ± 20	119 ± 16	95 ± 4	100 ± 0				
LC_LCDSSLCC	100 ± 0	104 ± 25	—	—	—	—	—	—	—					
Q4	Laboratory control	100 ± 0	100 ± 13	100 ± 5	100 ± 4	10Cu: 100 ± 7 20Cu: 100 ± 7	10Cu: 100 ± 14 20Cu: 100 ± 12	10Cu: 100 ± 9 20Cu: 100 ± 15	10Cu: 100 ± 4 20Cu: 100 ± 2	10Cu: 100 ± 0 20Cu: 100 ± 0	100 ± 9	100 ± 7	100 ± 2	100 ± 6
	Pooled Batch References	100 ± 0	100 ± 19	99 ± 6	79 ± 25	103 ± 5	91 ± 19	91 ± 10	94 ± 5	100 ± 0	54 ± 43	56 ± 46	100 ± 2	100 ± 7
	Fording River reference	100 ± 0	102 ± 26	102 ± 0	90 ± 11	105 ± 0	98 ± 15	97 ± 5	93 ± 2	100 ± 0	70 ± 47	74 ± 49	101 ± 2	99 ± 10
	Elk River reference	100 ± 0	97 ± 16	98 ± 6	75 ± 27	104 ± 4	96 ± 11	84 ± 4	92 ± 3	100 ± 0	<b>57 ± 40</b>	<b>59 ± 43</b>	99 ± 4	98 ± 2
	Michel Creek reference	100 ± 0	101 ± 15	98 ± 9	72 ± 32	100 ± 7	78 ± 26	91 ± 16	97 ± 7	100 ± 0	<b>35 ± 47</b>	<b>36 ± 50</b>	98 ± 1	103 ± 7
	FR_FRCP1	100 ± 0	<b>54 ± 6</b>	96 ± 6	77 ± 11	100 ± 4	96 ± 12	109 ± 8	101 ± 2	100 ± 0	<b>27 ± 51</b>	<b>29 ± 55</b>	96 ± 6	105 ± 11
	GH_FR1	100 ± 0	116 ± 10	102 ± 0	77 ± 14	96 ± 7	94 ± 16	102 ± 12	98 ± 4	100 ± 0	<b>23 ± 46</b>	<b>23 ± 45</b>	92 ± 0	108 ± 0
	GH_ERC	100 ± 0	101 ± 27	—	—	—	—	—	—	—	<b>23 ± 38</b>	<b>22 ± 39</b>	91 ± 3	96 ± 5
	EV_MC2	100 ± 0	126 ± 14	—	—	—	—	—	—	—	<b>24 ± 46</b>	<b>23 ± 46</b>	91 ± 7	102 ± 6
	EV_HC1	100 ± 0	100 ± 11	—	—	—	—	—	—	—	<b>34 ± 37</b>	<b>34 ± 37</b>	90 ± 2	92 ± 11
	CM_MC2	80 ± 42	<b>41 ± 27</b>	90 ± 17	<b>44 ± 10</b>	98 ± 8	82 ± 12	95 ± 10	97 ± 4	100 ± 0	<b>23 ± 46</b>	<b>23 ± 45</b>	113 ± 0	127 ± 0
LC_LCDSSLCC	100 ± 0	127 ± 15	—	—	—	—	—	—	—	<b>41 ± 44</b>	<b>41 ± 44</b>	109 ± 3	119 ± 5	

**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) Results for copper-amended samples are provided. In Q3, laboratory control results are provided for laboratory control + 10 µg/L copper (Cu) and laboratory control + 20 µg/L Cu (Appendix B-3).  
 (c) *P. promelas* results are normalized to the laboratory control + 20 µg/L Cu.  
 — = 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.



### 3.3.1 By Test Species

#### 3.3.1.1 *Ceriodaphnia dubia*

Individual replicate results are provided in Figures 3.3-1 and 3.3-4. Mean test results are provided in Tables 3.3-1 and 3.3-2 and Figures 3.3.2, 3.3.3, 3.3.5 and 3.3.6.

There was no evidence of statistically significant adverse effects on mean *C. dubia* survival in any test (Figure 3.3-1). The few individual replicates for which mortality was observed in Q2, Q3, and Q4 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 16 of 29 tests (Figure 3.3-4 to Figure 3.3-6; Table 3.3-1; Table 3.3-2), including:

- four FR\_FRCP1 tests (Q1 to Q4)
- two GH\_FR1 tests (Q2, Q3)
- three EV\_MC2 tests (Q1, Q2, Q3)
- one EV\_HC1 test (Q2)
- five CM\_MC2 tests (Q1 to Q4; two tests were conducted in Q2)
- one LC\_LCDSSLCC test (Q1).

In three of 16 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 = 15%, Q3 = 17%]; GH\_FR1 [Q2 = 10%]), indicating no adverse response. In five of 16 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 (EV\_MC2 [Q1 = 28%], LC\_LCDSSLCC [Q1 = 30%], EV\_HC1 [Q2 = 23%], CM\_MC2 [Q2 = 36%; second test], GH\_FR1 [Q3 = 22%]). 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 eight of 16 tests with significant results, mean reproduction was below the local and regional NRs (FR\_FRCP1 [Q1 to Q4] and CM\_MC2 [Q1 to 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 35% (Q3) to 56% (Q2) in FR\_FRCP1 tests and from 47% (Q2) to 72% (Q3) for CM\_MC2 tests.

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

- **No adverse response (16 of 29 tests):** GH\_ERC (Q1 to Q4), EV\_HC1 (Q1, Q3, Q4), GH\_FR1 (Q1, Q2, Q4), LC\_LCDSSLCC (Q2 to Q4), EV\_MC2 (Q2 to Q4)
- **Possible adverse response (5 of 29 tests):** EV\_MC2 (Q1), LC\_LCDSSLCC (Q1), EV\_HC1 (Q2), CM\_MC2 (Q2; second test), GH\_FR1 (Q3)
- **Likely adverse response (8 of 29 tests):** FR\_FRCP1 (Q1 to Q4) and CM\_MC2 (Q1 to Q4; first Q2 test)

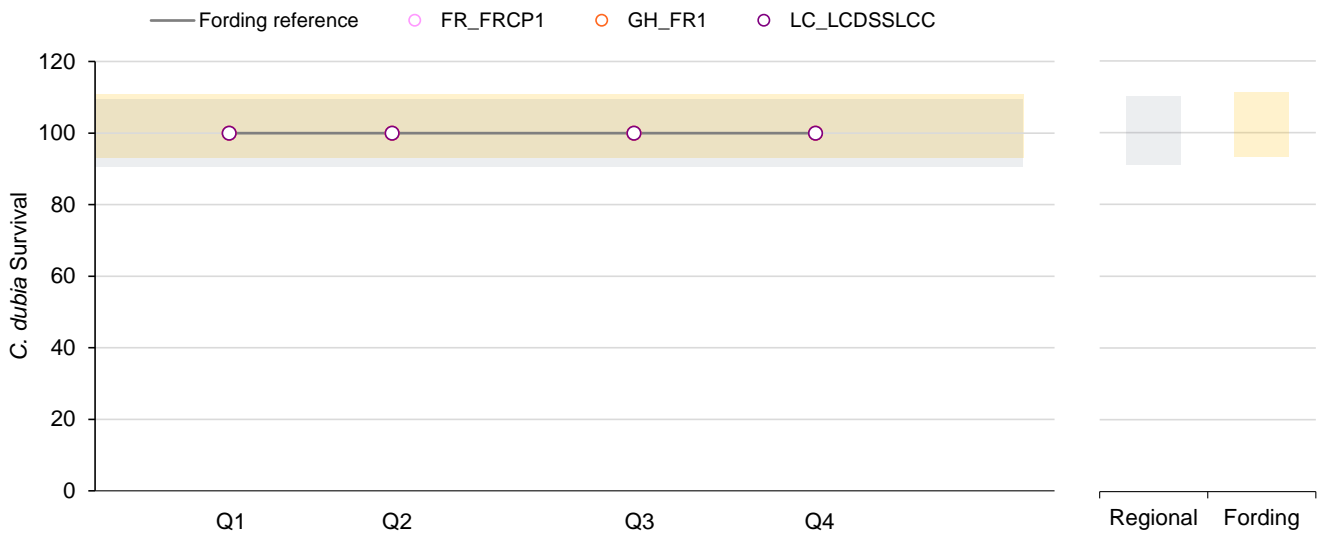
The concentration-response analysis for *C. dubia* reproduction is presented in Section 3.4.1.

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



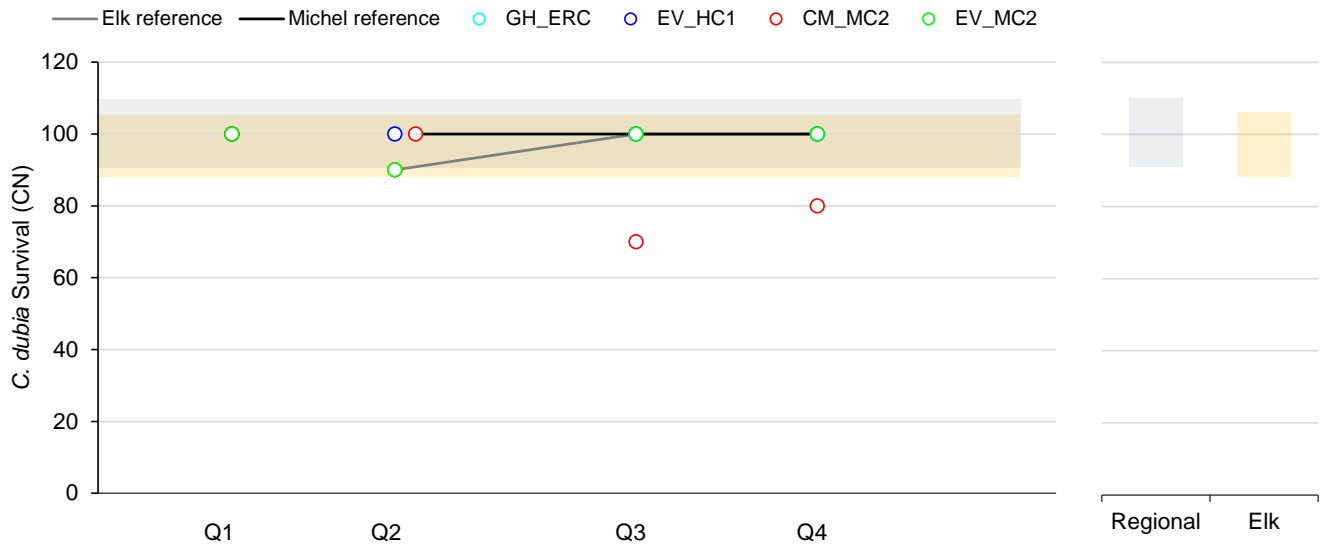
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-2: Mean results for *C. dubia* survival in the Fording River reference and its paired test site waters (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



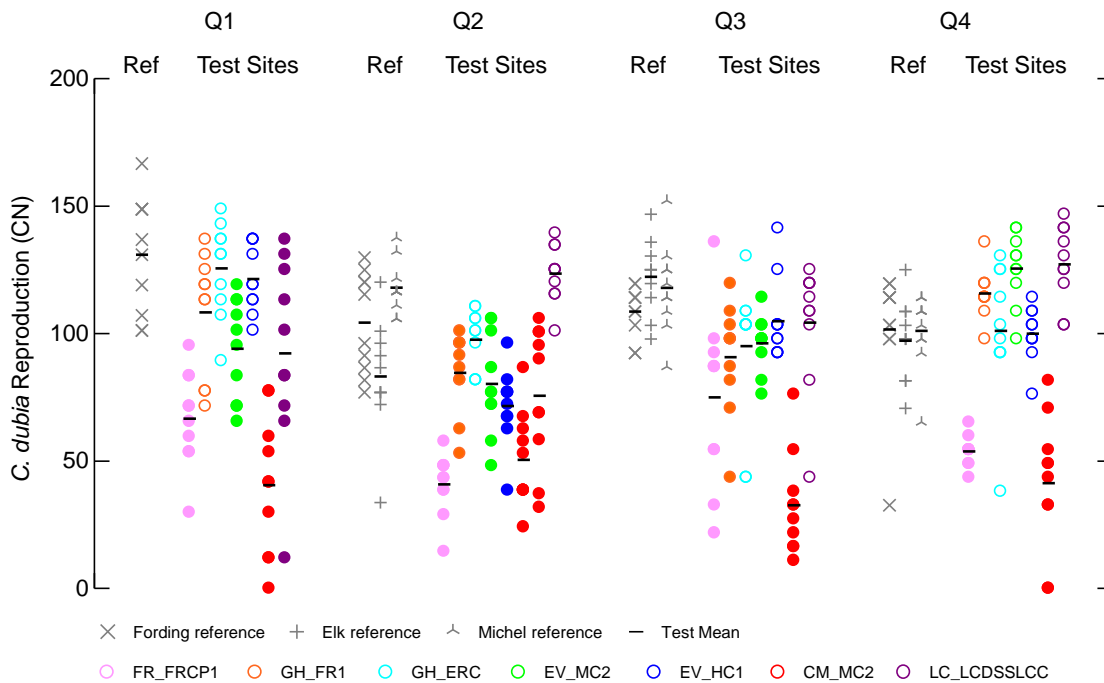
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-3: Mean results for *C. dubia* survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



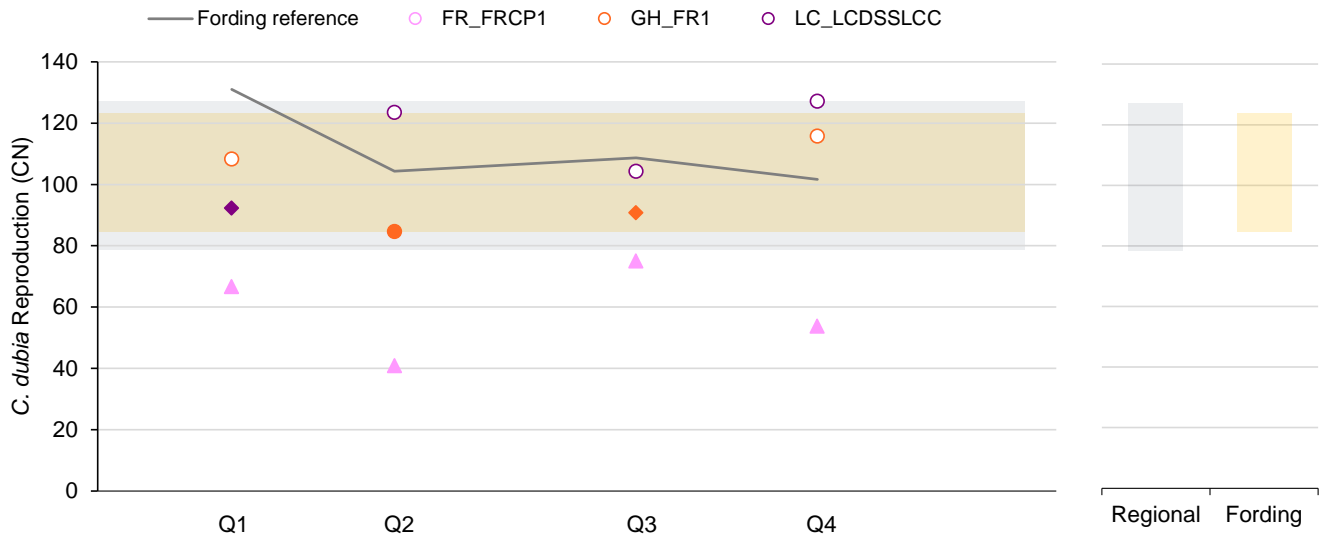
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.3-4: Individual replicate and mean results for *C. dubia* reproduction in reference (Ref) and test site waters.**



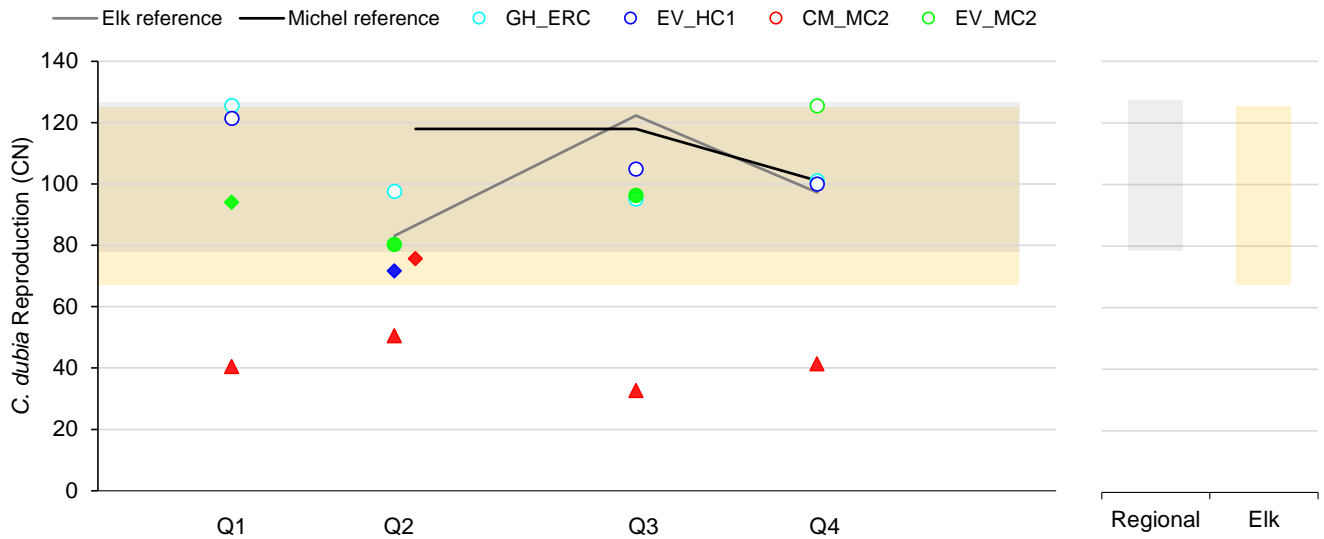
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-5: Mean results for *C. dubia* reproduction in the Fording River reference and its paired test site waters (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

**Figure 3.3-6: Mean results for *C. dubia* reproduction in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

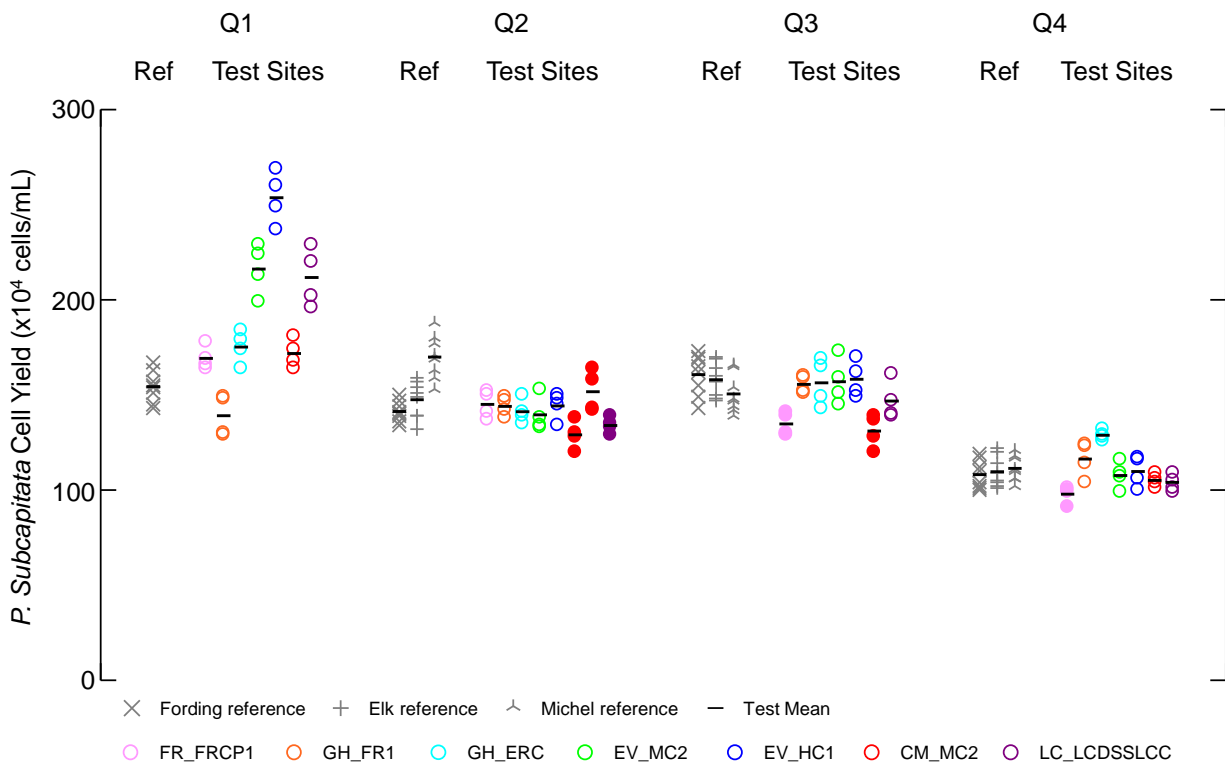
### 3.3.1.2 *Pseudokirchneriella subcapitata*

Cell yield was significantly reduced relative to one or more references in six of 29 tests, including two FR\_FRCP1 tests (Q3, Q4), three CM\_MC2 tests (Q2 [both tests], Q3), and one LC\_LCDSSLCC test (Q2) (Figure 3.3-7 to Figure 3.3-9; Table 3.3-1). In all tests with significant results, mean cell yield was within the local and regional NRs and the effect size was less than 20% compared to the mean response in batch-specific references. Compared to the mean response in batch-specific references, the effect size in tests with significant results ranged from 7% (Q2 LC\_LCDSSLCC) to 17% (Q3 CM\_MC2). There is uncertainty as to whether these results represent an adverse response to the test water or variance in test organism performance related to background water quality.

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

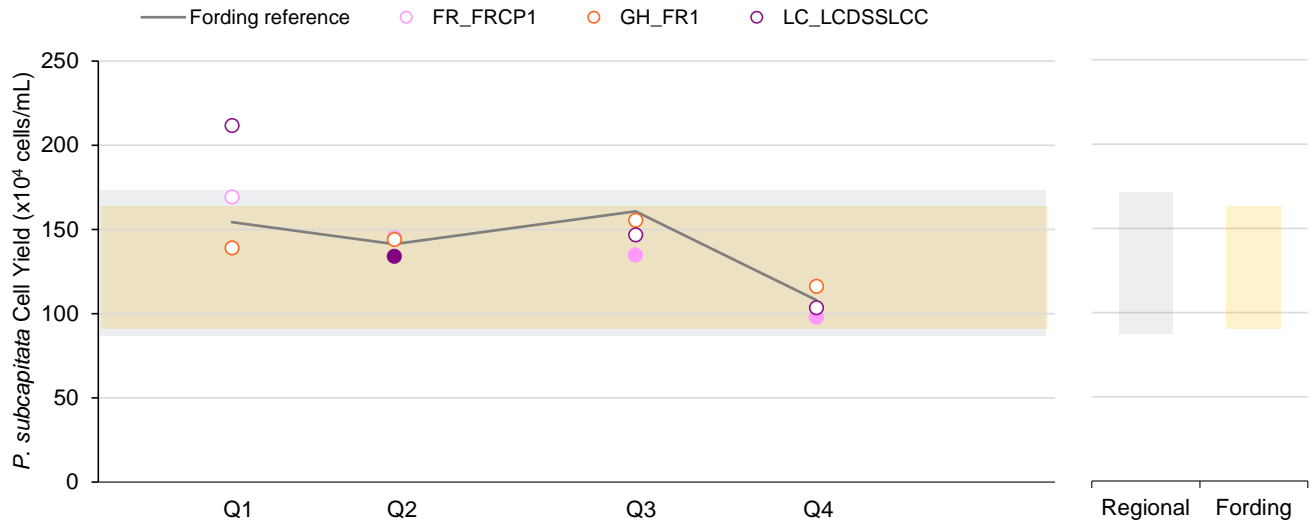
- **No adverse response (29 of 29 tests).** All tests—as shown in Figures 3.3-7 through 3.3-9, the few cases for which statistically significant differences were observed relative to one or more references yielded small effect sizes and results close to the range of reference performance. This endpoint 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 (0 of 29 tests):** No tests were in this category.
- **Likely adverse response (0 of 29 tests):** No tests were in this category.

Figure 3.3-7: Individual replicate and mean results for *P. subcapitata* cell yield in reference (Ref) and test site waters.



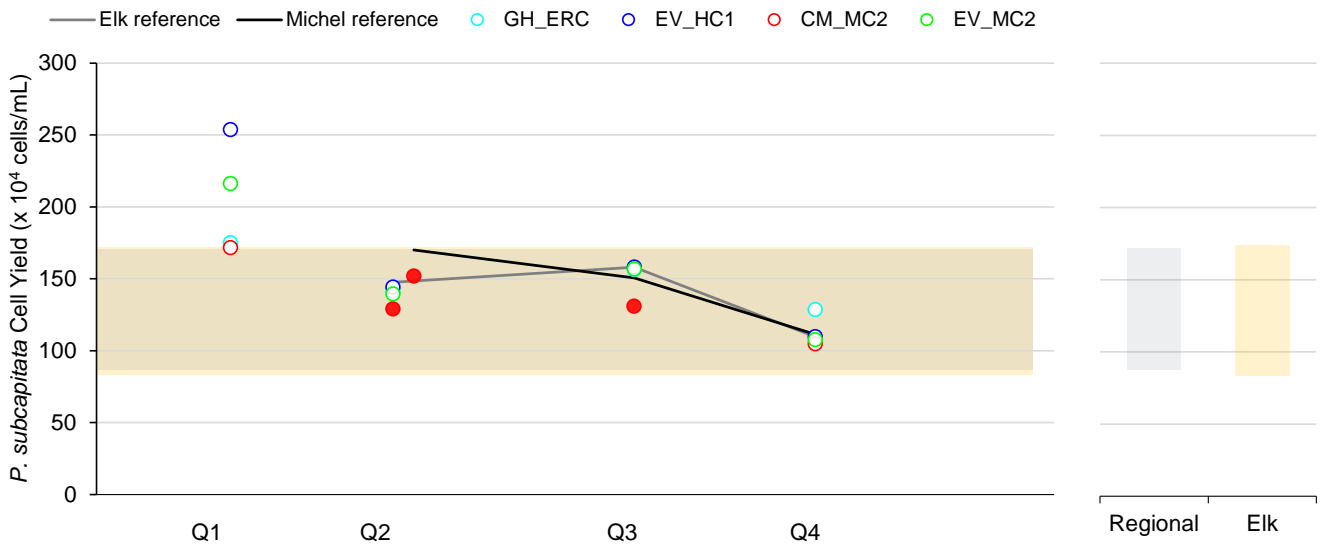
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-8: Mean results for *P. subcapitata* cell yield in the Fording River reference and its paired test site waters.**



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

**Figure 3.3-9: Mean results for *P. subcapitata* cell yield in the Elk River and Michel Creek references and their paired test site waters.**



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

### 3.3.1.3 *Hyaella azteca*

Results of standard Permit-based testing are provided below, followed by results of the toxicity identification evaluation conducted to evaluate adverse responses observed at CM\_MC2.

#### Standard Permit-based Testing

Survival was significantly reduced in three of 12 tests, specifically the three CM\_MC2 tests (Q1, Q2, Q3) (Figure 3.3-10; Figure 3.3-11; Table 3.3-1; Table 3.3-2). In these 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 were 33% (Q1), 45% (Q2), and 100% (Q3). These results indicate a likely adverse response to the test water. Because of the 0% survival in Q3 at CM\_MC2, the AMP management response framework was utilized and a supplemental investigation using toxicity identification evaluation (TIE) was initiated to determine the cause of the adverse responses at CM\_MC2. The results of the TIE are presented in the following section.

Dry weight was significantly reduced in six of 12 tests, including two FR\_FRCP1 tests (Q1, Q2) and four CM\_MC2 tests (Q1 to Q4) (Figure 3.3-12; Figure 3.3-13; Table 3.3-1; Table 3.3-2). For one of the six tests (Q2 FR\_FRCP1), mean dry weight was within the local NR and the effect size (8%) 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 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 44% (Q4) to 100% (Q3) for CM\_MC2 tests and was 34% for the Q1 FR\_FRCP1 test.

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

- **No adverse response (7 of 12 tests):** FR\_FRCP1 (Q2, Q3, Q4) and GH\_FR1 (Q1 to Q4).
- **Possible adverse response (0 of 12 tests):** No tests were in this category.
- **Likely adverse response (5 of 12 tests):** FR\_FRCP1 (Q1) and four CM\_MC2 tests (Q1 to Q4).

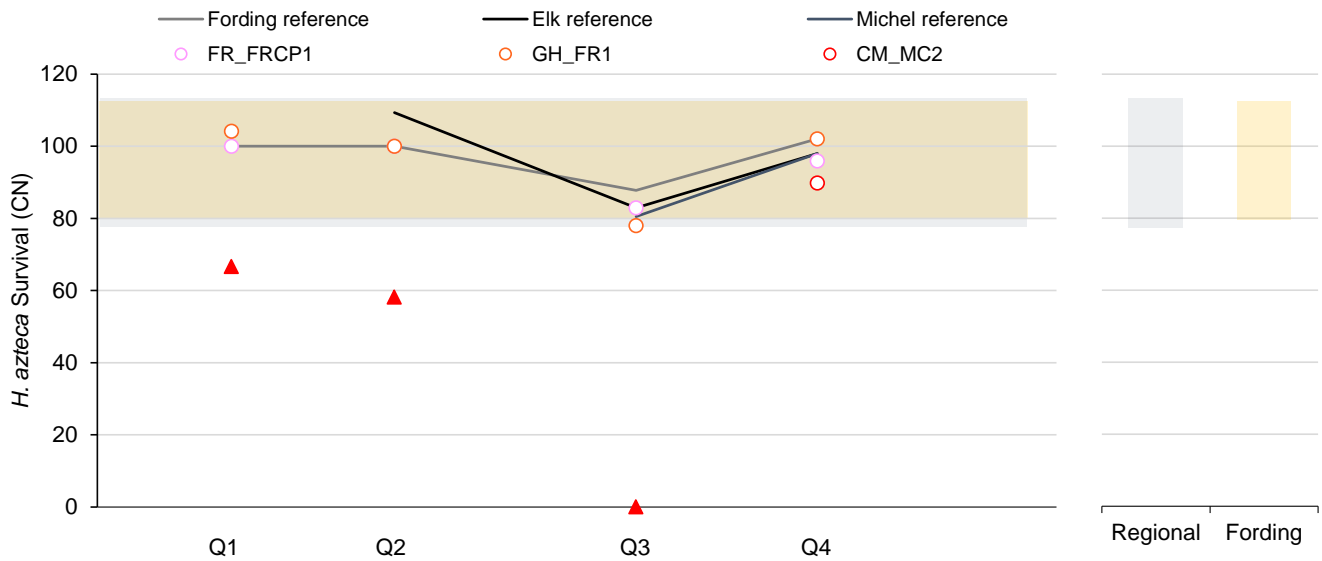
The concentration-response analysis for *H. azteca* survival and dry weight is presented in Section 3.4.2.

**Figure 3.3-10: 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.

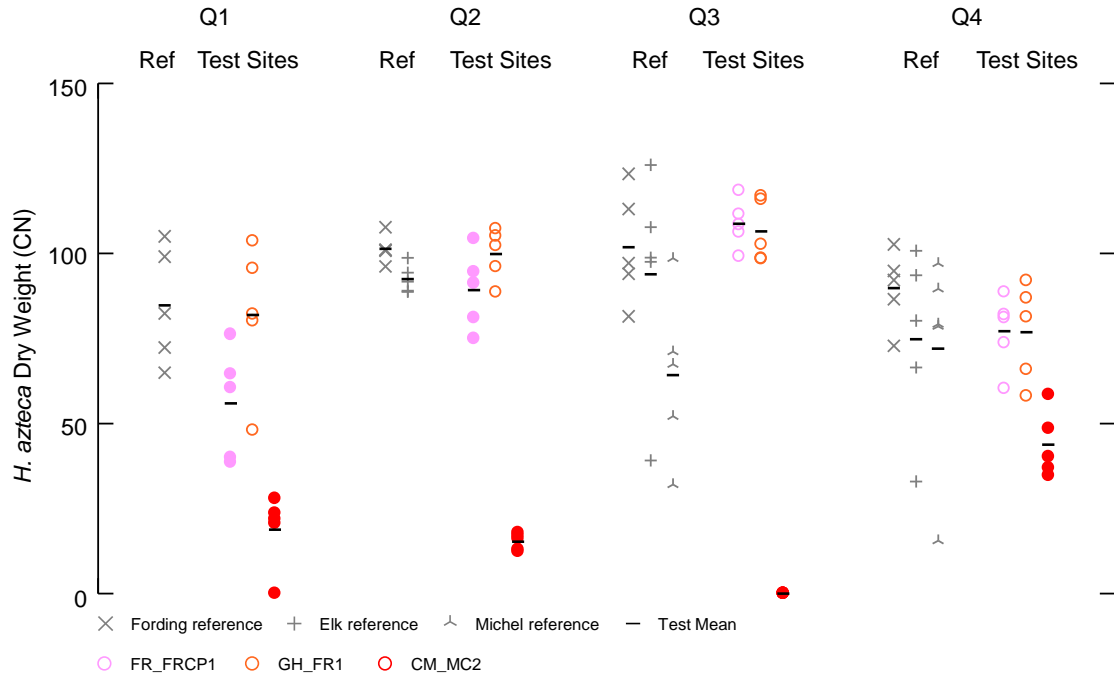
**Figure 3.3-11: Mean results for *H. azteca* survival in reference and test site waters.**



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

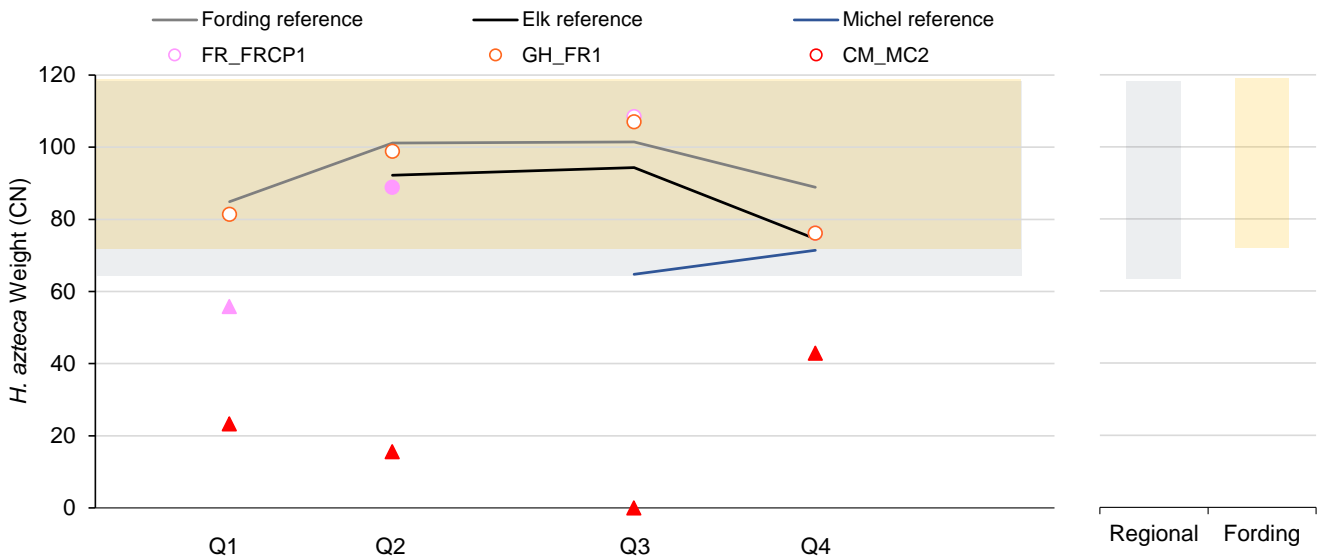


**Figure 3.3-12: Individual replicate and mean results for *H. azteca* dry weight in reference (Ref) and test site waters.**



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

**Figure 3.3-13: Mean results for *H. azteca* dry weight in reference and test site waters.**



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

## Toxicity Identification Evaluation – Preliminary Findings

A TIE was initiated to investigate the cause of adverse responses observed in CM\_MC2 tests. TIE methods and findings have not yet been finalized, but an overview was provided at the February 2018 EMC meeting (Teck 2018a). Details from the February 2018 EMC meeting are summarized below.

The following approach was used for the TIE:

- Treatments included tests with both *H. azteca* and *C. dubia*, which are both crustacean species and which both are sensitive to some mine-related constituents of potential concern.
- Initial treatments were designed to identify whether toxicity was caused by organic constituents (using C18 treatment), divalent metal cations (using ethylene diamine tetra-acetic acid [EDTA] treatment), or either nitrate, selenium, sulphate or water hardness (using a spiking approach by adding salts to the upstream reference CM\_MC1 to match concentrations at CM\_MC2).
- Treatments were used in a 14-day exposure to *H. azteca* to provide a more rapid result than the 28-day test. The results indicated that organic constituents, sulphate, nitrate, and selenium were not the cause of toxicity. EDTA treatment removed toxicity, indicating that divalent metal cations (e.g., copper, cadmium, nickel, zinc, cobalt), were the probable cause of toxicity.
- Divalent cation concentrations were reviewed, and cobalt and nickel were identified as potential toxicants, although in the case of nickel, the concentration was well below the BC and Canadian Council of Ministers of the Environment (CCME) water quality guidelines. Nickel was retained as a candidate constituent of potential concern because Nautilus was familiar with other test data (both published and based on in-house testing) that indicated higher sensitivity of crustaceans to nickel than indicated through WQG screening.
- Nickel and cobalt were spiked into water samples from the upstream reference CM\_MC1, after adjusting the hardness to match CM\_MC2. Toxicity tests were conducted with *C. dubia* (7-day tests) and *H. azteca* (28-day tests). In the *H. azteca* tests, four concentrations were tested for cobalt (CM\_MC1 with the addition of 1, 2, 4, and 8 µg/L) and nickel (CM\_MC1 with the addition of 10, 20, 40, and 80 µg/L). In the *C. dubia* tests, seven concentrations were tested for cobalt (CM\_MC1 with the addition of 0.5, 1, 2, 4, 8, 16, and 32 µg/L) and nickel (CM\_MC1 with the addition of 2.5, 5, 10, 20, 40, 80, and 160 µg/L).

In the cobalt-amended treatments, there was no evidence of adverse effects on *H. azteca* endpoints (i.e.,  $IC_{25} > 7.85$  µg/L) and *C. dubia* endpoints (i.e.,  $IC_{25} > 32.7$  µg/L). In the nickel-amended treatments, effects were observed to *H. azteca* and *C. dubia* endpoints;  $IC_{25}$  estimates were 22.4 µg/L for *H. azteca* growth and 10.8 µg/L for *C. dubia* reproduction. Effects on survival were observed at higher concentrations for *H. azteca* ( $LC_{50} = 59.7$  µg/L) and *C. dubia* ( $LC_{50} = 105$  µg/L). Nickel concentrations at CM\_MC2 have increased from 2015 (generally ranged from 5 to 15 µg/L) to 2017 (generally ranged from 10 to 45 µg/L). As discussed in Section 3.5.5, there has also been a trend towards more and higher responses in *C. dubia* and *H. azteca* tests between 2015 and 2017. Overall, based on the results from the TIE, nickel concentrations at CM\_MC2 would be expected to result in adverse effects to *C. dubia* and *H. azteca* in chronic toxicity testing. This is discussed further in the concentration-response analysis (Section 3.4).

### 3.3.1.4 *Oncorhynchus mykiss*

Results of standard Permit-based testing are provided below, followed by results of additional copper-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 two Q2 tests (FR\_FRCP1 [survival only], GH\_ERC) and all of the Q4 tests (Figure 3.3-14 to Figure 3.3-19; Table 3.3-1; Table 3.3-2). In the Q2 FR\_FRCP1 test, mean survival was within the local NR and the effect size (10%) was less than 20% compared to the mean response in batch-specific references, indicating no adverse response. In the Q2 GH\_ERC test, mean responses were within the local NR and the effect size (30%) was between 20% and 50% compared to the mean response in batch-specific references. 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 all Q4 tests, mean survival and mean viability were below the local and regional NRs. These results indicate a likely adverse response to the test water.

In Q4, survival and viability were reduced in all three reference waters relative to the laboratory control (Appendix B-4). Based on the presence of adverse responses in each of these upstream site waters, the laboratory concluded that the results were consistent with effects caused by microbial growth, as has been observed previously with the fathead minnow test, rather than indicating a toxicological effect caused by contaminants (Appendix B-4). The large systematic change in survival response between Q2 and Q4 is larger than can be explained from the differences in water chemistry between seasons, suggesting that another factor is at play.

As discussed in the following section, copper-treated tests were conducted in 2017 to evaluate potential effects of microbes on *O. mykiss* responses.

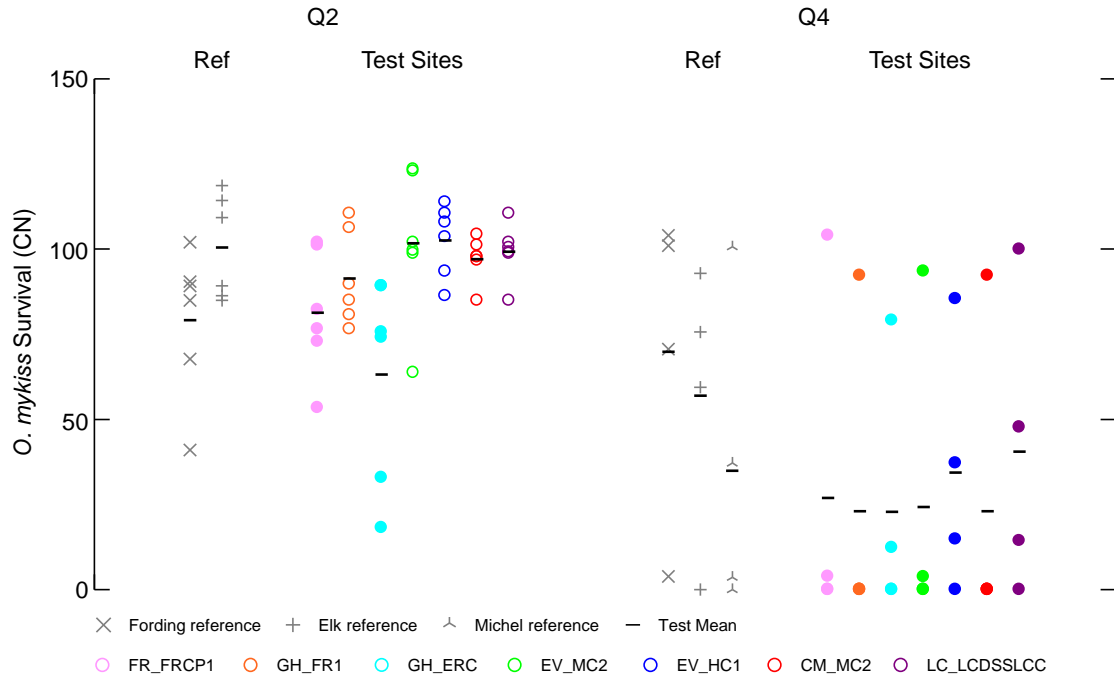
There was no evidence of statistically significant adverse effects on mean *O. mykiss* length or weight in any test (Figure 3.3-20 to Figure 3.3-25; Table 3.3-1; Table 3.3-2).

Based on the results presented above, *O. mykiss* tests were categorized as follows:

- **No adverse response (6 of 14 tests):** Q2 tests with FR\_FRCP1, GH\_FR1, EV\_MC2, EV\_HC1, CM\_MC2, and LC\_LCDSSLCC.
- **Possible adverse response (1 of 14 tests):** Q2 test with GH\_ERC.
- **Likely adverse response (7 of 14 tests):** All Q4 tests.

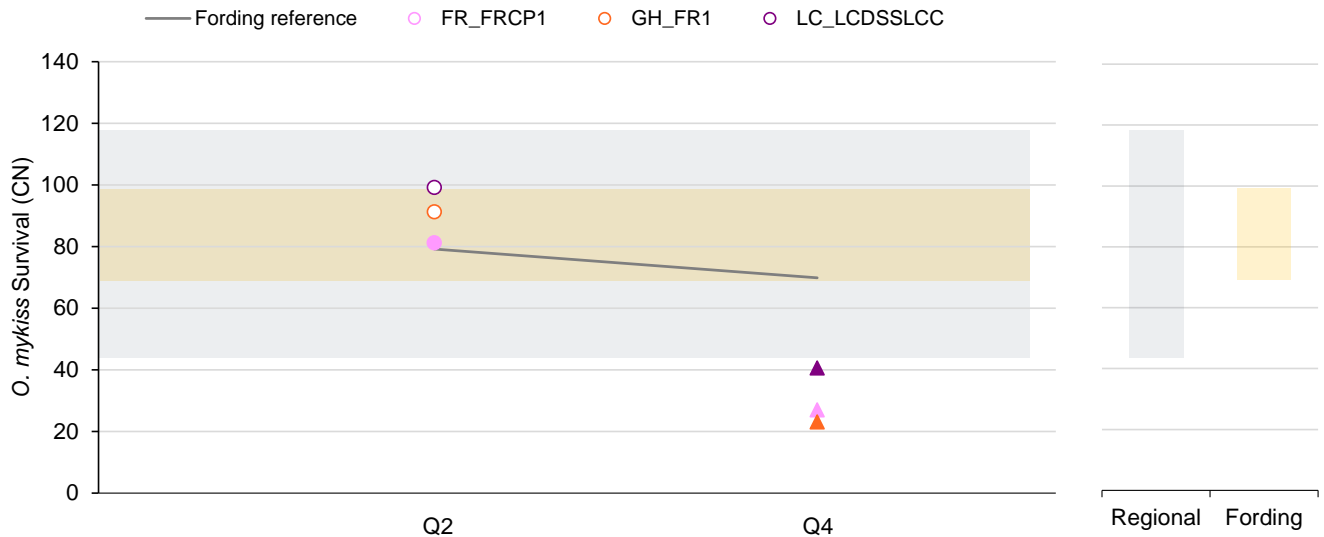
The concentration-response analysis for *O. mykiss* survival and viability is presented in Section 3.4.3.

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



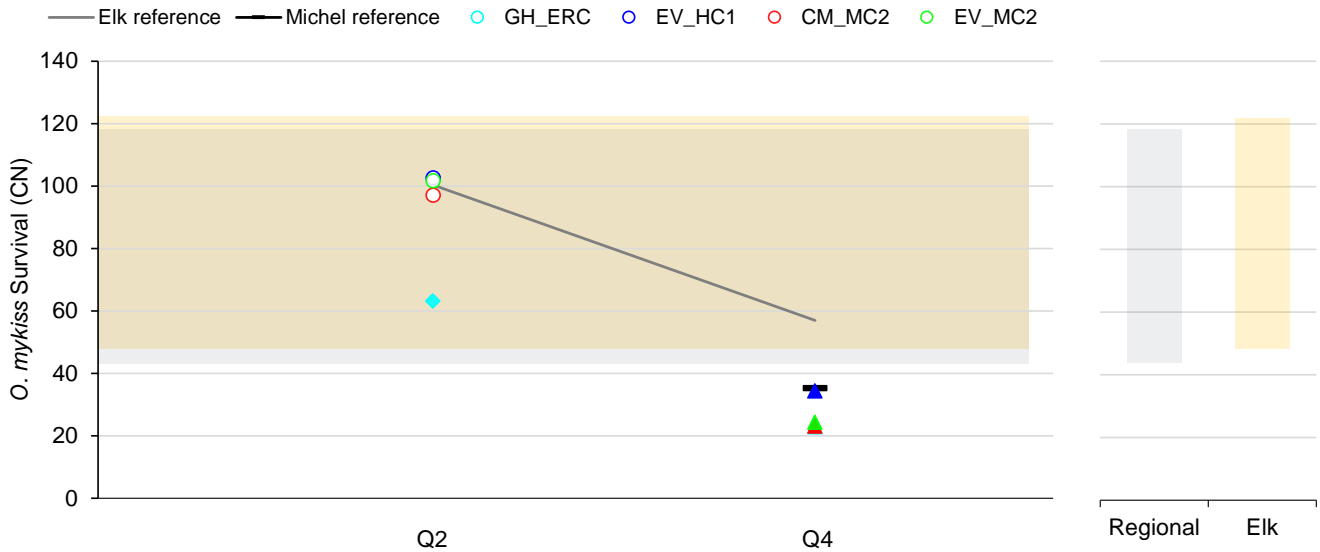
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-15: Mean results for *O. mykiss* survival in the Fording River reference and its paired test site waters.**



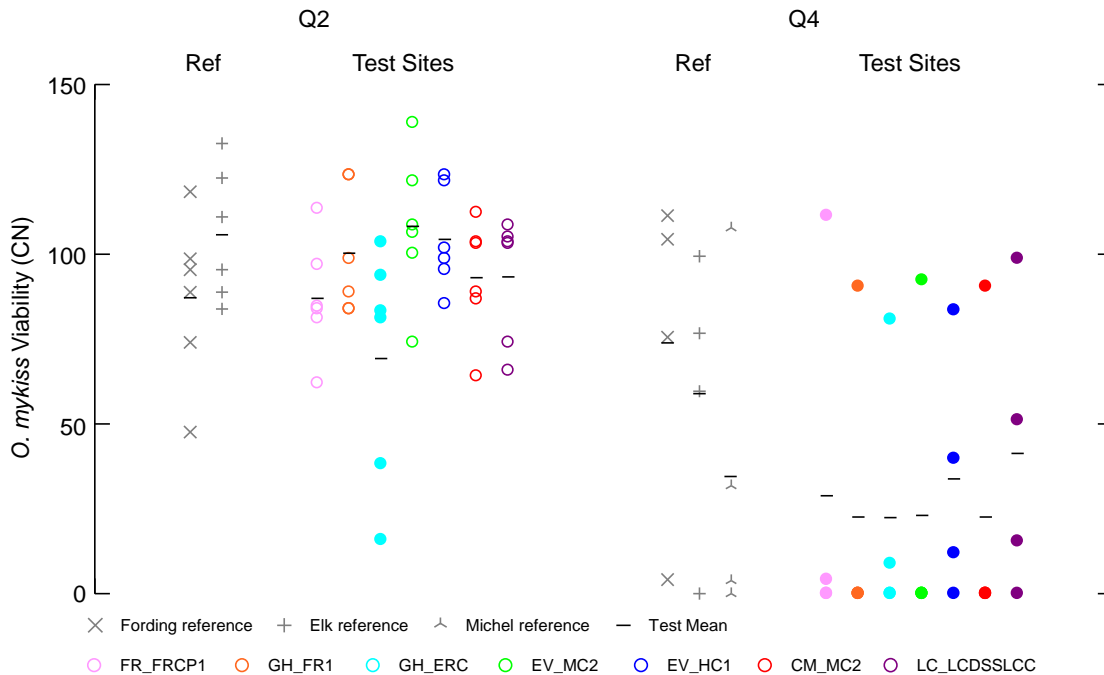
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-16: Mean results for *O. mykiss* survival in the Elk River and Michel Creek references and their paired test site waters.**



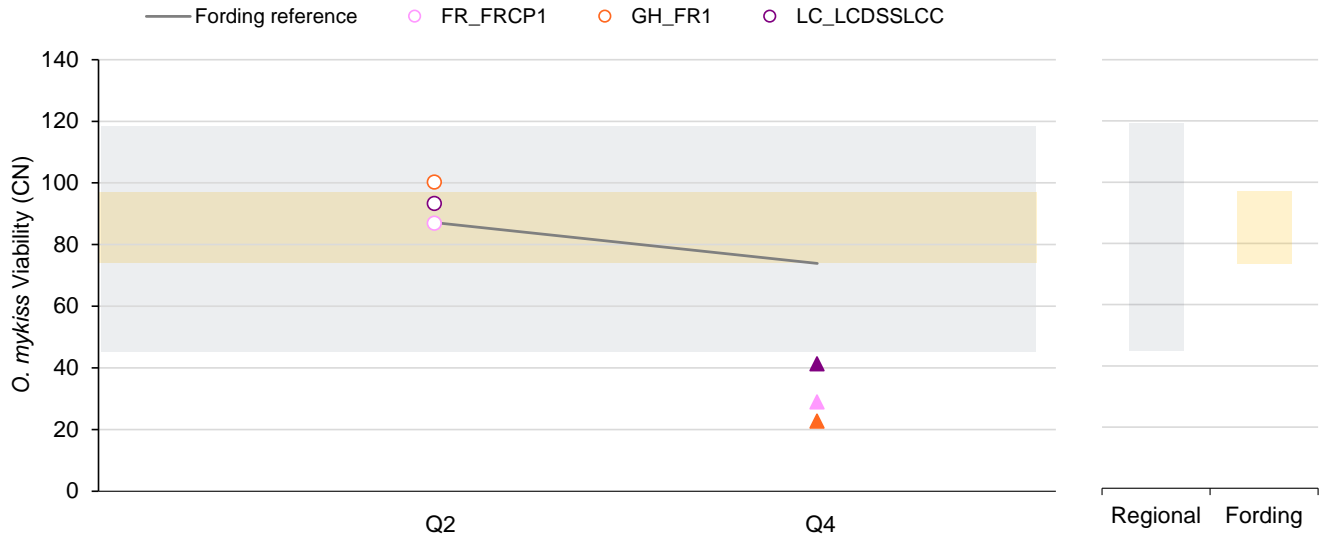
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.3-17: Individual replicate and mean results for *O. mykiss* viability in reference (Ref) and test site waters.**



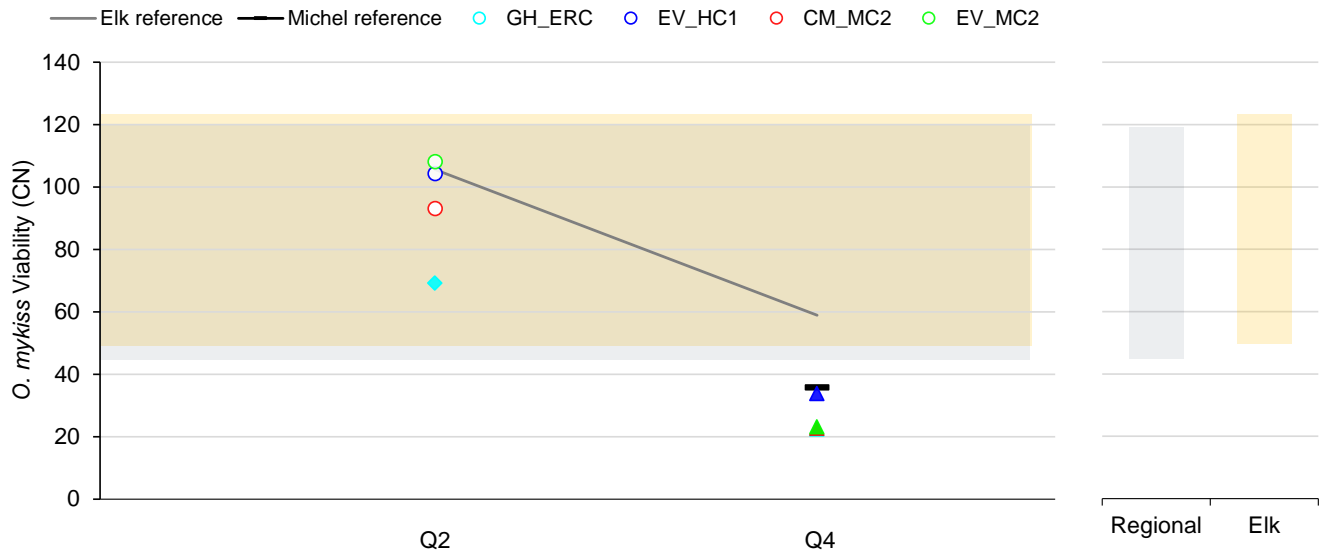
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-18: Mean results for *O. mykiss* viability in the Fording River reference and its paired test site waters.**



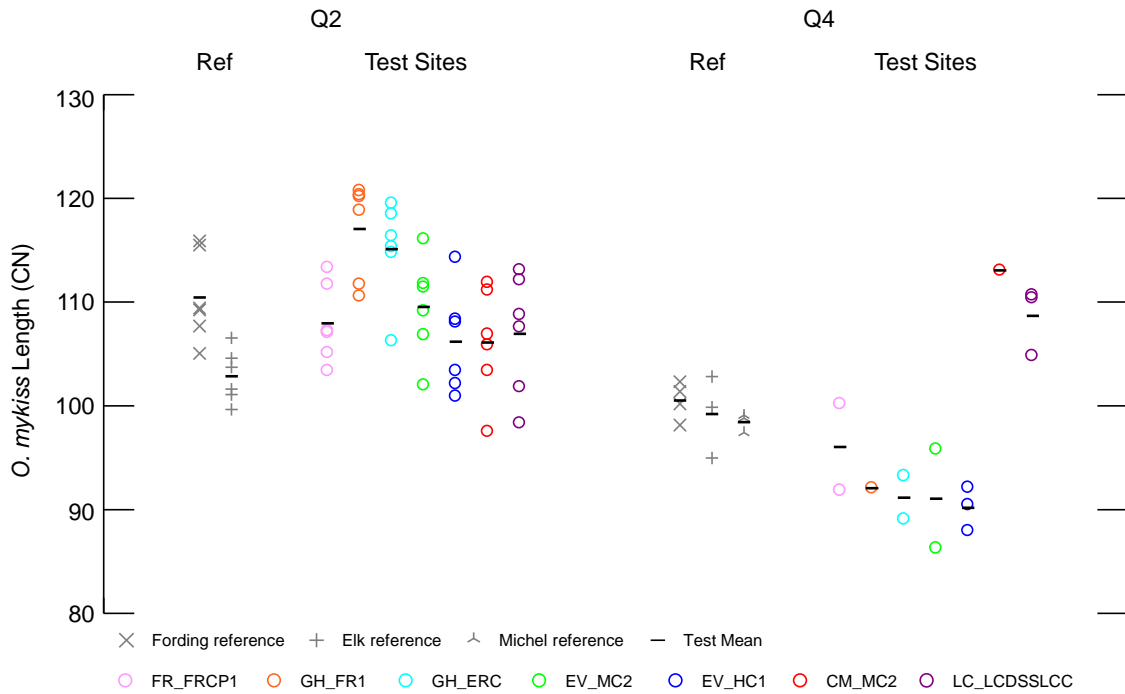
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-19: Mean results for *O. mykiss* viability in the Elk River and Michel Creek references and their paired test site waters.**



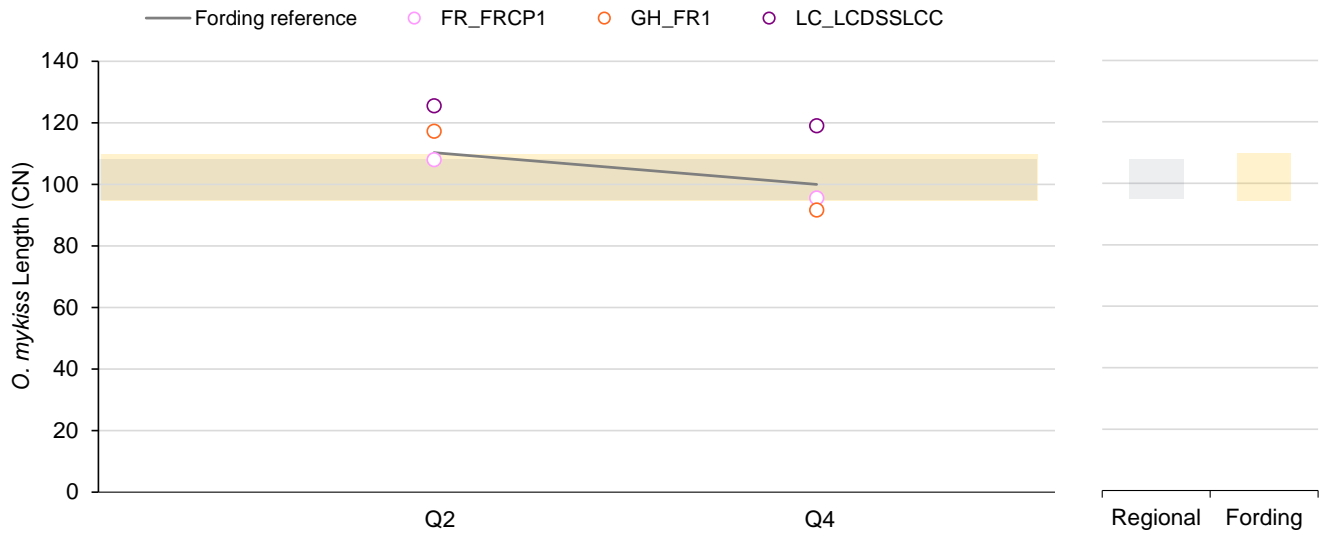
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.3-20: Individual replicate and mean results for *O. mykiss* length in reference (Ref) and test site waters.**



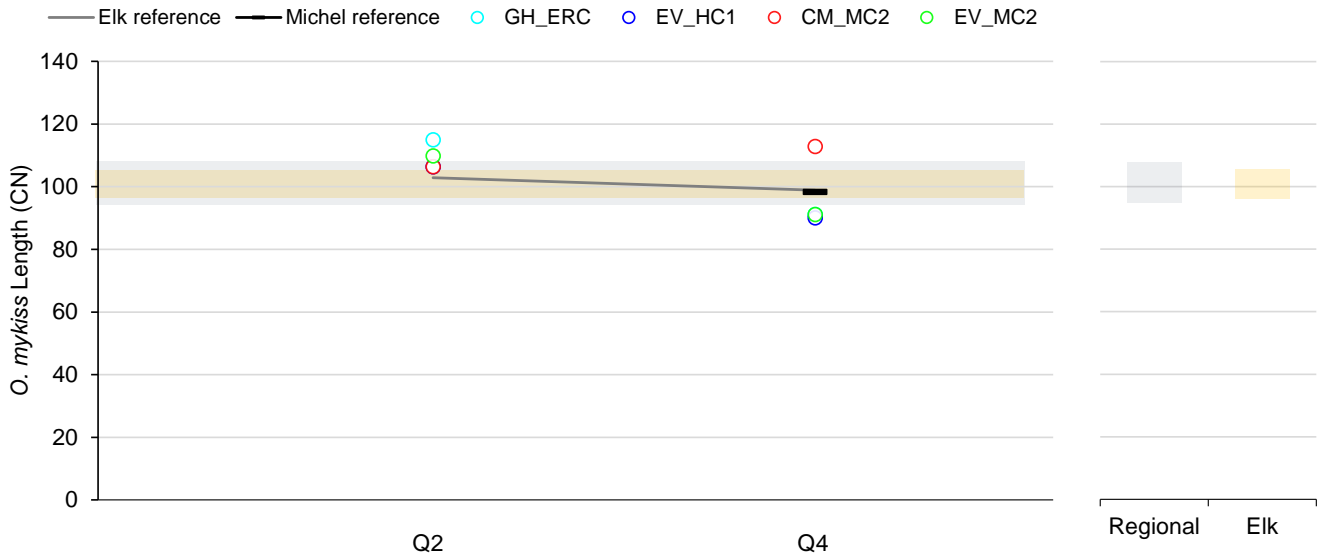
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-21: Mean results for *O. mykiss* length in the Fording River reference and its paired test site waters.**



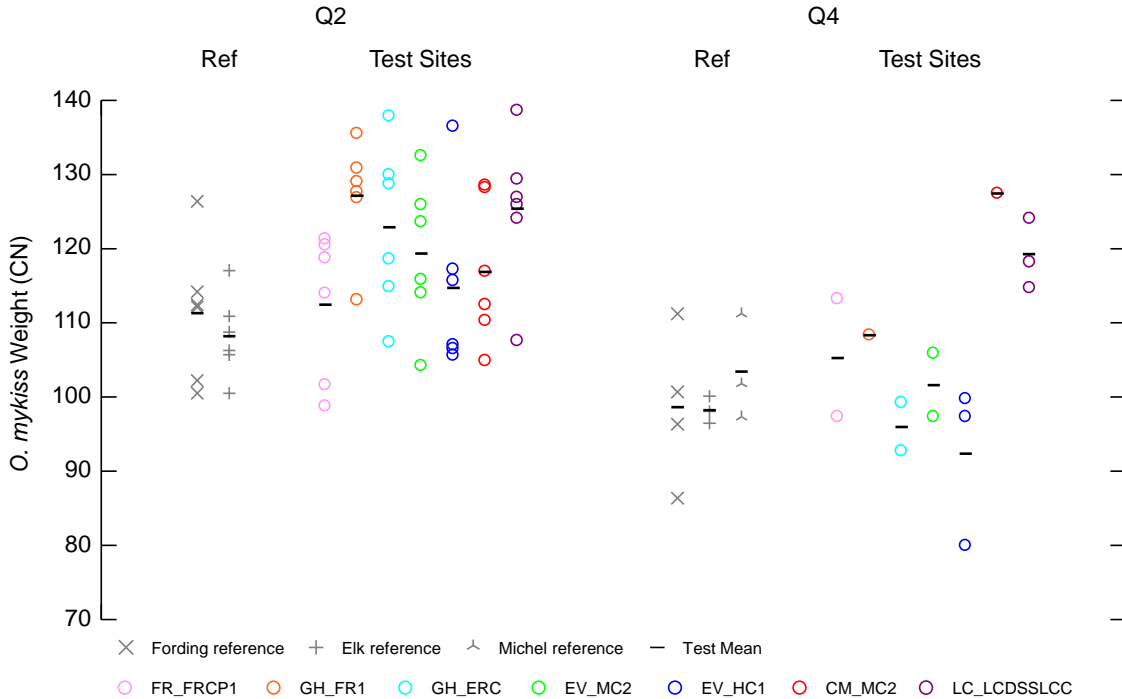
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-22: Mean results for *O. mykiss* length in the Elk River and Michel Creek references and their paired test site waters.**



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

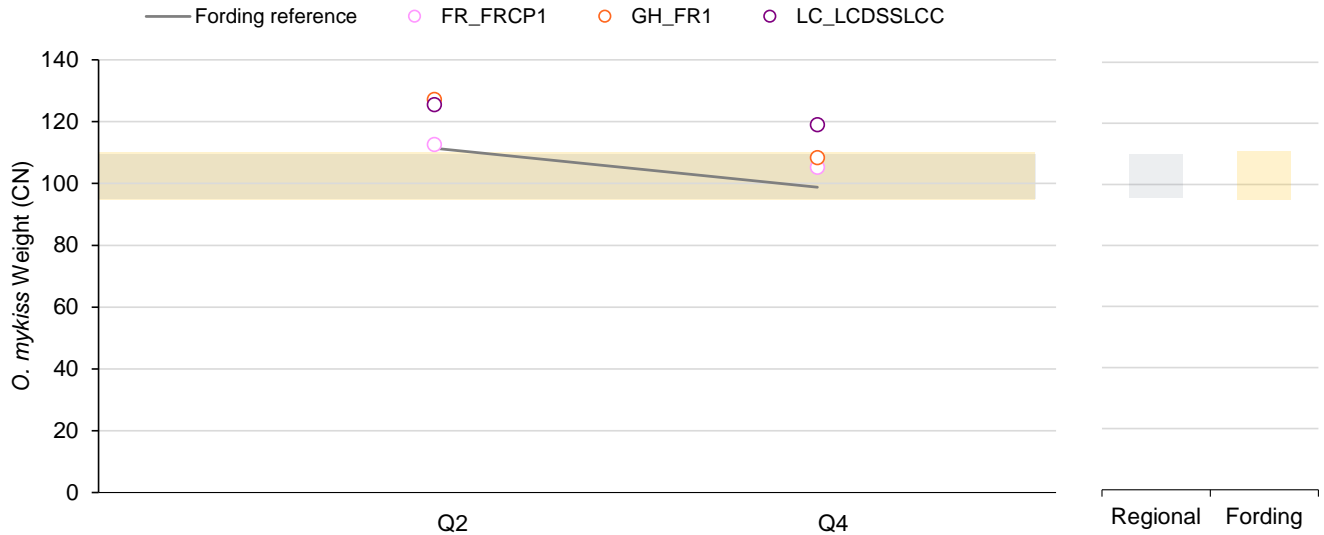
**Figure 3.3-23: Individual replicate and mean results for *O. mykiss* weight in reference (Ref) and test site waters.**



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

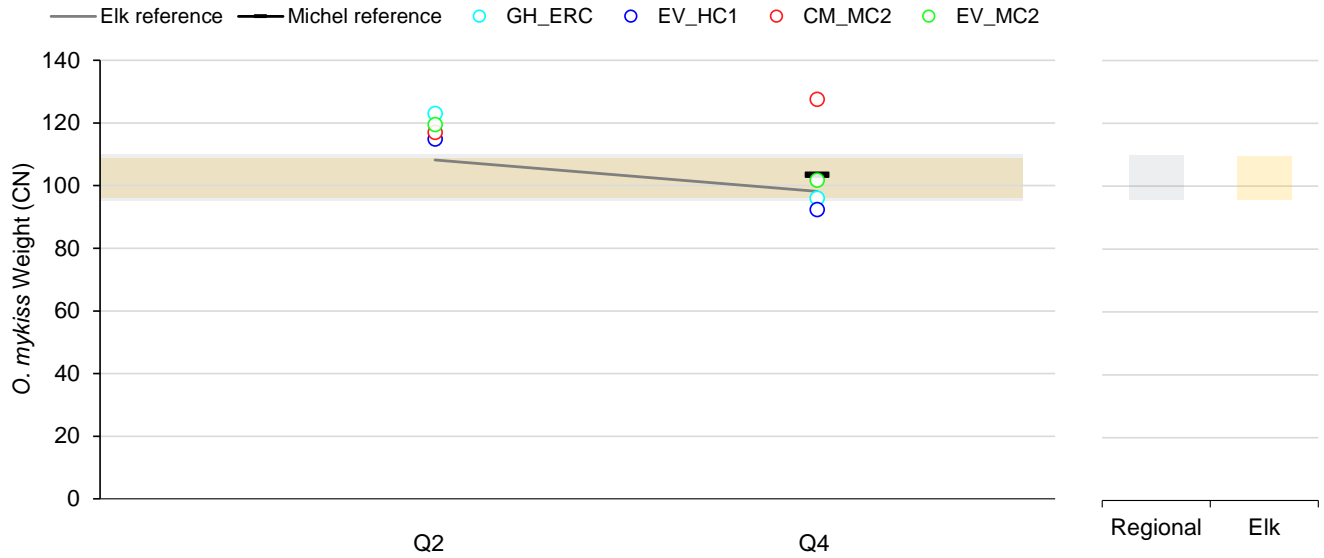


**Figure 3.3-24: Mean results for *O. mykiss* weight in the Fording River reference and its paired test site waters.**



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

**Figure 3.3-25: Mean results for *O. mykiss* weight in the Elk River and Michel Creek references and their paired test site waters.**



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

## Copper-Treated Tests – Preliminary Findings

To evaluate the potential influence of microbes, Nautilus conducted *O. mykiss* tests in Q2 and Q4 with two reference waters (Fording and Michel [Q4 only]) and three test site waters (FR\_FRCP1, GH\_FR1, and CM\_MC2) treated with 10 µg/L copper. Methods and findings from copper-treated *O. mykiss* tests have yet to be formally reported, but an overview was provided at the February 2018 EMC meeting (Teck 2018a). Untreated and copper-treated test results are provided in Table 3.3-3. Individual replicate results are plotted on Figures 3.3-26 to 3.3-29.

There was no evidence of adverse effects on any endpoint in Q2, except for a reduction in length in the FR\_FRCP1 copper-treated test. There was no evidence of adverse effects on length or weight in Q4. Mean results were statistically similar in untreated tests and copper-treated tests in Q2 (all endpoints) and Q4 (length and weight), except for survival in the GH\_FR1 test.

With respect to survival and viability in Q4, there was a high degree of inter-replicate variability in tests conducted with reference and test site waters. Survival and viability in test site waters were significantly reduced relative to one or more references in the untreated tests and copper-treated tests. In reference waters, survival and viability were significantly higher in copper-treated tests compared to untreated tests, but were still lower than the paired laboratory control. In test site waters, survival and viability were similar (FR\_FRCP1, GH\_FR1) or higher (CM\_MC2) in copper-treated tests relative to untreated tests. These results may indicate that the 10 µg/L copper addition was insufficient to curtail microbial growth in these samples, as was observed in a subset of the *P. promelas* tests (Section 3.3.1.5). The 10 µg/L copper addition was also shown to be insufficient to ameliorate microbial responses in some test waters in the fathead minnow supplemental testing conducted over the past two years. At this preliminary stage, it is not known whether additional copper would assist in improving test responses for rainbow trout early life stage endpoints, or whether higher copper exposure may result in toxicological effects, but additional research into this issue is recommended in 2018.

Overall, preliminary findings from the copper-treated tests indicate that effects on *O. mykiss* survival and viability may be related to microbial effects and not a toxicological effect from water quality. This interpretation is based on the following:

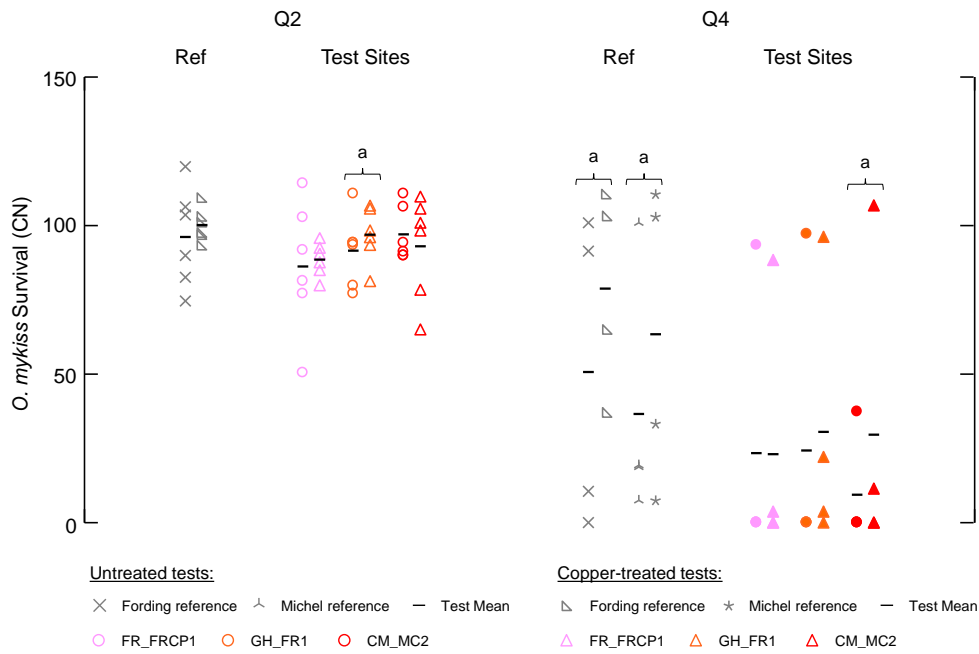
- High degree of inter-replicate variability was observed in Q4 tests conducted with reference and test site waters. If effects were related to a contaminant, then observed responses would be expected to be similar across replicates, and across different batches of tests with similar water quality.
- Responses were similarly large across all stations in Q4, even though stations have different water quality profiles.
- At least one replicate in all seven test waters in Q4 performed well (i.e., survival close to 100%; Figure 3.3-17), a pattern that is not expected if a chemical toxicant was the driver for the responses
- Reference performance dropped between Q2 and Q4.

**Table 3.3-3: Summary of Untreated and Copper-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
<b>Q2 Untreated</b>								
Laboratory Control	77.8 ± 9.6	69.2 ± 9.8	18.5 ± 0.6	76.5 ± 4.5	100 ± 12	100 ± 14	100 ± 3	100 ± 6
Fording River reference	74.8 ± 13	67 ± 8.1	18 ± 0.7	74.4 ± 6.4	96 ± 17	97 ± 12	97 ± 4	97 ± 8
FR_FRCP1	67.2 ± 17	59.6 ± 13	18 ± 0.5	81.3 ± 9.2	86 ± 22	86 ± 19	97 ± 3	106 ± 12
GH_FR1	71.3 ± 9.4 <sup>§</sup>	64 ± 11.5	18 ± 0.8	77.3 ± 6.2	92 ± 12	93 ± 17	97 ± 4	101 ± 8
CM_MC2	75.5 ± 7.1	65.5 ± 11.3	19.4 ± 0.5	87.9 ± 5.5	97 ± 9	95 ± 16	105 ± 3	115 ± 7
<b>Q2 Cu-Treated</b>								
Laboratory Control + 10 µg/L Cu	82 ± 5.5	69.6 ± 13	18.8 ± 0.6	78.1 ± 4.5	100 ± 7	100 ± 19	100 ± 3	100 ± 6
Fording River reference + 10 µg/L Cu	82.1 ± 4.6	74.2 ± 7.5	18.5 ± 0.4	78.5 ± 5.3	100 ± 6	107 ± 11	99 ± 2	101 ± 7
FR_FRCP1 + 10 µg/L Cu	72.6 ± 4.6	67.2 ± 6	<b>17.2 ± 0.9</b>	76.5 ± 6.8	89 ± 6	96 ± 9	<b>92 ± 5</b>	98 ± 9
GH_FR1 + 10 µg/L Cu	79.5 ± 7.6	72 ± 6.5	17.9 ± 0.4	79.8 ± 5.5	97 ± 9	103 ± 9	95 ± 2	102 ± 7
CM_MC2 + 10 µg/L Cu	76.3 ± 14	67.1 ± 19	18.2 ± 1.1	82.4 ± 12	93 ± 17	96 ± 28	97 ± 6	105 ± 16
<b>Q4 Untreated</b>								
Laboratory Control	89.2 ± 8.8	85.8 ± 9.2	18.3 ± 0.2	75.5 ± 6.4	100 ± 10	100 ± 11	100 ± 1	100 ± 8
Fording River reference	45.2 ± 47 <sup>§</sup>	43.5 ± 47 <sup>§</sup>	17.5 ± 0.8	76.8 ± 0.5	51 ± 53 <sup>§</sup>	51 ± 55 <sup>§</sup>	95 ± 4	102 ± 1
Michel Creek reference	32.6 ± 39 <sup>§</sup>	<b>28.5 ± 35<sup>§</sup></b>	18.3 ± 0.3	79.8 ± 11.2	37 ± 43 <sup>§</sup>	<b>33 ± 40<sup>§</sup></b>	100 ± 1	106 ± 15
FR_FRCP1	<b>20.8 ± 42</b>	<b>20.8 ± 42</b>	18.5 ± 0	86.8 ± 0	<b>23 ± 47</b>	<b>24 ± 49</b>	101 ± 0	115 ± 0
GH_FR1	<b>21.7 ± 43.3</b>	<b>21.7 ± 43.3</b>	17.9 ± 0	76.5 ± 0	<b>24 ± 49</b>	<b>25 ± 50</b>	98 ± 0	101 ± 0
CM_MC2	<b>8.3 ± 16.7<sup>§</sup></b>	<b>6.7 ± 13.3<sup>§</sup></b>	18.1 ± 0	80 ± 0	<b>9 ± 19<sup>§</sup></b>	<b>8 ± 16<sup>§</sup></b>	99 ± 0	106 ± 0
<b>Q4 Cu-Treated</b>								
Laboratory Control + 10 µg/L Cu	90.5 ± 14.5	86.4 ± 14.5	17.5 ± 0.5	73 ± 4.8	100 ± 16	100 ± 17	100 ± 3	100 ± 7
Fording River reference + 10 µg/L Cu	71.3 ± 31	69.7 ± 32	17.6 ± 0.9	74 ± 5.8	79 ± 34	81 ± 37	101 ± 5	101 ± 8
Michel Creek reference + 10 µg/L Cu	<b>57.4 ± 46</b>	<b>54.9 ± 45</b>	<b>15.8 ± 1</b>	66.9 ± 6.5	<b>63 ± 51</b>	<b>64 ± 52</b>	<b>90 ± 6</b>	92 ± 9
FR_FRCP1 + 10 µg/L Cu	<b>20.8 ± 39.5</b>	<b>16.7 ± 33.3</b>	15.6 ± 0.9	74.2 ± 5.9	<b>23 ± 44</b>	<b>19 ± 39</b>	90 ± 5	102 ± 8
GH_FR1 + 10 µg/L Cu	<b>27.6 ± 40.6</b>	<b>26.8 ± 40.8</b>	18.2 ± 1	82.2 ± 9.4	<b>31 ± 45</b>	<b>31 ± 47</b>	104 ± 6	112 ± 13
CM_MC2 + 10 µg/L Cu	<b>26.8 ± 46.9</b>	<b>26.8 ± 46.9</b>	19.1 ± 0.6	84 ± 5.6	<b>30 ± 52</b>	<b>31 ± 54</b>	109 ± 3	115 ± 8

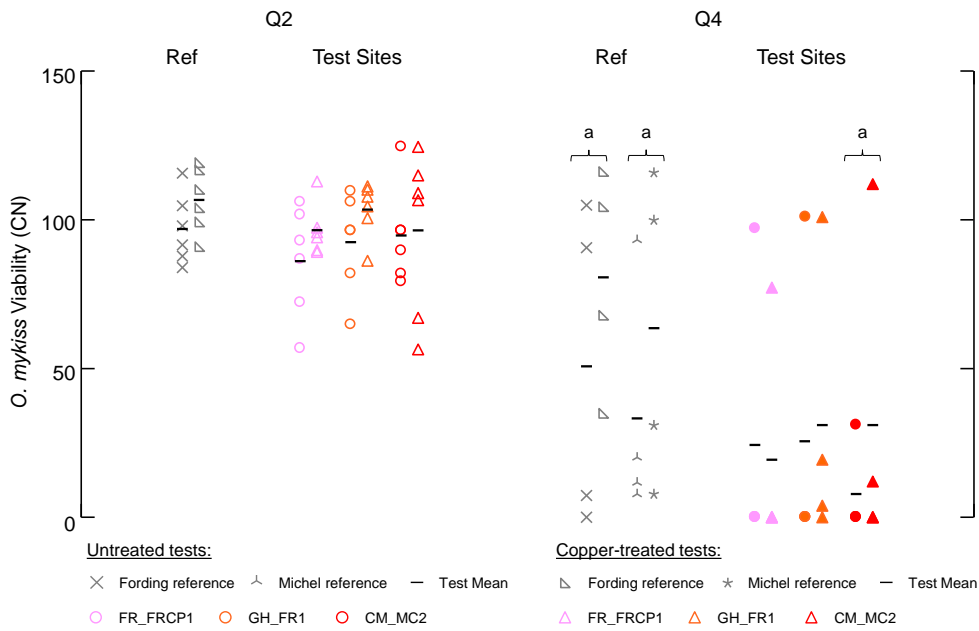
**Notes:**  
 (a) Results presented mean ± standard deviation (SD).  
 µg/L = micrograms per litre; mg = milligrams; mm = millimetres; % = percent; ± = plus or minus.  
**Screening:**  
**Value** = result significantly lower than Fording River reference.  
**Value** = result significantly lower than Michel Creek reference.  
 § = Result was significantly lower than the corresponding 10 µg/L copper (Cu) treated sample.

**Figure 3.3-26: Individual replicate and mean results for *O. mykiss* survival in reference (Ref) and test site waters (untreated and copper-treated).**



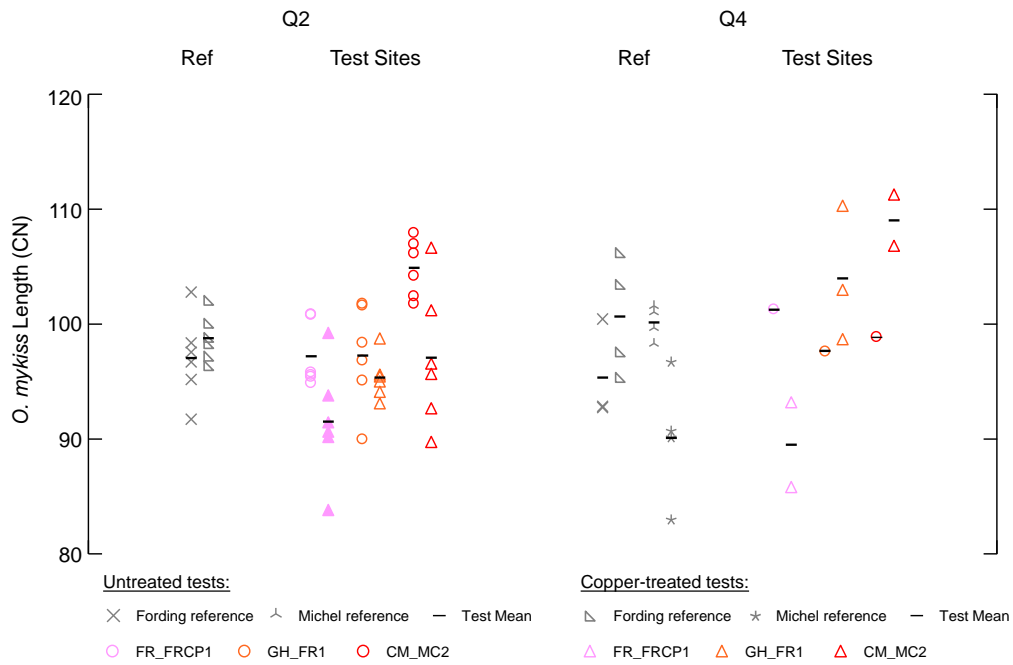
Note: See Figure 2.3-2 for description of lines and symbols. a = mean response in untreated test was significantly lower than corresponding copper-treated sample.

**Figure 3.3-27: Individual replicate and mean results for *O. mykiss* viability in reference (Ref) and test site waters (untreated and copper-treated).**



Note: See Figure 2.3-2 for description of lines and symbols. a = mean response in untreated test was significantly lower than corresponding copper-treated sample.

**Figure 3.3-28: Individual replicate and mean results for *O. mykiss* length in reference (Ref) and test site waters (untreated and copper-treated).**



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

**Figure 3.3-29: Individual replicate and mean results for *O. mykiss* weight in reference (Ref) and test site waters (untreated and copper-treated).**



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

### 3.3.1.5 *Pimephales promelas*

There was no evidence of adverse effects on hatch rate (Figure 3.3-30; Figure 3.3-31), survival (Figure 3.3-32; Figure 3.3-33), biomass (Figure 3.3-34; Figure 3.3-35), length (Figure 3.3-36; Figure 3.3-37), or development (Figure 3.3-38; Figure 3.3-39) except for the following: length in the Q1 CM\_MC2 test, biomass in the Q2 FR\_FRCP1 test, and survival and biomass in the Q2 GH\_FR1 test (Table 3.3-1; Table 3.3-2).

In the Q1 CM\_MC2 test and the Q2 FR\_FRCP1 test, mean responses were within the local NR and the effect size was less than 20% compared to the mean response in batch-specific references (CM\_MC2 = 11%; FR\_FRCP1 = 10%), indicating no adverse response. In the Q2 GH\_FR1 test, survival was below the local and regional NRs whereas biomass was within the local and regional NRs. Compared to the mean response in batch-specific references, the effect size in this test was 35% for survival and 22% for biomass. The survival endpoint indicates a likely adverse response, whereas the biomass endpoint indicates a possible adverse response with elevated uncertainty.

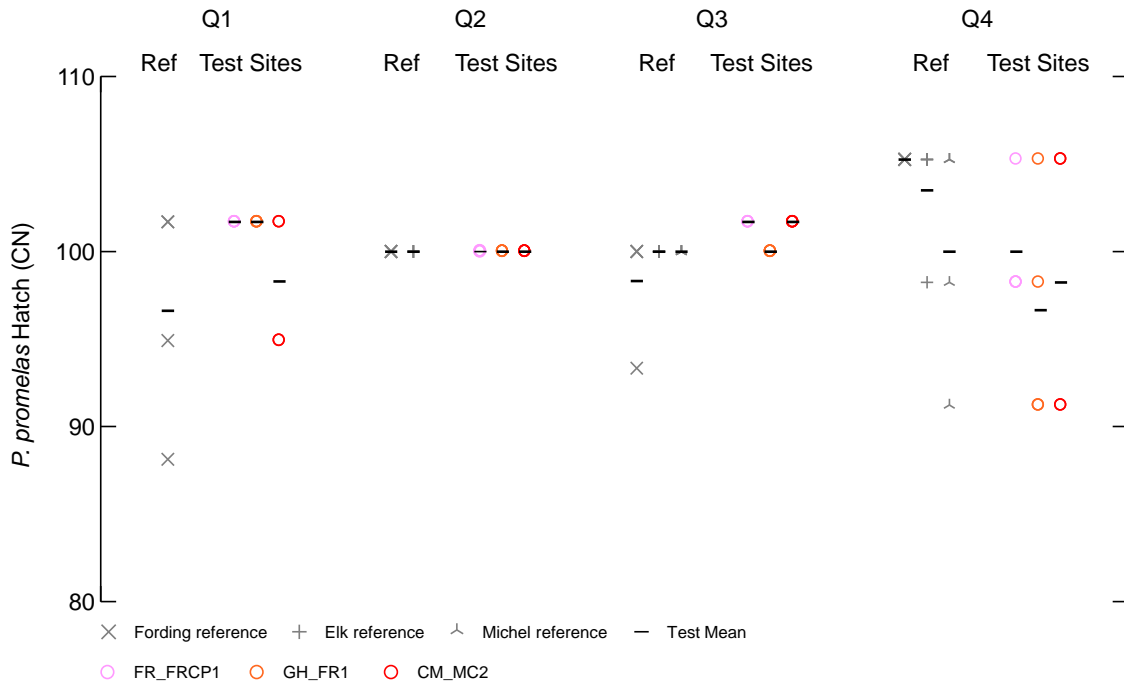
As noted in the laboratory report (Appendix B-2), the addition of 10 µg/L copper successfully curtailed fungal growth in the Q2 GH\_FR1 test, with the exception of one replicate in which fungal growth was noted to be present in association with some individual mortalities. Survival in this replicate was 46.7%. In the other three replicates, survival was  $66.7 \pm 23.1\%$ , which was still below reference performance (Appendix B-2). Similar to the Q2 GH\_FR1 test, in Q3 and Q4, 10 µg/L was insufficient to curtail microbial growth in some of the test site samples (Appendix B-3, B-4). When tests were repeated with 20 µg/L copper, responses in test site waters were statistically similar to reference waters.

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

- **No adverse response (11 of 12 tests).** FR\_FRCP1 (Q1 to Q4), GH\_FR1 (Q1, Q3, Q4), CM\_MC2 (Q1 to Q4).
- **Possible adverse response (0 of 12 tests):** No tests were in this category.
- **Likely adverse response (1 of 12 tests):** GH\_FR1 (Q2).

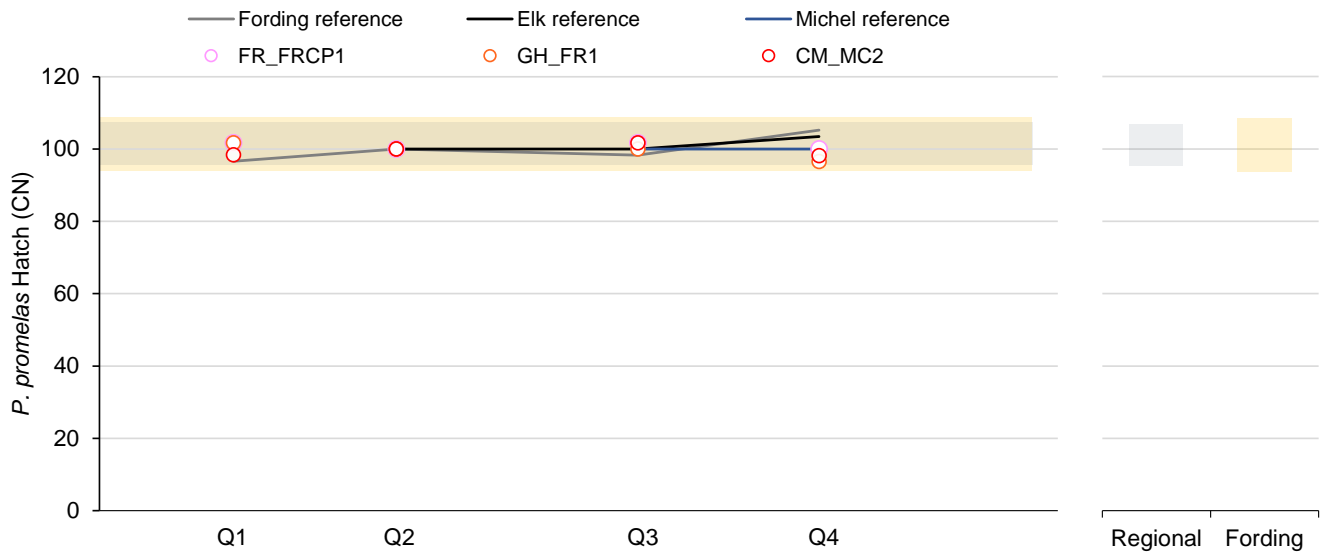
The concentration-response analysis for *P. promelas* survival and biomass is presented in Section 3.4.4.

**Figure 3.3-30: Individual replicate and mean results for *P. promelas* hatch in reference (Ref) and test site waters.**



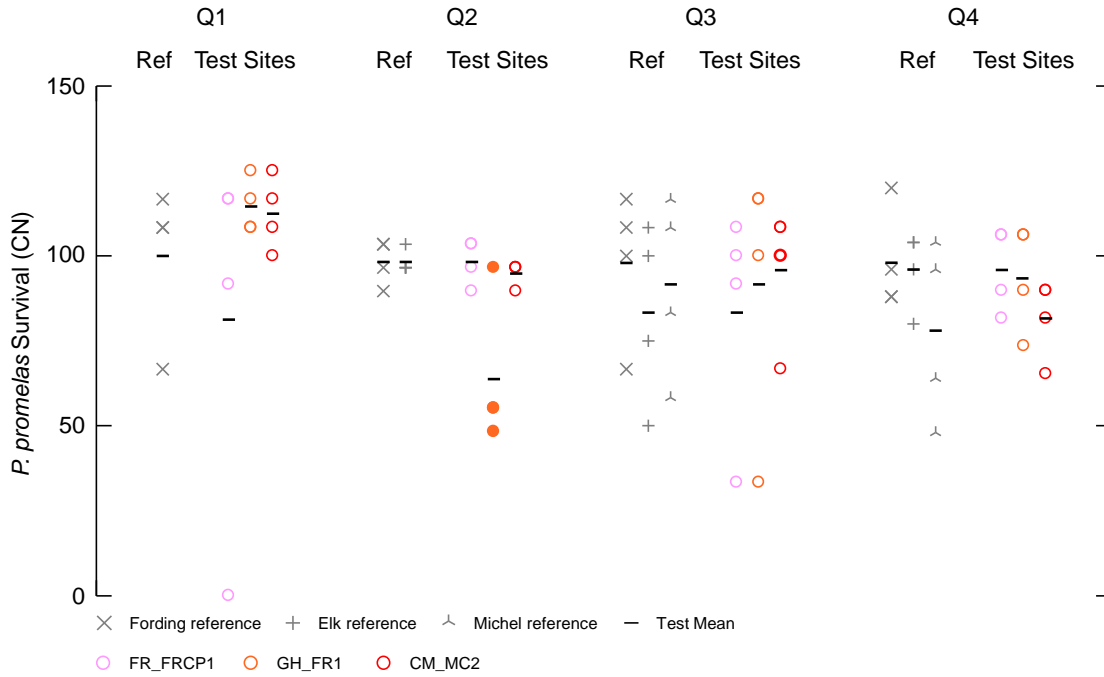
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-31: Mean results for *P. promelas* hatch in reference and test site waters.**



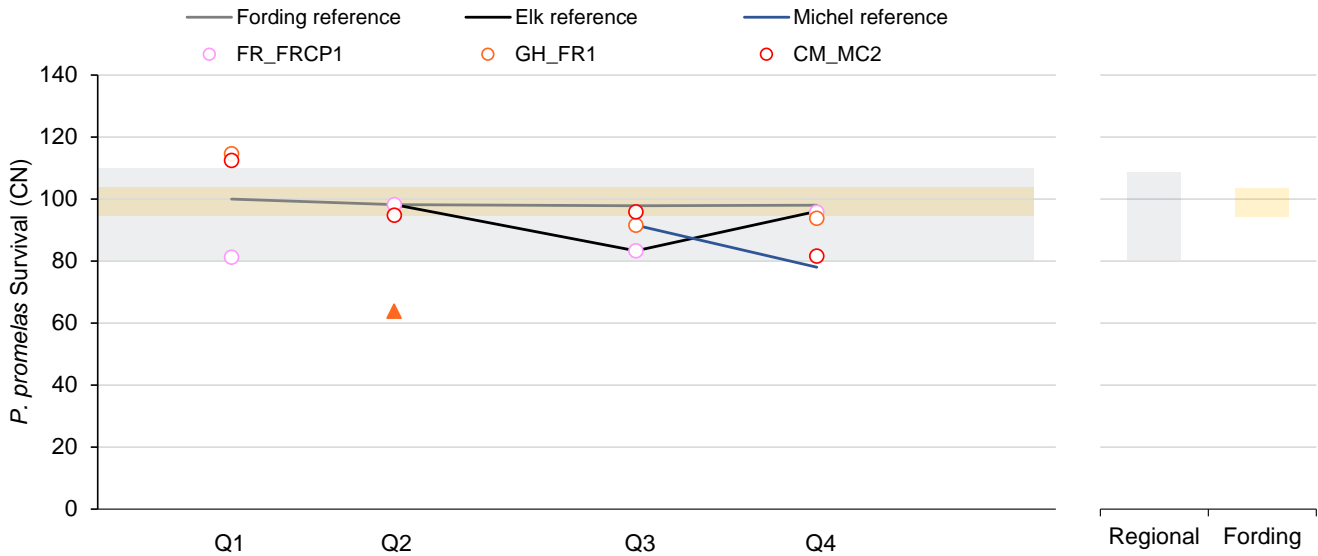
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-32: 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.

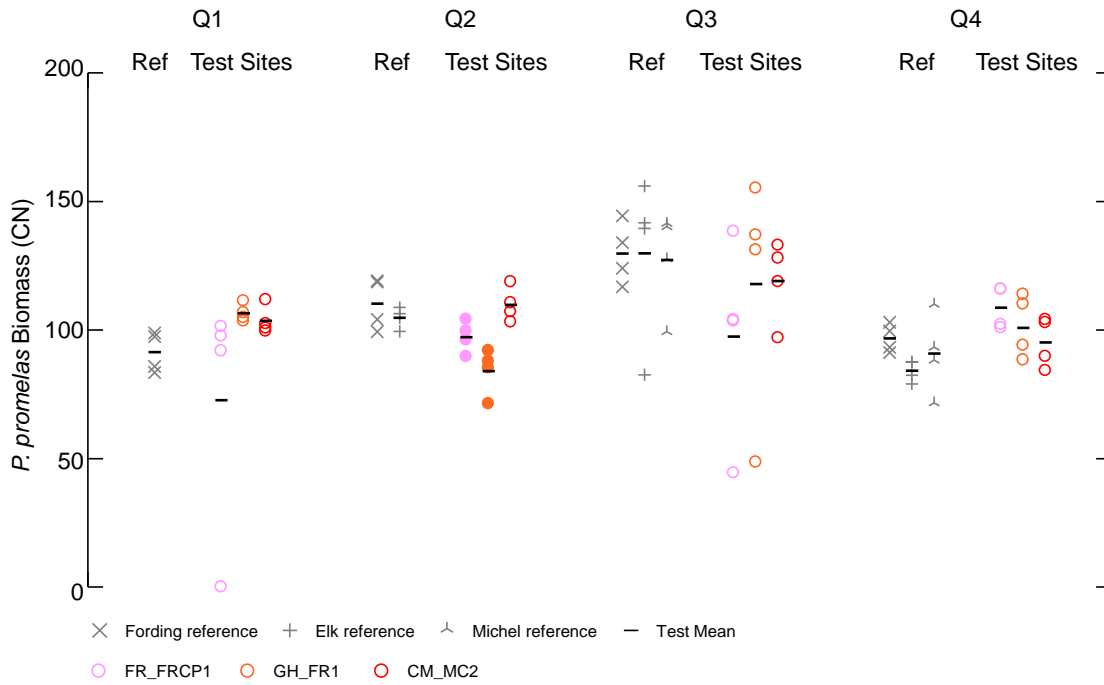
**Figure 3.3-33: Mean results for *P. promelas* survival in reference and test site waters.**



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

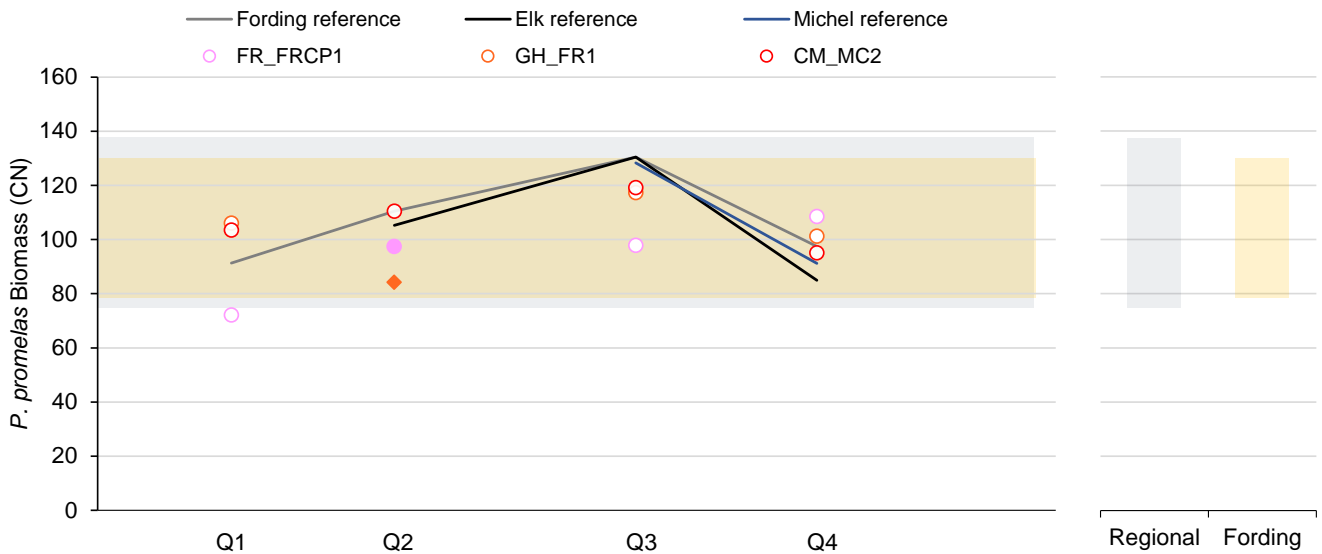


**Figure 3.3-34: Individual replicate and mean results for *P. promelas* biomass in reference (Ref) and test site waters.**



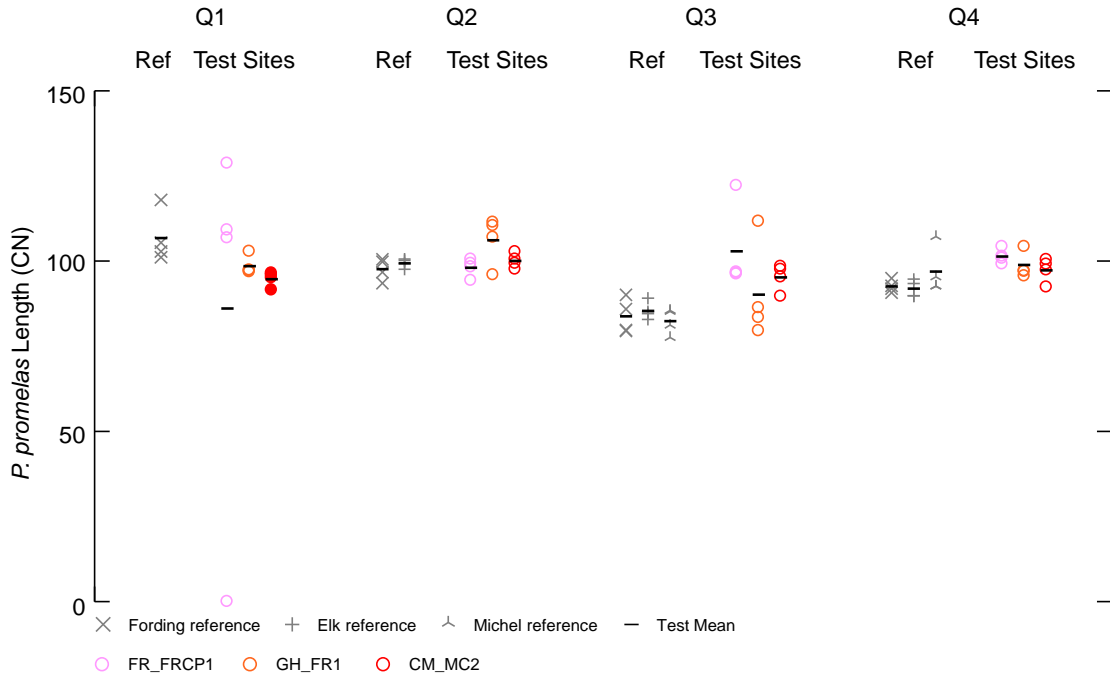
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-35: Mean results for *P. promelas* biomass in reference and test site waters.**



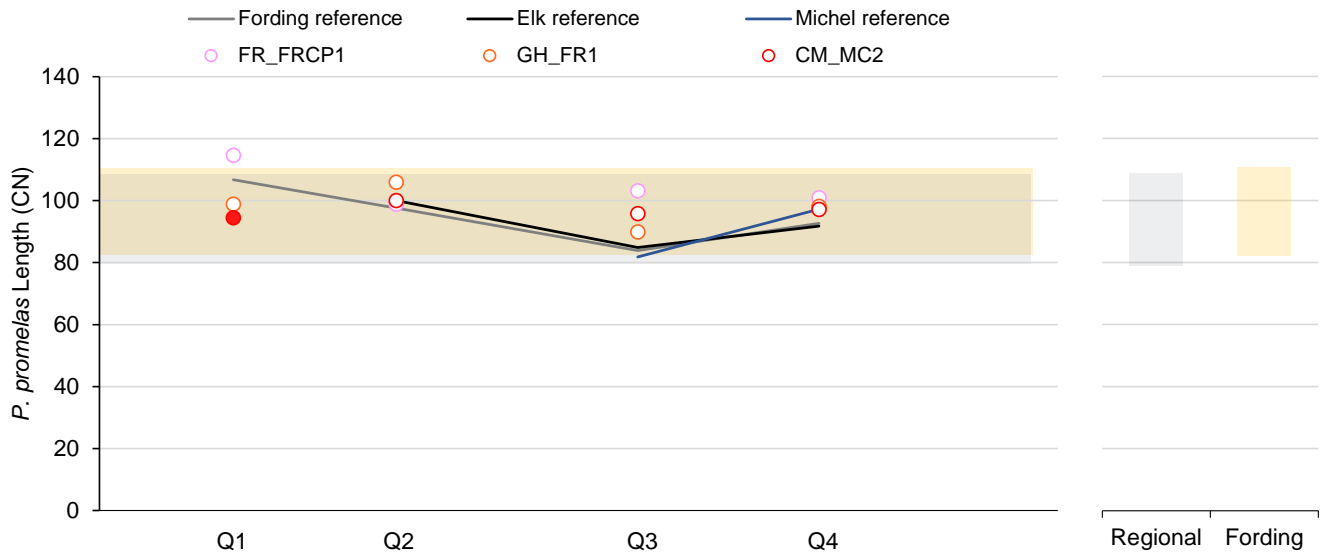
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-36: Individual replicate and mean results for *P. promelas* length in reference (Ref) and test site waters.**



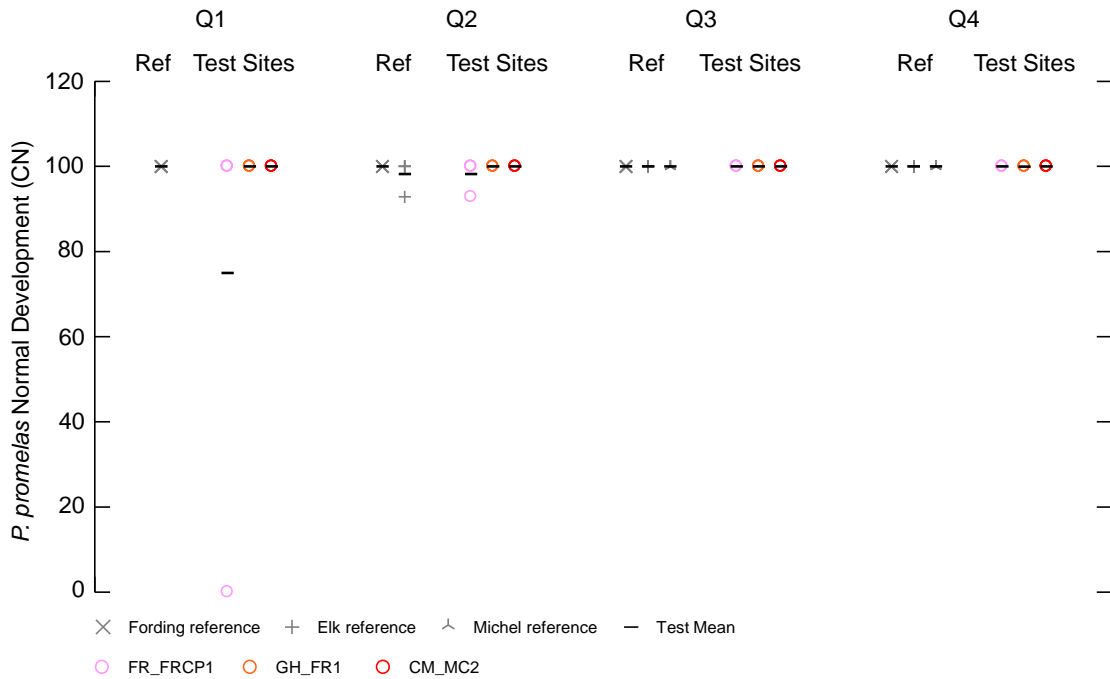
Note: See Figure 2.3-2 for description of lines and symbols.

**Figure 3.3-37: Mean results for *P. promelas* length in reference and test site waters.**



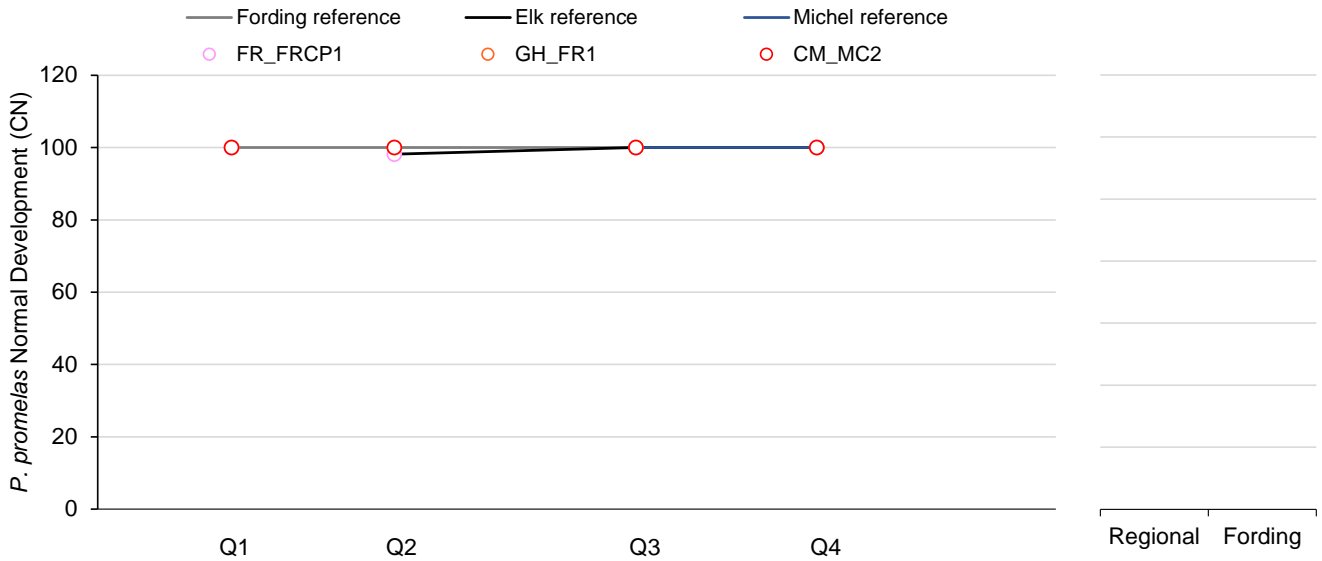
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.3-38: 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 3.3-39: Mean results for *P. promelas* normal development in reference and test site waters.**



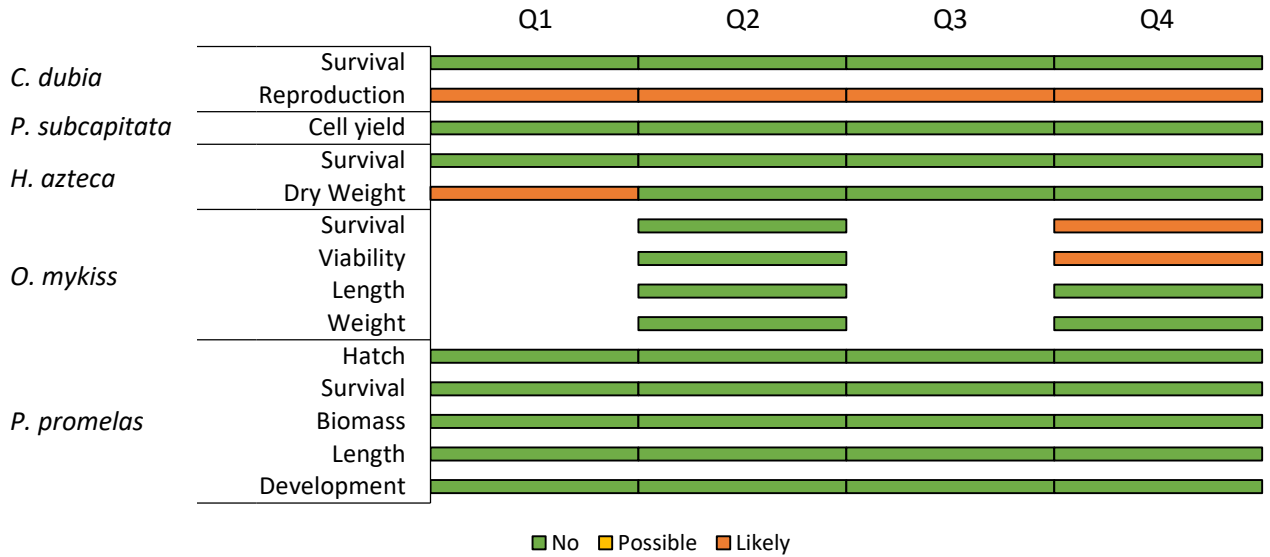
Note: See Figure 2.3-3 for description of lines and symbols. NRs were not calculated for this endpoint due to minimal variability in test response (Section 3.2.3).

### 3.3.2 By Test Site

Results are summarized by test site in Figure 3.3-40 (FR\_FRCP1), Figure 3.3-41 (GH\_FR1), Figure 3.3-42 (GH\_ERC), Figure 3.3-43 (EV\_HC1), Figure 3.3-44 (CM\_MC2), Figure 3.3-45 (EV\_MC2), and Figure 3.3-46 (LC\_LCDSSLCC). Results were as follows:

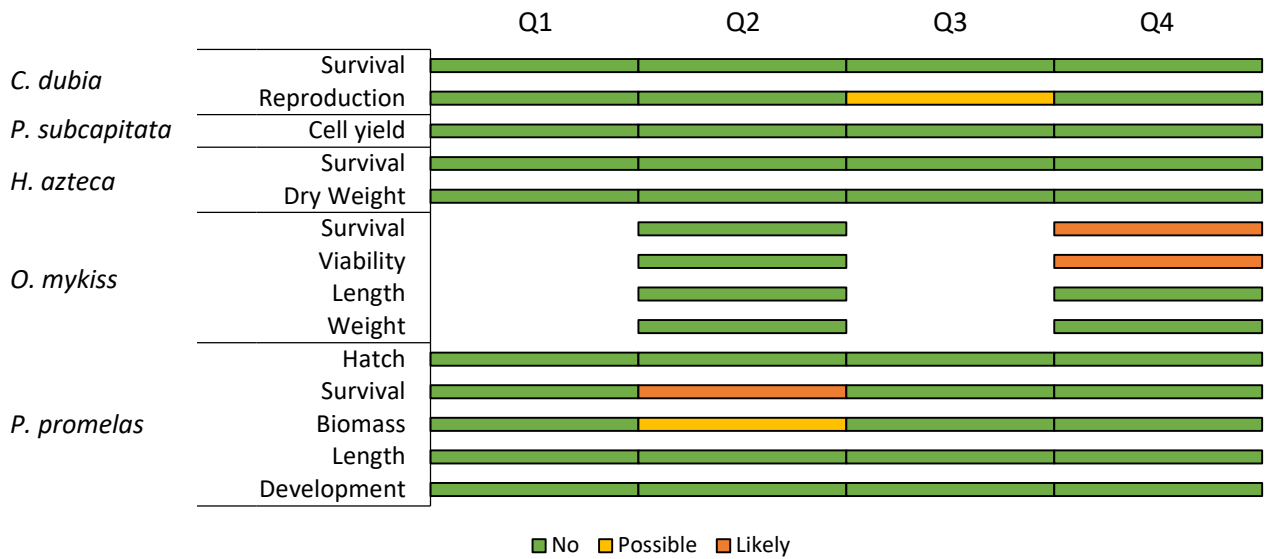
- **FR\_FRCP1.** No adverse responses were observed for most test endpoints (10 of 14). Likely adverse responses were observed in four of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* dry weight (Q1), and *O. mykiss* survival and viability (Q4). As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.
- **GH\_FR1.** No adverse responses were observed for most test endpoints (9 of 14). Possible adverse responses were observed in two of 14 endpoints: *C. dubia* reproduction (Q3) and *P. promelas* biomass (Q2). Likely adverse responses were observed in three of 14 endpoints: *O. mykiss* survival and viability (Q4) and *P. promelas* survival (Q2). As discussed in Sections 3.3.1.4 and 3.3.1.5, there was evidence of microbial effects on these endpoints.
- **GH\_ERC.** No adverse responses were observed for most test endpoints (5 of 7). Possible adverse responses were observed in Q2 for *O. mykiss* survival and viability. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.
- **EV\_HC1.** No adverse responses were observed for most test endpoints (4 of 7). Possible adverse response was observed in Q2 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.
- **CM\_MC2.** No adverse responses were observed for most test endpoints (9 of 14). Likely adverse responses were observed for five of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* survival (Q1 to Q3), *H. azteca* dry weight (Q1 to Q4), and *O. mykiss* survival and viability (Q4). As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.
- **EV\_MC2.** No adverse responses were observed for most test endpoints (4 of 7). Possible adverse response was observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.
- **LC\_LCDSSLCC.** No adverse responses were observed for most test endpoints (4 of 7). Possible adverse response was observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4.

**Figure 3.3-40: Summary of test results by category at FR\_FRCP1.**



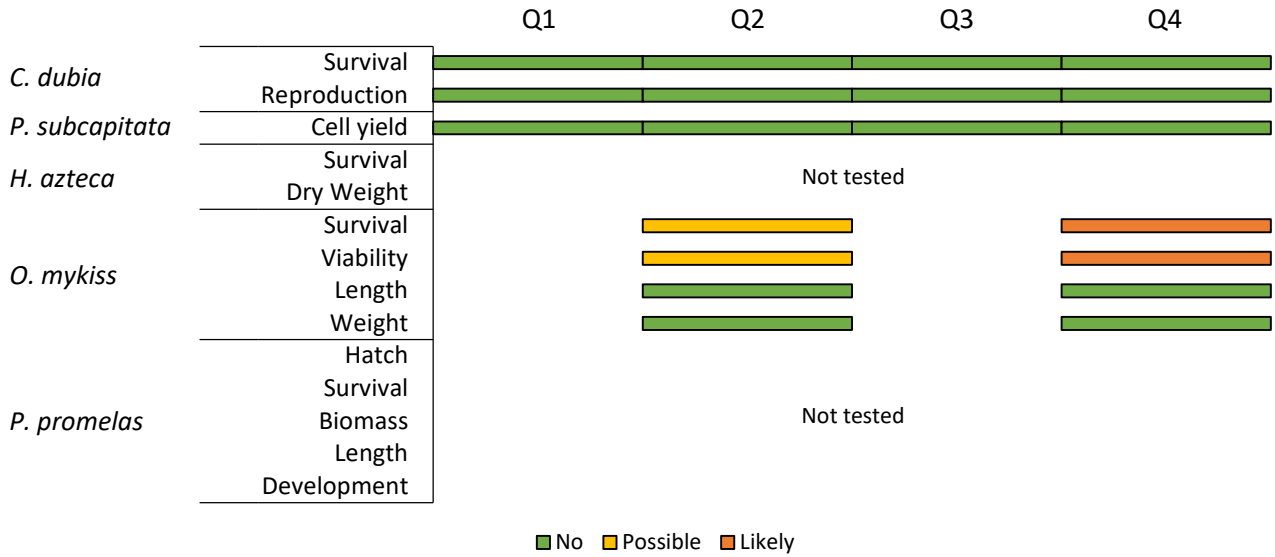
Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-41: Summary of test results by category at GH\_FR1.**



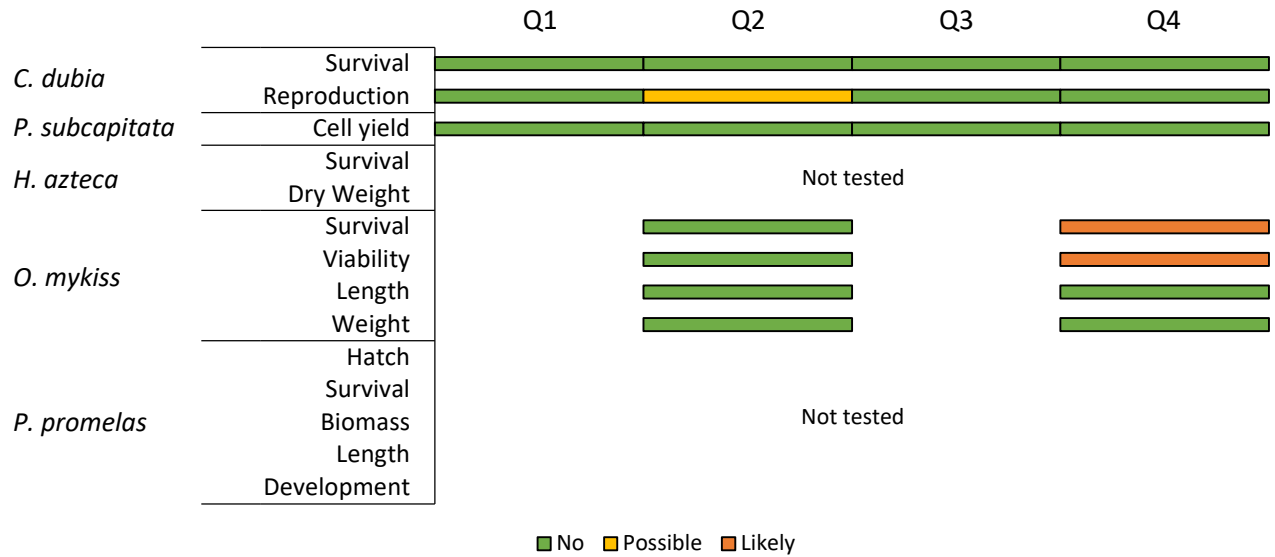
Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-42: Summary of test results by category at GH\_ERC.**



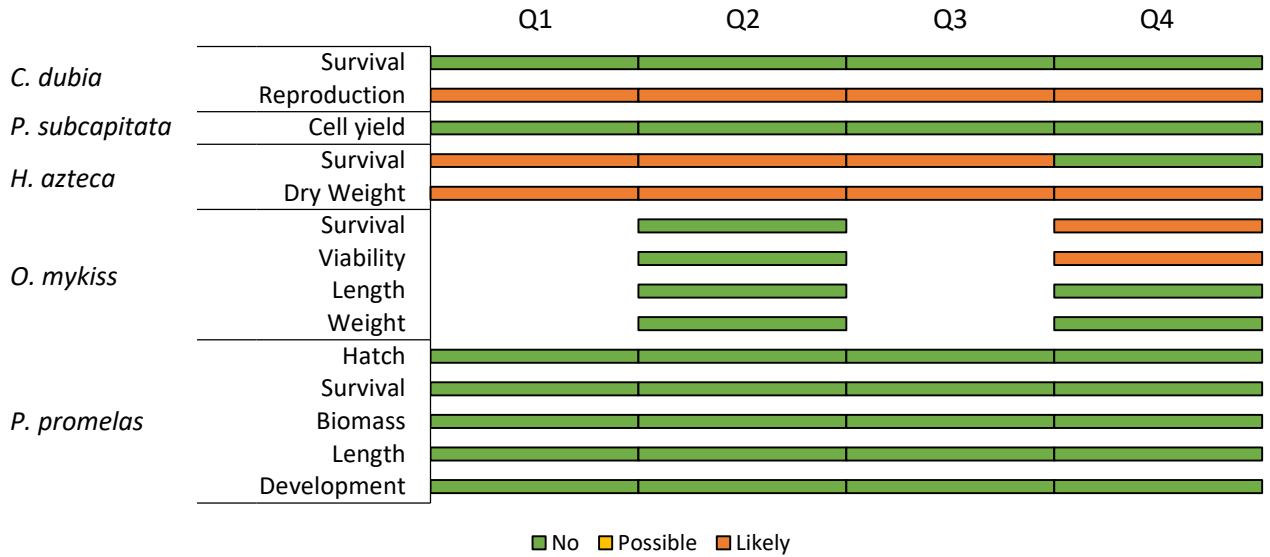
Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-43: Summary of test results by category at EV\_HC1.**



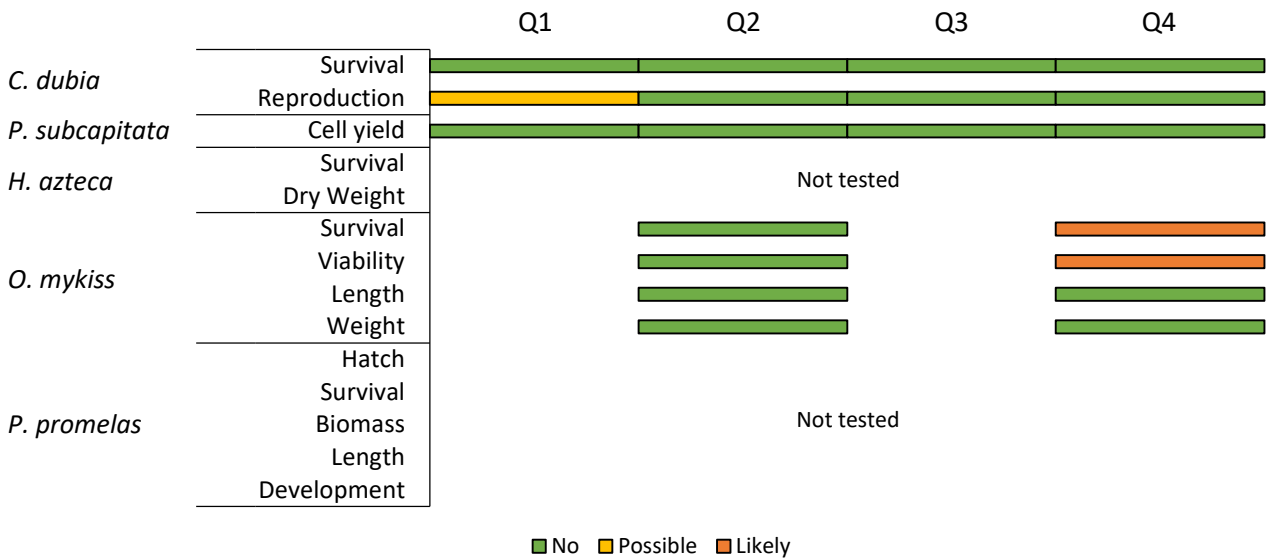
Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-44: Summary of test results by category at CM\_MC2.**



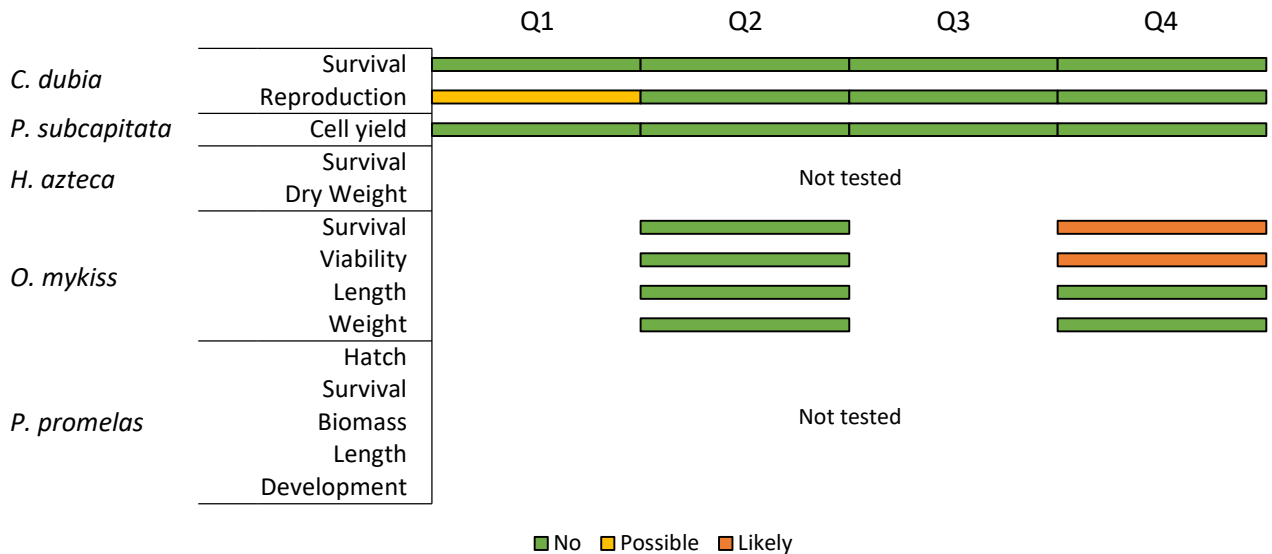
Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-45: Summary of test results by category at EV\_MC2.**



Note: Test results are categorized in Section 3.3.1.

**Figure 3.3-46: Summary of test results by category at LC\_LCDSSLCC.**



Note: Test results are categorized in Section 3.3.1.

### 3.4 Concentration-Response Analysis

Concentration-response analysis was conducted for *C. dubia* reproduction, *H. azteca* growth and survival, *O. mykiss* survival and viability, and *P. promelas* survival and biomass. These are the test endpoints for which possible or likely toxicity responses were observed for one or more test site waters in 2017. The following appendices have supporting information for the analyses:

- Appendix C provides water chemistry data screened against BC WQGs for all 2017 tests conducted with reference and test site waters. Sum of toxic units ( $\Sigma$ 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  $\Sigma$ 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 18 additional parameters<sup>9</sup> with statistically significant negative 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

<sup>9</sup> The 18 parameters were DOC, total lithium, total nickel, nitrite, phosphorus, TDS, TKN, TOC, TSS, turbidity, total vanadium,  $\Sigma$ TUs (calculated using WQGs only and WQGs and EVWQP benchmarks), PC1 scores (combined dataset and 2017 dataset), PC2 scores (combined dataset and 2017 dataset), and PC3 score (combined dataset).



Figure 3.4-6; Table F-1). Although bromide had a statistically significant negative correlation, it was not included in graphical analysis because of low detection frequency<sup>10</sup>. The following PC scores had statistically significant negative Spearman rank correlations:

- **PC1 (combined dataset).** This component accounted for 31.4% of the variance (Table E-1). PC1 had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP parameters (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 several metals, including lead, iron, arsenic, aluminum, and copper.
- **PC3 (combined dataset).** This component accounted for 11.1% of the variance (Table E-1). PC3 had strong positive loadings for total Kjeldahl nitrogen (TKN), manganese, and turbidity, and strong negative loadings for tin and vanadium.
- **PC1 (2017 only dataset).** This component accounted for 35% of the variance (Table E-1). Similar to the combined dataset, PC1 for the 2017 dataset had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP parameters (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).
- **PC2 (2017 only dataset).** This component accounted for 19.1% of the variance (Table E-1). Similar to the combined dataset, PC2 for the 2017 dataset had strong positive loadings for several metals, including lead, iron, vanadium, aluminum, and copper.

Most of the evaluated parameters did not exhibit a consistent concentration-response relationship across all tests (Figure 3.4-1 to Figure 3.4-6). However, a few parameters exhibited a consistent relationship between exposure concentration and magnitude of adverse response; these included nickel, nitrite,  $\Sigma$ TUs (when calculated using BC WQGs and EVWQP benchmarks), and PC1 (using the combined dataset and 2017 only dataset). The potential for these variables to have explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most parameters 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 parameters are not expected to contribute to toxicity in these tests. Parameters 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:

- **CM\_MC2 (Q1 to Q4):** The strongest evidence for causation was observed for nickel. Concentrations of bromide (Q4), cobalt (Q2), nickel, nitrite (Q3), strontium, TDS (Q1 and Q4), 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. However, most of these parameters did not provide strong evidence for causation once available toxicity thresholds were considered. The bromide concentration in Q4 (0.065 mg/L) was more than two orders of magnitude lower than the reported no observable effects concentration of 7.8 mg/L for crustaceans (Flury and Papritz 1993), indicating that it is not likely contributing to toxicity. The cobalt concentrations in Q2 tests (5.2 to 5.6 µg/L) were below effect concentrations from Michel Creek TIE testing ( $IC_{25} > 32.7$  µg/L; Section 3.3.1.3), indicating that it is not likely contributing to toxicity. The nitrite

<sup>10</sup> Of 39 samples, one had a detected concentration of boron (Table D-1).

concentration in Q3 (0.024 mg/L as nitrogen [N]; chloride of 1 mg/L) was below the chronic HC<sub>5</sub> value (0.032 mg/L as N at chloride of 1 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. Strontium concentrations in these tests (0.33 to 0.44 mg/L) were more than an order of magnitude lower than the reported IC<sub>20</sub> of 11 mg/L for *C. dubia* (McPherson et al. 2014), indicating that it is not likely contributing to toxicity. TDS in Q1 and Q4 (733 and 793 mg/L) was lower than the IC<sub>20</sub> for TDS in alkalinity-supplemented Fording River water (1,322 mg/L) (Golder 2013), indicating that it is not likely contributing to toxicity. The nickel concentration in Q1 (24.8 µg/L), Q2 (23.8 µg/L in first test; 26.8 µg/L in second test), Q3 (29.2 µg/L), and Q4 (17.1 µg/L) were greater than the IC<sub>25</sub> for nickel in Michel Creek water (10.8 µg/L; Section 3.3.1.3). With the exception of Q4, nickel concentrations were approximately equal to or greater than the IC<sub>50</sub> for nickel in Michel Creek water (24.6 µg/L; Section 3.3.1.3). These results indicate that nickel likely contributed to observed responses in CM\_MC2 tests.

In addition to the parameters discussed above, the  $\Sigma$ TUs were also higher in these tests than in reference waters and/or test site waters categorized as no adverse response. However, the  $\Sigma$ TU values for CM\_MC2 tests were largely driven by the hazard quotient for nickel. For example, in the  $\Sigma$ 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 54% and 59% of the  $\Sigma$ TU value. These results indicate that the relationship between  $\Sigma$ 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  $\Sigma$ 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  $\Sigma$ TUs) are not necessary to explain observed toxicity, and reinforces that nickel was the only parameter identified as having strong evidence for causing adverse responses in these tests.

- **FR\_FRCP1 (Q1 and Q4):** The evidence for this location was less strong and consistent relative to CM\_MC2, but also identified nickel as a potential cause of the adverse response in these tests. Concentrations of lithium (Q1 only), selenium, sulphate, TDS, and components of TDS (e.g., calcium) were higher in these tests than reference waters and test site waters categorized as no adverse response<sup>11</sup>. However, most of these parameters did not provide strong evidence for causation once available toxicity thresholds were considered. The lithium concentration in the Q1 test (0.0564 mg/L) was lower than the reported IC<sub>25</sub> of 0.32 mg/L for *C. dubia* (Kszos et al. 2003)<sup>12</sup>, indicating that it is not likely contributing to toxicity. The selenium concentrations in these tests (149 µg/L in Q1 and 124 µg/L in Q4) were equal to or lower than the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013), indicating that it is not likely contributing to toxicity. The sulphate concentration in these tests (531 mg/L in Q1 and 510 mg/L in Q4) were lower than the IC<sub>20</sub> value for sulphate in alkalinity-supplemented Fording River water (840 mg/L) (Golder 2013), indicating that it is not likely contributing to toxicity. TDS in these tests (1,140 mg/L in Q1 and 980 mg/L in Q4) were lower than the IC<sub>20</sub> for TDS in alkalinity-supplemented Fording River water (1,322 mg/L) (Golder 2013), indicating that it is not likely contributing to toxicity.

<sup>11</sup> 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 2018b).

<sup>12</sup> Sodium has been shown to ameliorate lithium toxicity (Kszos et al. 2003). The sodium concentration in the Q1 FR\_FRCP1 test (2.3 mg/L) was similar to conditions in which the IC<sub>25</sub> was derived (2.8 mg/L), making the effect concentration from Kszos et al. (2003) relevant to the FR\_FRCP1 test.

Although nickel concentrations in these tests were below concentrations measured in reference tests and tests categorized as no adverse response, Figure 3.4-2 indicates that responses in Q1 and Q4 may be related to nickel. Concentrations of nickel in Q1 (10.2 µg/L) and Q4 (8.8 µg/L) were approximately equal to (Q1) or slightly below (Q4) the  $IC_{25}$  for nickel in Michel Creek water (10.8 µg/L). These results indicate that nickel may have contributed to observed responses.

In addition to the parameters discussed above, the  $\Sigma$ TUs were also higher in these tests than in reference waters and/or test site waters categorized as no adverse response. However, the  $\Sigma$ TU values for these tests were largely driven by the hazard quotient for selenium and nickel. When calculated using BC WQGs and EVWQP benchmarks, the selenium hazard quotient accounted for 54% of the  $\Sigma$ TU value in Q1 and 55% of the  $\Sigma$ TU value in Q4. When calculated using BC WQGs only, the selenium hazard quotient accounted for 86% of the  $\Sigma$ TU value in Q1 and Q4. For nickel, the hazard quotient accounted for 14% of the  $\Sigma$ TU value in Q1 and 15% of the  $\Sigma$ TU value in Q4 when using BC WQGs and EVWQP benchmarks. When using BC WQGs only, the nickel hazard quotient accounted for 2% in Q1 and 3% in Q4. These results indicate that the relationship between  $\Sigma$ TU values and reduced reproduction is largely driven by selenium (which was discussed above as not likely contributing to toxicity) and nickel (which was identified above as potentially contributing to toxicity). If the hazard quotients for selenium and nickel were excluded from the calculation, then the  $\Sigma$ TUs calculated using BC WQGs and EVWQP benchmarks for these tests 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  $\Sigma$ TUs) are not contributing to toxicity. Overall, nickel was the only parameter identified as the potential cause of the adverse response in these tests.

- **FR\_FRCP1 (Q2):** Overall, no water quality parameter was identified as a potential cause of the observed response in this test. The concentration of vanadium was higher in this test than reference waters and test site waters categorized as no adverse response. However, given that the vanadium concentration in this test (3.2 µg/L) is below the federal water quality guideline of 120 µg/L (Environment Canada 2016), vanadium is not expected to have contributed to the observed response.

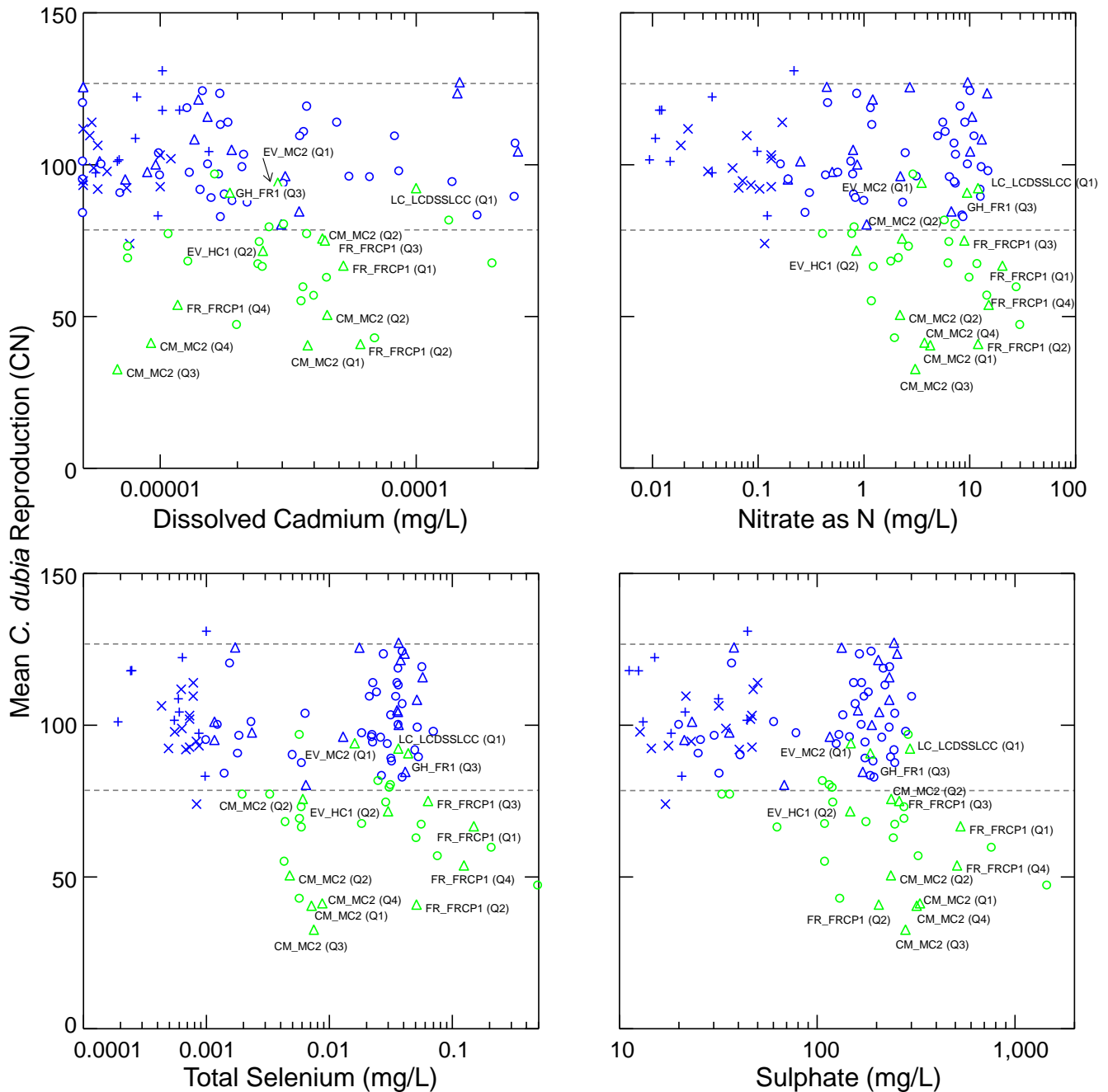
In addition to vanadium, the  $\Sigma$ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the  $\Sigma$ TU value for this test was largely driven by the hazard quotient for selenium. When calculated using BC WQGs and EVWQP benchmarks, the selenium hazard quotient accounted for 32% of the  $\Sigma$ TU value. When calculated using BC WQGs only, the selenium hazard quotient accounted for 74% of the  $\Sigma$ TU value. These results indicate that the relationship between  $\Sigma$ TU and reduced reproduction is largely driven by selenium, which is likely spurious—selenium is not likely contributing to toxicity given that the selenium concentration in this test (51 µg/L) was lower than the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013). If the hazard quotient for selenium were excluded from the calculation, then the  $\Sigma$ 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  $\Sigma$ TUs) are not contributing to toxicity.

- **FR\_FRCP1 (Q3):** Overall, no water quality parameter was identified as a potential cause of the observed response in this test. The concentration of TKN was higher than in both reference waters and test site waters categorized as no adverse response, but the magnitude of the difference was small (19%), indicating that it is not likely contributing to toxicity. In addition to TKN, the  $\Sigma$ TU calculated using BC WQGs only was higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the  $\Sigma$ TU value for this test was largely driven by the hazard quotient for selenium, which accounted for 84% of the  $\Sigma$ TU value. This indicates that the relationship between  $\Sigma$ TU and reduced reproduction is largely

driven by selenium, which is likely spurious given that the selenium concentration in this test (63 µg/L) was lower than the maximum concentration tested in a mixture toxicity study that resulted in no adverse effects (149 µg/L) (Golder 2013). When the hazard quotient for selenium is excluded from the calculation, the  $\Sigma$ TU for this test is 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  $\Sigma$ TUs) are not contributing to toxicity.

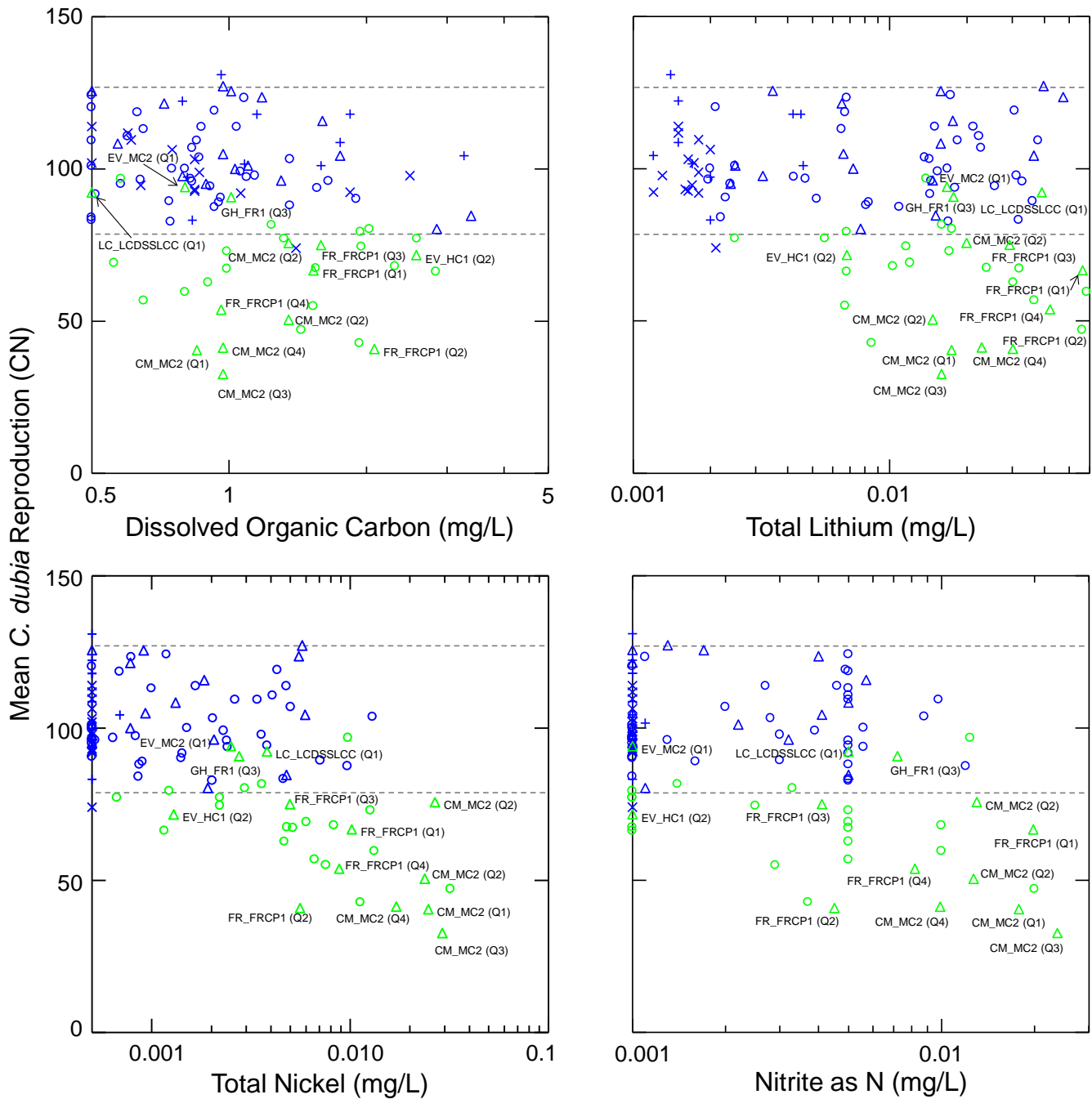
- **EV\_HC1 (Q2), EV\_MC2 (Q1), GH\_FR1 (Q3), and LC\_LCDSSLCC (Q1):** No water quality parameter was identified as a potential cause of the observed responses in these tests. Concentrations of all parameters in these tests were equal to or lower than concentrations in reference waters and/or test site 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).**



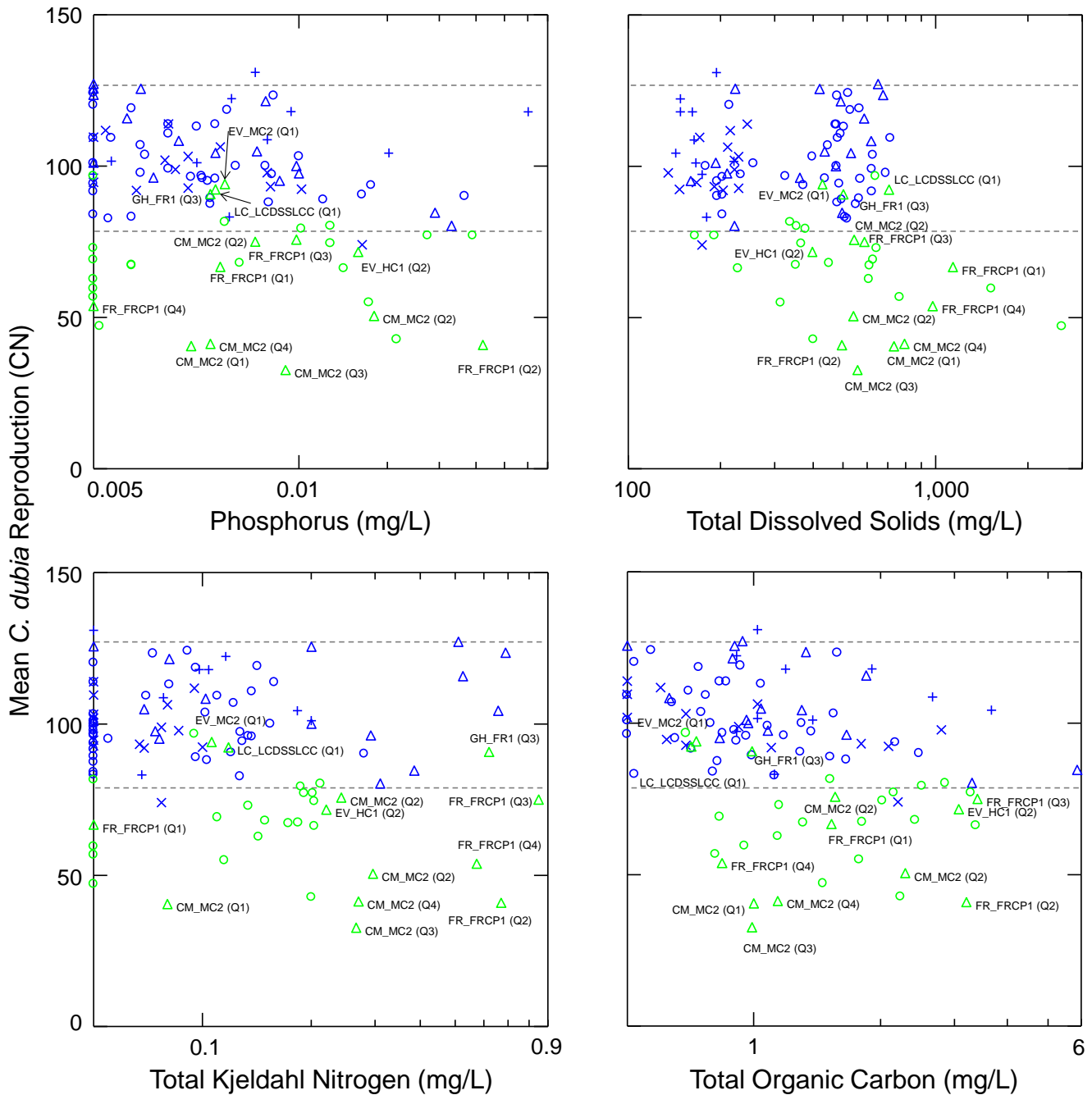
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-2: Mean *C. dubia* reproduction versus concentrations of dissolved organic carbon (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right).**



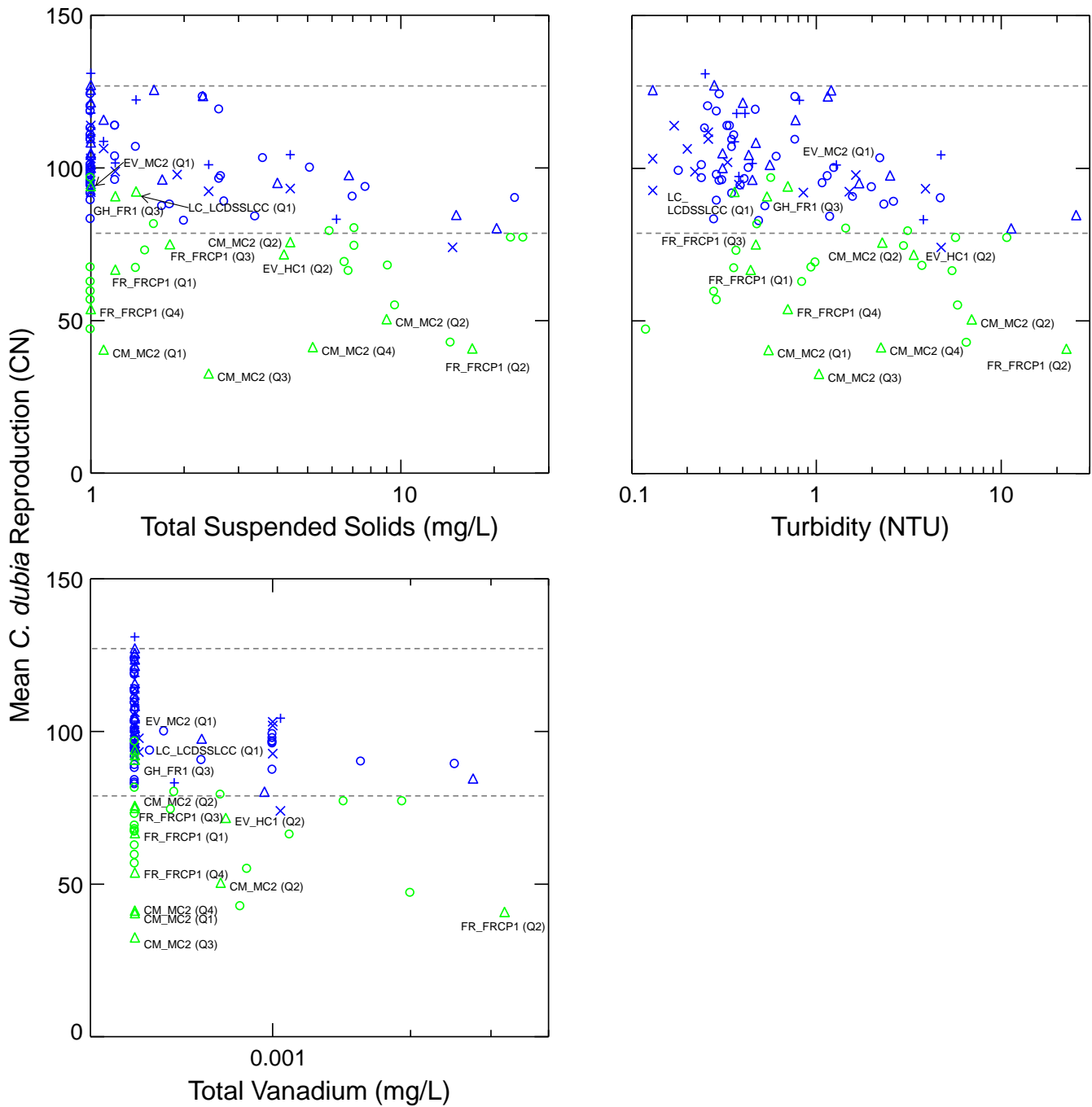
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-3: Mean *C. dubia* reproduction versus concentrations of phosphorus (top left), total dissolved solids (top right), total Kjeldahl nitrogen (bottom left), and total organic carbon (bottom right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

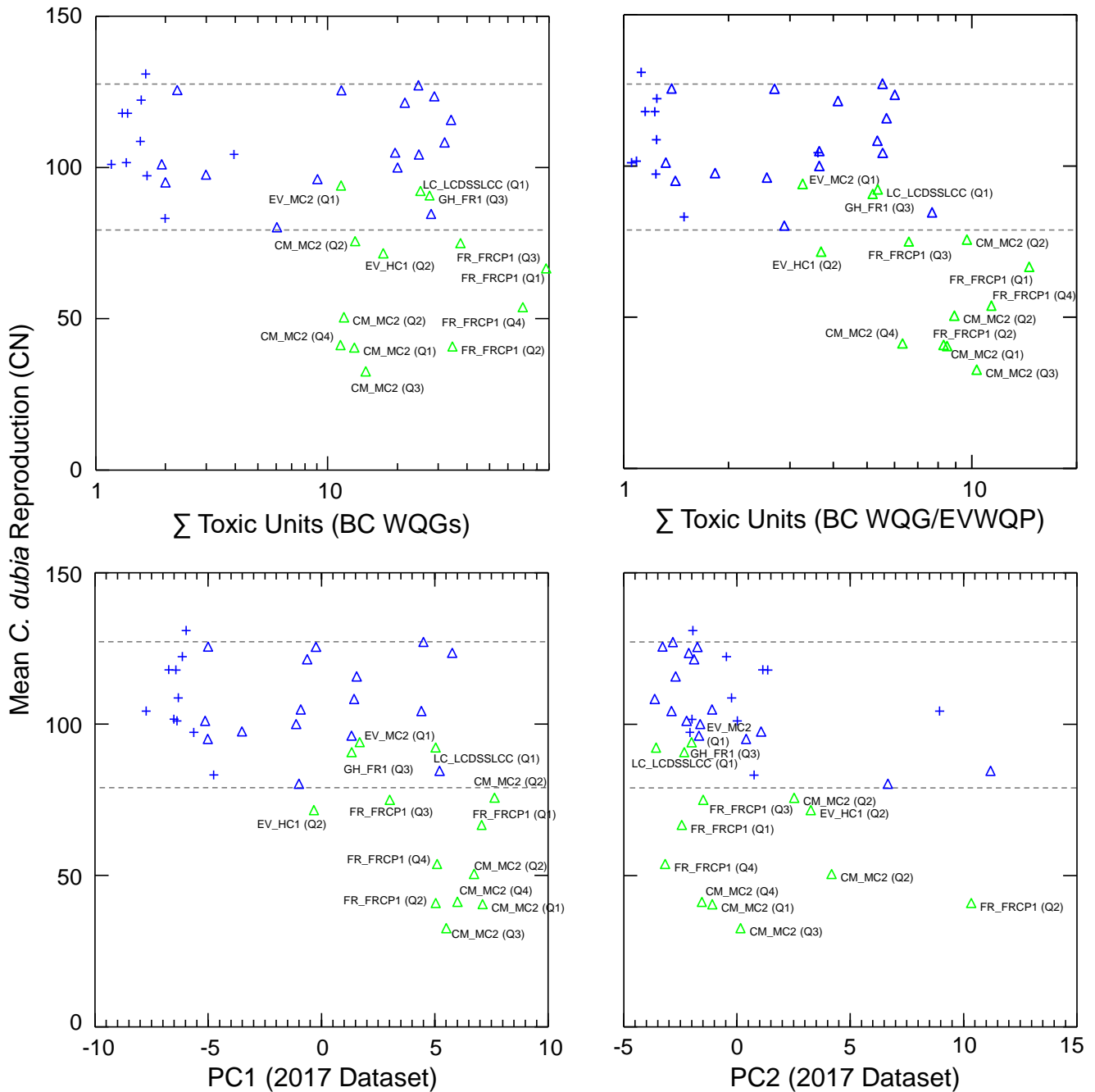
**Figure 3.4-4: Mean *C. dubia* reproduction versus concentrations of total suspended solids (top left), turbidity (top right), and total vanadium (bottom left).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

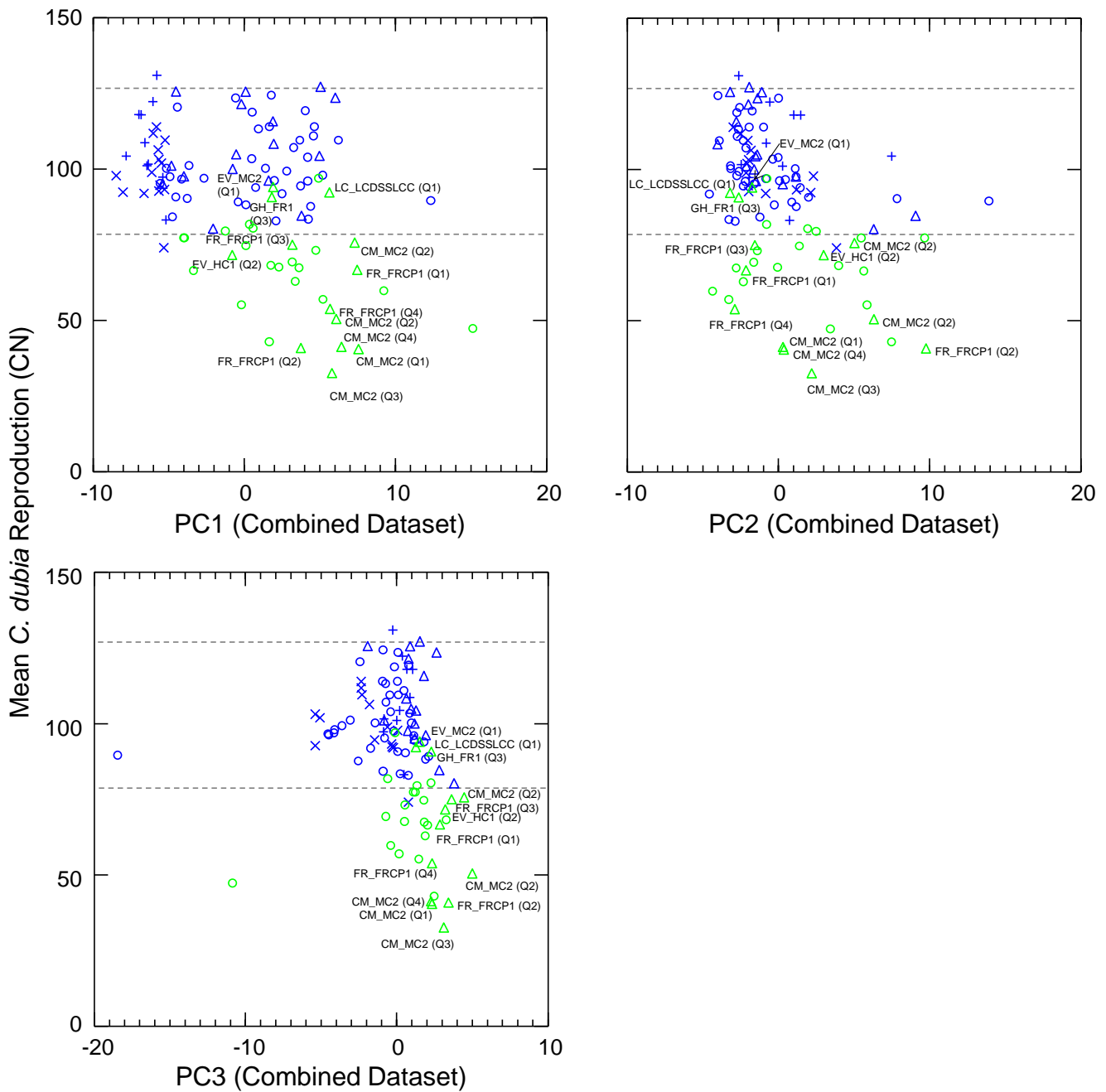


**Figure 3.4-5: Mean *C. dubia* reproduction versus sum of toxic units calculated using BC WQGs only (top left), sum of toxic units calculated using BC WQGs and EVWQP benchmarks (top right), PC1 using the 2017 dataset (bottom left), and PC2 using the 2017 dataset (bottom right).**



Note: Responses are control normalized (CN). Symbols indicate 2017 tests, including reference waters (blue +), test site waters with mean results categorized as no adverse response (blue Δ), and test site waters with mean results categorized as possible or likely adverse response (green Δ). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-6: Mean *C. dubia* reproduction versus PC1 (top left), PC2 (top right), and PC3 (bottom left) using the combined dataset.**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

### 3.4.2 *Hyalella azteca*

#### Survival

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-7) and five additional parameters were carried through to graphical analysis (Table F-2). The latter were parameters with statistically significant negative Spearman rank correlations (nitrite, total strontium, TDS, PC1 [combined dataset and 2017 dataset]; Figure 3.4-8 and Figure 3.4-9) that did not screen out when compared to water quality guidelines. Although total tin had a significant negative correlation, it was not included in graphical analysis because of low detection frequency<sup>13</sup>. Although total nickel did not have a significant negative correlation, it was included in graphical analysis (Figure 3.4-9) because the TIE results identified nickel as a potential toxicant in quarterly tests with *H. azteca* (Section 3.2.3.3).

The PC1 score for the combined dataset (which accounted for 35.7% of the variance) and 2017 only dataset (which accounted for 41.4% of the variance) had statistically significant negative Spearman rank correlations. Both PC1 scores had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP parameters (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).

None of the evaluated parameters exhibited a consistent concentration-response relationship across all tests (Figure 3.4-7 to Figure 3.4-9). In tests categorized as having a possible or likely adverse response, concentrations of most parameters 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 parameters are not expected to contribute to toxicity in these tests. Parameters 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:

- **CM\_MC2 (Q1, Q3):** Similar to the findings for *C. dubia* reproduction, the strongest evidence for causation was observed for nickel. Concentrations of cobalt (Q1), nickel, strontium, and components related to TDS (e.g., sodium) were higher in these tests than reference waters and test site waters categorized as no adverse response. However, most of these parameters did not provide strong evidence for causation once available toxicity thresholds were considered. The cobalt concentration in Q1 (4.2 µg/L) was below the effect concentrations from Michel Creek TIE testing (IC<sub>25</sub> >8 µg/L; Section 3.3.1.3), indicating that it is not likely contributing to toxicity. Strontium concentrations in these tests (0.45 mg/L in Q1 and 0.38 mg/L in Q3) were lower than the reported IC<sub>10</sub> of 30.2 mg/L for *H. azteca* weight (McPherson et al. 2014), indicating that it is not likely a contributor to toxicity<sup>14</sup>. 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. TDS is not expected to have contributed to toxicity in these tests because the concentrations (750 mg/L in Q1 and 627 mg/L in Q3) were lower than the no-observed effect concentration of ~1,700 mg/L in Fording River water (Annex F of Teck 2014). Nickel concentrations in these tests (33 µg/L in Q1 and 27 µg/L in Q3) were between concentrations in Michel Creek TIE testing with no effect on survival (20 µg/L) and a small effect on survival (approximately 10% at 40 µg/L), indicating that nickel may have contributed to the observed responses. Overall, nickel is the only constituent identified as potentially contributing to observed responses. Given that the magnitude of response in the Q1 (33%) and

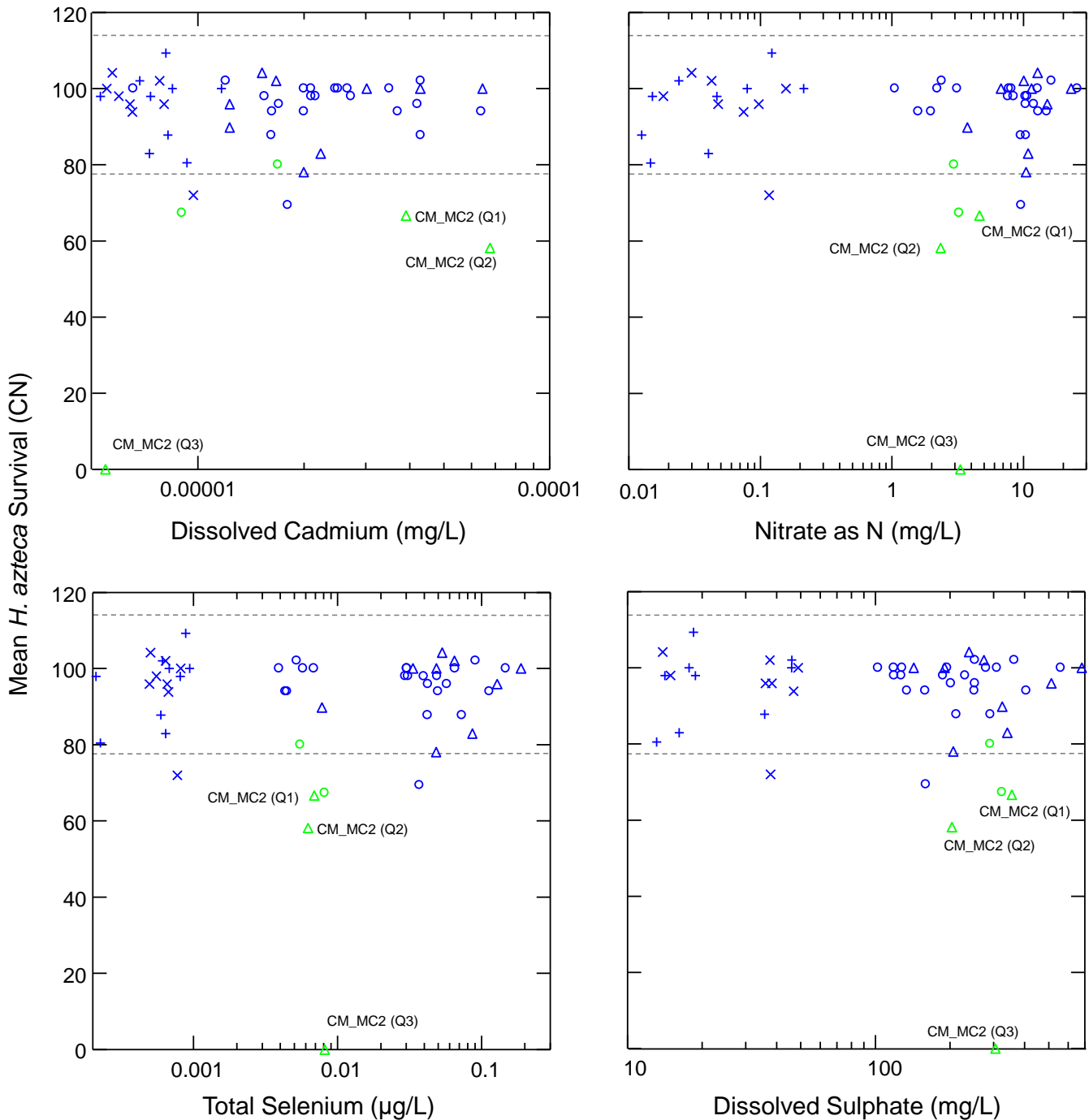
<sup>13</sup> Of 21 samples, one had a detected concentration of total tin (Table D-3).

<sup>14</sup> There is some uncertainty in this comparison because the IC<sub>10</sub> 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 IC<sub>10</sub>.

Q3 (100%) tests were higher than the magnitude of response observed in the 40 µg/L treatment (approximately 10%), additional constituents may have contributed to observed effects.

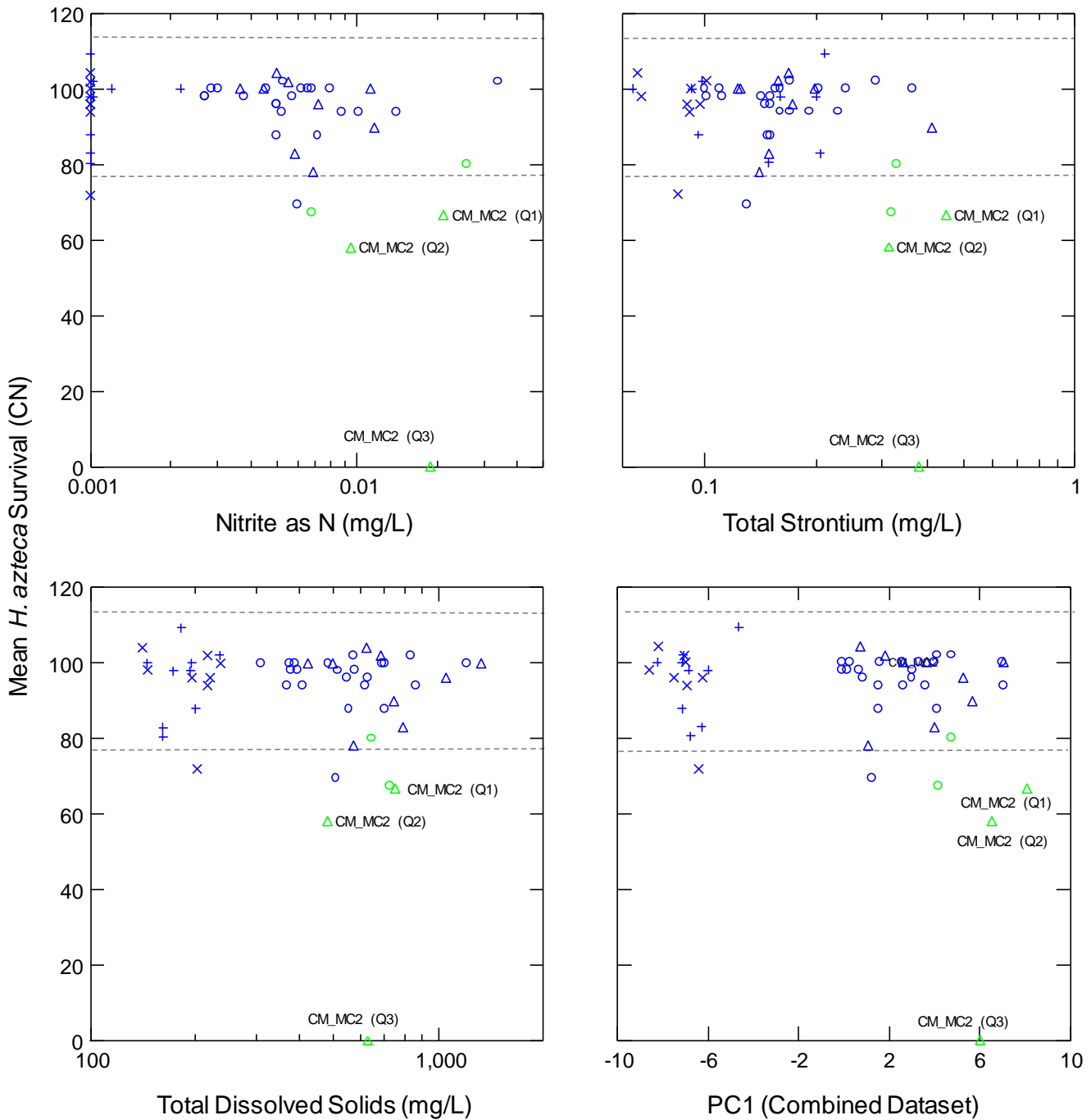
- **CM\_MC2 (Q2):** Overall, no water quality parameter was identified as a potential cause of the observed response in this test. Concentrations of cobalt, nickel, and tin in this test were higher than reference waters and test site waters categorized as no adverse response. The concentration of tin in this test (0.00013 mg/L) was higher than reference waters and test site waters with non-significant results, but this difference was small (7%), indicating that it is not likely contributing to toxicity. The concentration of cobalt in this test (3 µg/L) was below the effect concentrations from Michel Creek TIE testing ( $IC_{25} > 8$  µg/L), indicating that it is not likely contributing to toxicity. The concentration of nickel in this test (20 µg/L) was equal to concentrations from Michel Creek TIE testing that did not affect survival, indicating that it is not likely contributing to toxicity.

**Figure 3.4-7: Mean *H. azteca* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).**



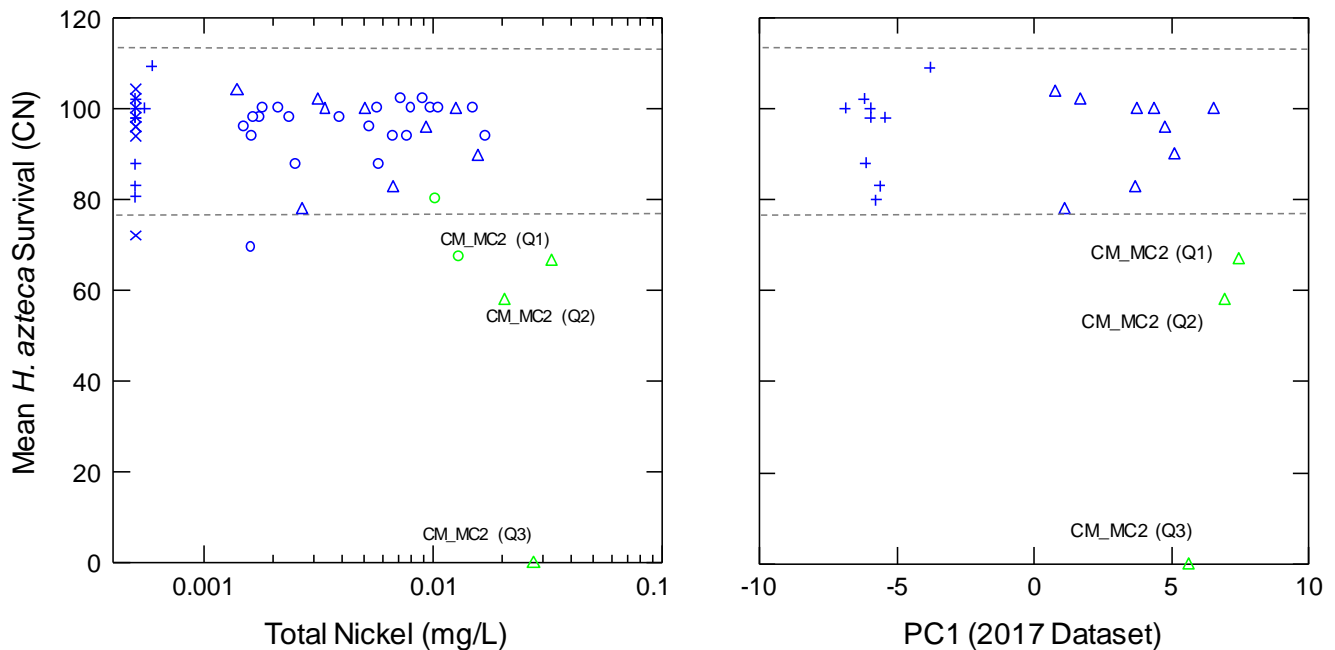
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-8: Mean *H. azteca* survival versus concentrations of nitrite (top left), total strontium (top right), total dissolved solids (bottom left), and PC1 for the combined dataset (bottom right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-9: Mean *H. azteca* survival versus concentration of total nickel (left) and PC1 for the 2017 dataset (right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017) and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

### Dry Weight

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium; Figure 3.4-10) and ten additional parameters were carried through to graphical analysis (Table F-2). The latter were parameters with statistically significant negative Spearman rank correlations (total cobalt, total lithium, total nickel, nitrite, total strontium, total uranium, TDS, TKN, and PC1 [combined dataset and 2017 dataset]; Figure 3.4-11 to 3.4-13) that did not screen out when compared to water quality guidelines. Although total tin had a significant negative correlation, it was not included in graphical analysis because of low detection frequency<sup>15</sup>.

The PC1 score for the combined dataset (which accounted for 35.7% of the variance) and the PC1 score for the 2017 only dataset (which accounted for 41.4% of the variance) had statistically significant negative Spearman rank correlations. PC1 scores had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP parameters (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium, nickel).

Most of the evaluated parameters did not exhibit a consistent concentration-response relationship across all tests (Figure 3.4-10 to Figure 3.4-13). Exceptions were cobalt, nickel, and strontium. The potential for these parameters to explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most parameters were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse

<sup>15</sup> Of 21 samples, one had a detected concentration of total tin (Table D-3).

response (Table D-3), and/or were lower than the chronic BC WQG (Appendix C). Such parameters are not expected to contribute to toxicity in these tests. Parameters 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:

- **CM\_MC2 (Q1 and Q3):** Overall, nickel is the only constituent identified as contributing to observed responses in these tests. Concentrations of cobalt (Q1), nickel, strontium, and components related to TDS (e.g., sodium) were higher in these tests than reference waters and test site waters categorized as no adverse response. The cobalt concentration in Q1 (4.2 µg/L) was below effect concentrations from Michel Creek TIE testing (IC<sub>25</sub> >8 µg/L Section 3.3.1.3), indicating that it is not likely contributing to toxicity. Strontium concentrations in these tests (0.45 mg/L in Q1 and 0.38 mg/L in Q3) were lower than the reported IC<sub>10</sub> of 30.2 mg/L for *H. azteca* weight (McPherson et al. 2014), indicating that it is not likely a contributor to toxicity. TDS is not expected to have contributed to toxicity in these tests because the concentrations (750 mg/L in Q1 and 627 mg/L in Q3) were lower than the no-observed effect concentration of ~1,700 mg/L in Fording River water (Annex F of Teck 2014). The nickel concentrations in Q1 (33 µg/L) and Q3 (27 µg/L) were greater than the IC<sub>25</sub> from Michel Creek TIE testing (22.4 µg/L; Section 3.3.1.3), indicating that nickel contributed to observed responses in these tests. Given that the magnitude of response in the Q1 (78% at 33 µg/L) and Q3 (100% at 27 µg/L) tests were higher than the magnitude of response observed in TIE testing (approximately 50% at 40 µg/L), additional constituents may also have contributed to observed effects.
- **CM\_MC2 (Q4):** Overall, nickel is the only constituent identified as contributing to the observed response in this test. Concentrations of nickel, strontium, and 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 strontium concentration in this test (0.41 mg/L) was lower than the reported IC<sub>10</sub> of 30.2 mg/L for *H. azteca* weight (McPherson et al. 2014), indicating that it is not likely a contributor to toxicity. TDS is not expected to have contributed to toxicity in these tests because the concentration (744 mg/L) was lower than the no-observed effect concentration of ~1,700 mg/L in Fording River water (Annex F of Teck 2014). The nickel concentration (16 µg/L) was between the concentration with no effect on growth (10 µg/L) and the concentration with a low effect on growth (approximately 20% at 20 µg/L) from Michel Creek TIE testing, indicating that nickel may have contributed to observed responses in the Q4 test. Given that the magnitude of response in this test (44% at 16 µg/L) was two times higher than the magnitude of response observed in the TIE testing (approximately 20% effect at 20 µg/L), additional constituents may also have contributed to observed effects.
- **CM\_MC2 (Q2):** The strongest evidence for causation was found for nickel. Concentrations of nickel and tin in this test were higher than reference waters and test site waters categorized as no adverse response. The concentration of tin in this test (0.00013 mg/L) was higher than reference waters and test site waters with non-significant results, but this difference was small (7%), indicating that it is not likely contributing to toxicity. The concentration of nickel in this test (20 µg/L) was equal to the concentration in Michel Creek testing that resulted in approximately 20% reduction in weight. Given that the magnitude of response in this test (85% at 20 µg/L) was four times higher than the magnitude of response observed in the TIE testing (approximately 20% at 20 µg/L), additional constituents may have contributed to observed effects.
- **FR\_FRCP1 (Q1).** Overall, nitrate and selenium were the only parameters identified that may have contributed to the observed response in this test. Mixture-related effects, although not expected, could not be ruled out, based on the analysis summarized below. Concentrations of nitrate, selenium, and sulphate in



this test were greater than the lowest level 1 benchmark from the EVWQP (Table C-4).<sup>16</sup> The nitrate concentration in this test (23 mg/L nitrate as nitrogen) was equal to the 14-day EC<sub>20</sub> of 23 mg/L for *H. azteca* biomass in Fording River water (Annex F of Teck 2014), indicating that nitrate may have contributed to the observed response in this test. The selenium concentration in this test (190 µg/L) was higher than the maximum concentration tested in the Site Performance Objective (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. Other parameters exhibited much weaker evidence for potential causation:

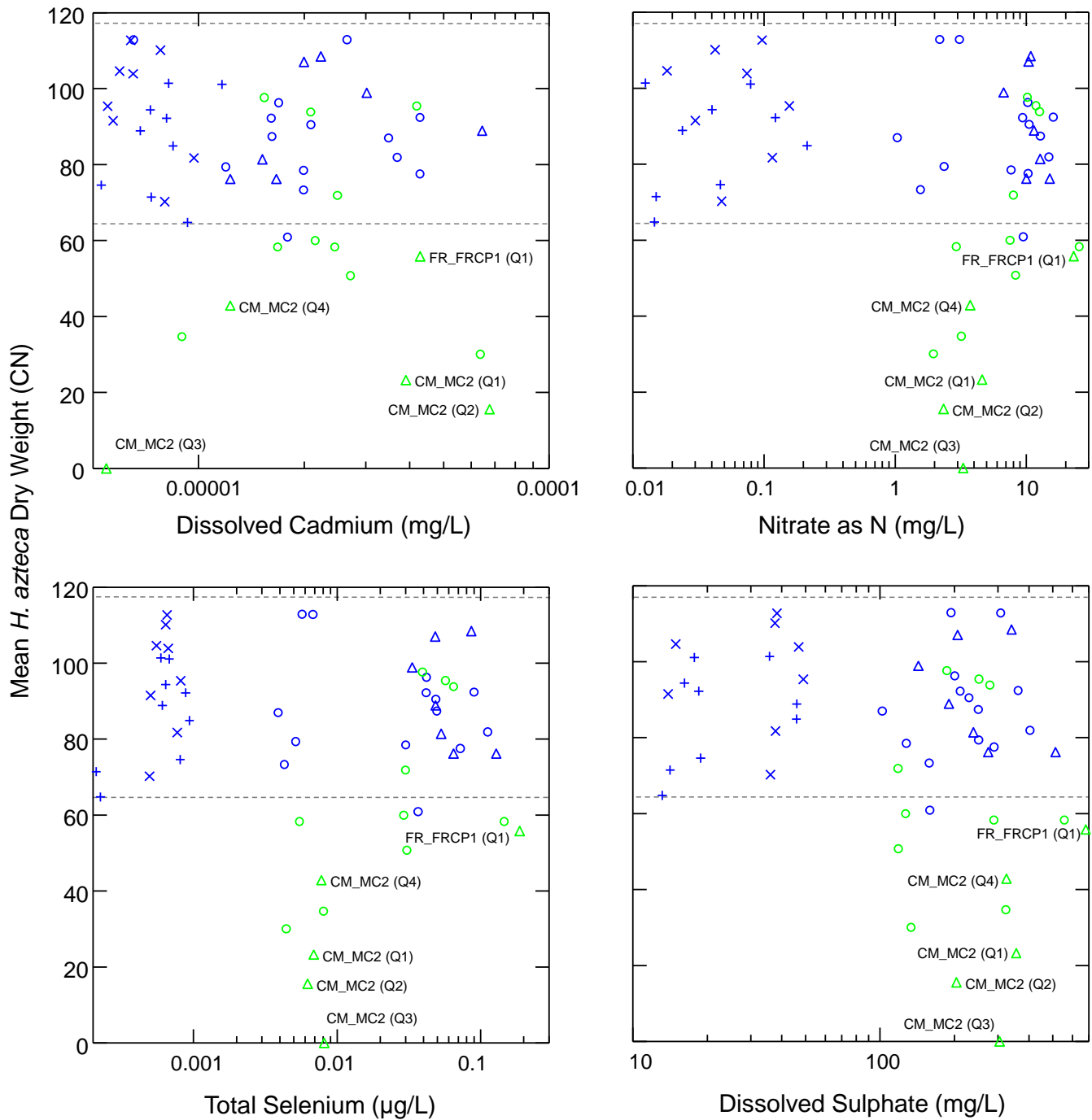
- Sulphate is not expected to have contributed to toxicity in this test because the test site concentration (680 mg/L) was lower than the no-observed effect concentration of 1,110 mg/L in Fording River water (Annex F of Teck 2014).
- TDS and several parameters related to TDS (e.g., calcium) were higher in this test than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-3). TDS is not expected to have contributed to toxicity in this test because the test site concentration (1,330 mg/L) was lower than the no-observed effect concentration of ~1,700 mg/L in Fording River water (Annex F of Teck 2014).
- Lithium and uranium were higher in this test than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-3). Uranium is not expected to have contributed to toxicity in this test because the test site concentration (7 µg/L) was lower than the reported EC<sub>10</sub> of 12 µg/L (CCME 2011). 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 January 2018, the US EPA ECOTOX database does not have lithium toxicity data. Therefore, it is unlikely that lithium contributed to the observed response in this test.

The  $\Sigma$ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However, the  $\Sigma$ TU values for this test were largely driven by the hazard quotient for selenium. When calculated using BC WQGs and EVWQP benchmarks, the selenium hazard quotient accounted for 59% of the  $\Sigma$ TU value. When calculated using BC WQGs only, the selenium hazard quotient accounted for 87% of the  $\Sigma$ TU value. These results indicate that the relationship between  $\Sigma$ TUs and reduced growth is largely driven by selenium. If the hazard quotient for selenium were excluded from the calculation, then the  $\Sigma$ TUs for this test would still be higher than the range observed in reference waters and test sites categorized as no adverse response. Mixture-related effects could not be ruled out for this test. Given that the magnitude of response in this test (34% at  $\Sigma$ TU of 17 when calculated using BC WQGs and EVWQP benchmarks) was two times lower than the magnitude of response observed in the Q1 CM\_MC2 test (78% at  $\Sigma$ TU of 11 when calculated using BC WQGs and EVWQP benchmarks), mixture-related effects are not expected.

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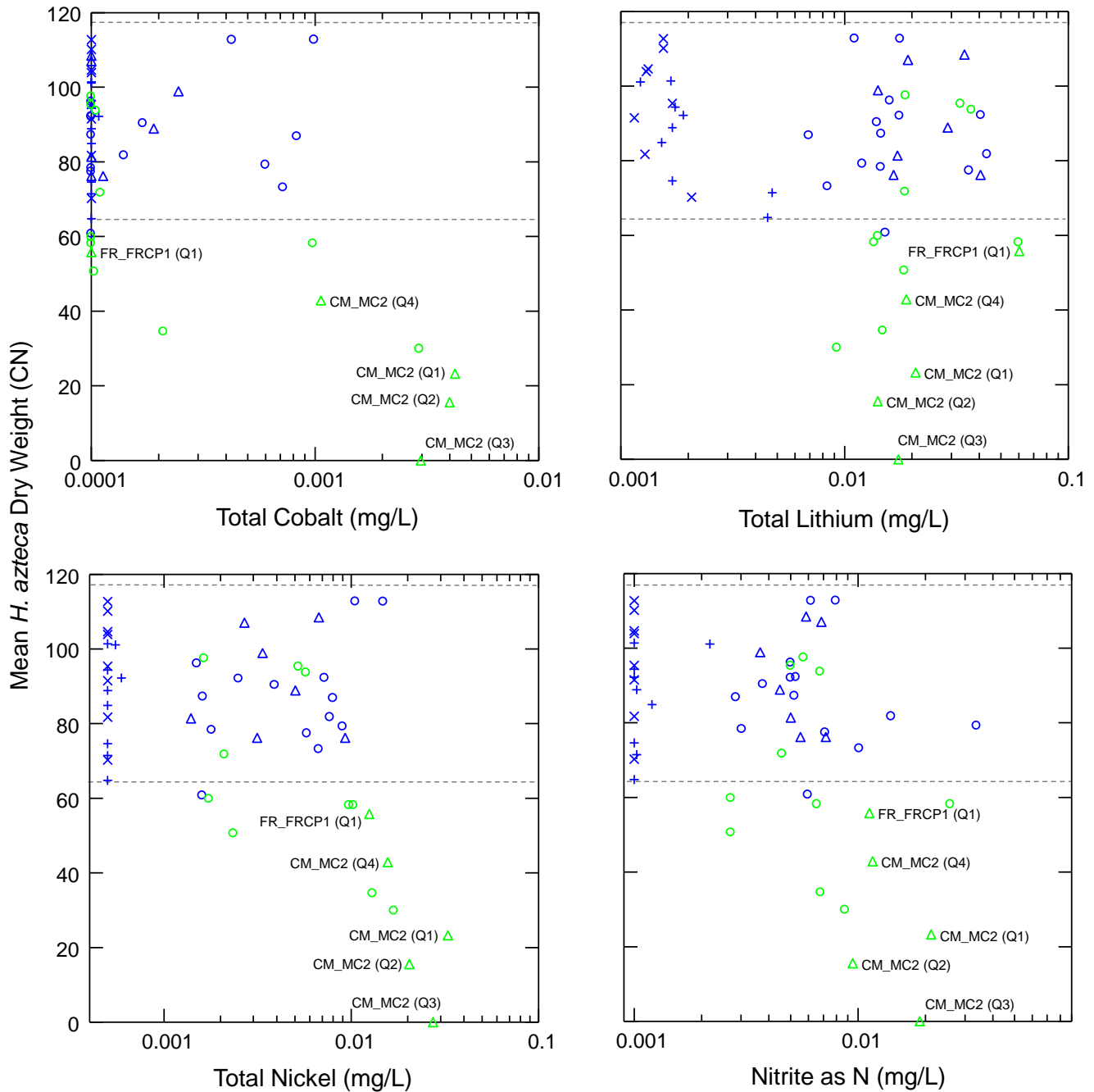
<sup>16</sup> Water quality under winter low flow conditions at FR\_FRCP1 is not representative of conditions in the upper Fording River to satisfy its primary intent which is to monitor and evaluate cumulative discharges from Fording River Operations in the receiving environment (Teck 2018b).

**Figure 3.4-10: Mean *H. azteca* dry weight versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).**



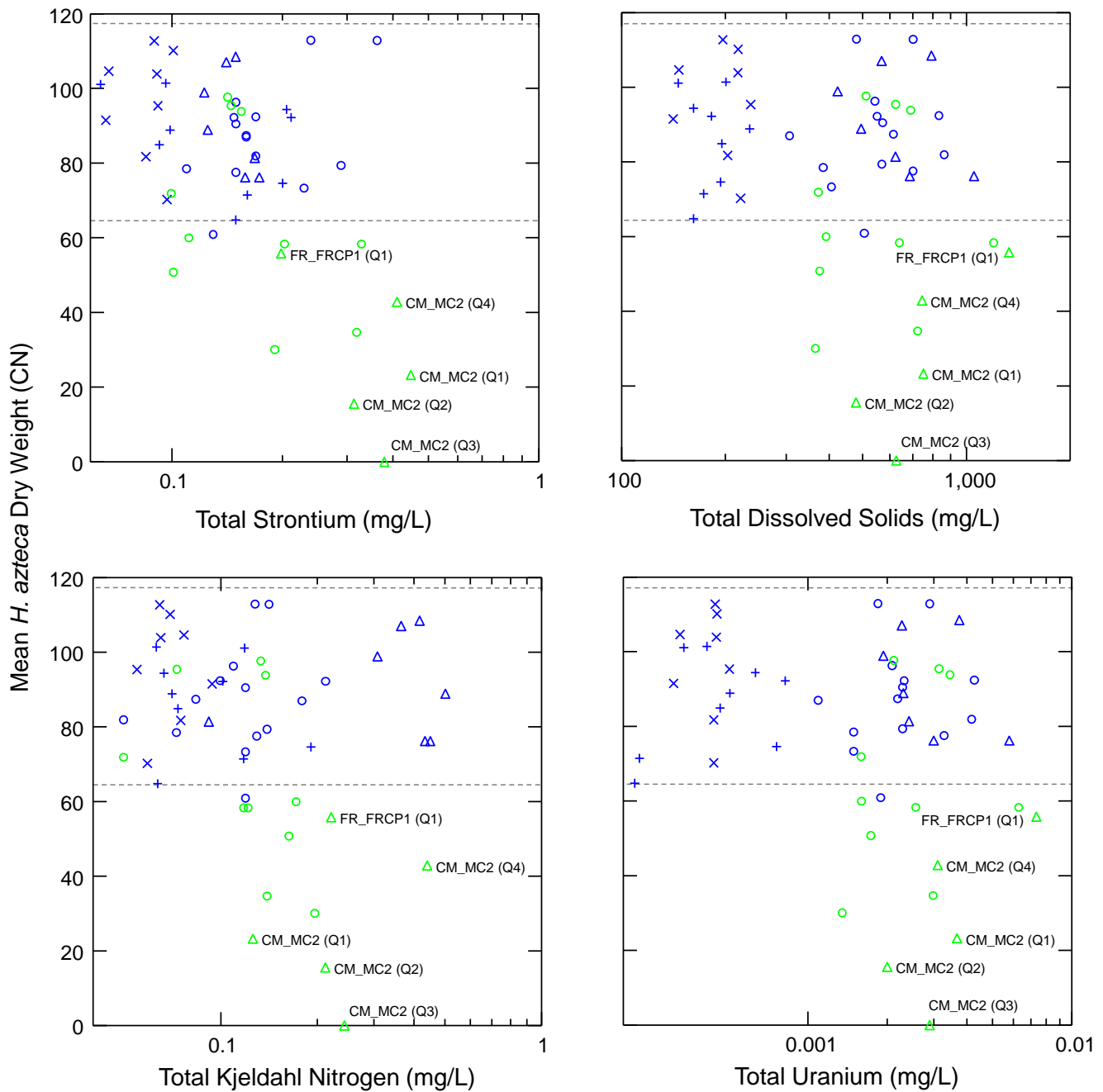
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-11: Mean *H. azteca* dry weight versus concentrations of total cobalt (top left), total lithium (top right), total nickel (bottom left), and nitrite (bottom right).**



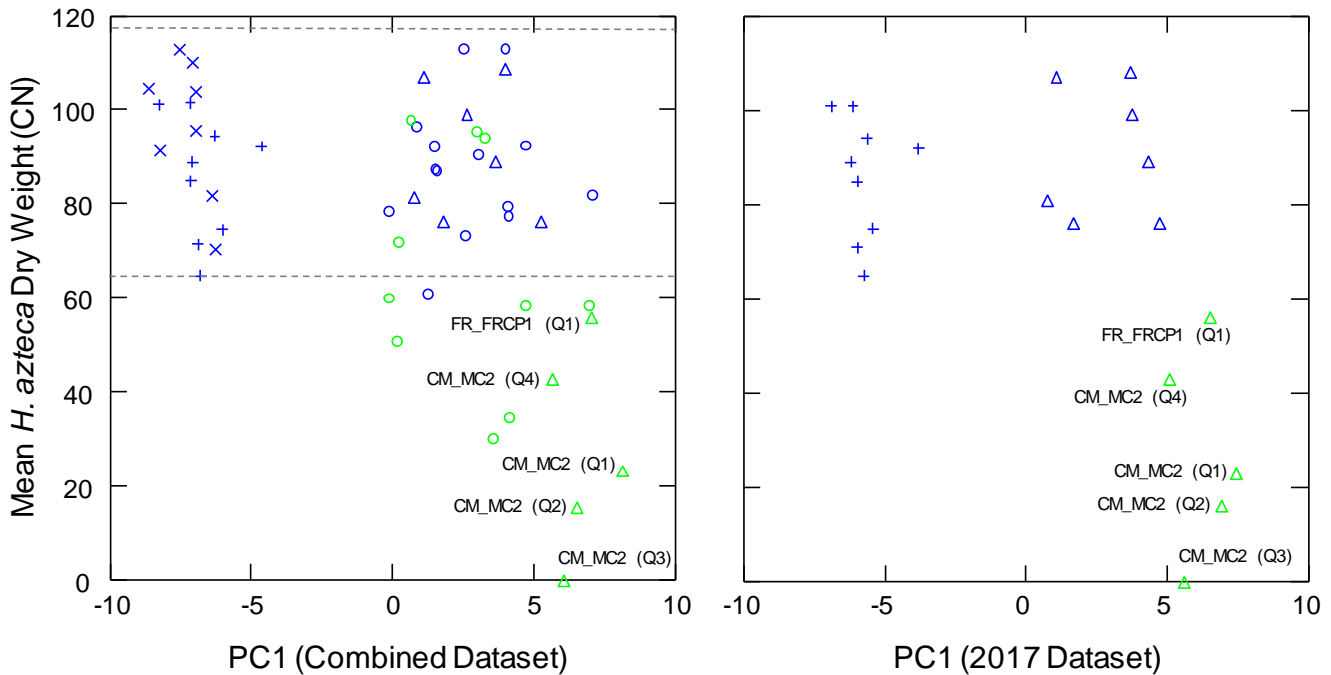
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-12: Mean *H. azteca* dry weight versus concentrations of total strontium (top left), total dissolved solids (top right), total Kjeldahl nitrogen (bottom left), and total uranium (bottom right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-13: Mean *H. azteca* dry weight versus PC1 for the combined dataset (left) and 2017 dataset (right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

### 3.4.3 *Oncorhynchus mykiss* Survival and Viability

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium) and five additional parameters were carried through to graphical analysis (Table F-3). The latter included parameters with statistically significant negative Spearman rank correlations (total lithium, total strontium, TDS, PC1 [combined dataset], and PC1 [2017 dataset]) that did not screen out when compared to water quality guidelines were carried through to graphical analysis (Table F-3). Although bromide had a significant negative correlation, it was not included in graphical analysis because of low detection frequency<sup>17</sup>. Concentration-response plots for survival are plotted in Figure 3.4-14 (Order constituents), Figure 3.4-15 (other parameters with significant correlations), and Figure 3.5-16 (PC1 [both datasets]). Viability data are plotted in Figure 3.4-17 (Order constituents), Figure 3.4-18 (other parameters with significant correlations), and Figure 3.4-19 (PC1 [both datasets]).

PC1 for the combined dataset accounted for 29.5% of the variance, whereas PC1 for the 2017 only dataset accounted for 36.1% of the variance (Table E-3). PC1 scores had strong positive loadings for TDS, components of TDS (e.g., calcium), EVWQP parameters (sulphate, nitrate, selenium), and several metals (e.g., lithium, uranium).

<sup>17</sup> Of 19 samples, five had a detected concentration of boron (Table D-5).

Most of the evaluated parameters did not exhibit a consistent concentration-response relationship across all tests (Figure 3.4-14 to Figure 3.4-19). Exceptions were sulphate and TDS. The potential for these and other parameters to explain observed effects is discussed below.

In tests categorized as having a possible or likely adverse response, concentrations of most parameters 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 parameters are not expected to contribute to toxicity in these tests. Parameters 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:

- **CM\_MC2 (Q4):** Overall, no parameter was identified as a potential cause of the observed response in this test. Concentrations of nickel, strontium, TDS, and several parameters related to TDS (e.g., magnesium) in this test were higher than reference waters and test site waters categorized as no adverse response. The nickel concentration in this test (17 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 CM\_MC2 conditions). This indicates that nickel is not likely contributing to toxicity. The strontium concentration in this test (0.41 mg/L) was more than two orders of magnitude lower than the reported LC<sub>10</sub> of 67 mg/L for *O. mykiss* (McPherson et al. 2014), indicating that it is not likely contributing to toxicity. The TDS concentration in this test (748 mg/L) was lower than the effect concentration reported in the Golder (2013) mixture toxicity study in Fording River water (923 mg/L), indicating that it is not likely contributing to toxicity.
- **EV\_HC1 (Q4):** Overall, no parameter was identified as a potential cause of the observed response in this test. The  $\Sigma$ TUs (calculated using BC WQGs) in this test was higher than in reference waters and/or test site waters categorized as no adverse response. However, this value was largely driven by the hazard quotient for selenium which accounted for 85% of the  $\Sigma$ TU value. These results indicate that the relationship between  $\Sigma$ TU and reduced survival/viability is largely driven by selenium, which is not likely contributing to toxicity. When the  $\Sigma$ TU was calculated using BC WQGs and EVWQP benchmarks (i.e., using a site-specific selenium concentration in the calculation), the  $\Sigma$ TU was lower than test site waters categorized as no adverse response (Table D-4). This interpretation indicates that mixture-related effects (as evaluated by  $\Sigma$ TUs) are not contributing to toxicity.
- **FR\_FRCP1 (Q4):** Evidence for potential causation was identified for major ions (i.e., components of TDS, including sulphate), although no individual parameter exhibited strong evidence. Concentrations of bromide, lithium, selenium, sulphate, TDS, and several other individual parameters related to TDS (e.g., calcium) in this test were higher than reference waters and test site waters categorized as no adverse response. Concentrations of sulphate (515 mg/L) and TDS (1,058 mg/L) in this test were approximately equal to (sulphate) or slightly greater than (TDS) concentrations reported in the Golder (2013) mixture toxicity study in Fording River water (sulphate IC<sub>20</sub> = 530 mg/L; TDS IC<sub>20</sub> = 923 mg/L), indicating that sulphate and TDS may have contributed to the adverse response in this test. Other exposure parameters exhibited weaker evidence for potential causation:
  - The bromide concentration in this test (0.29 mg/L) was more than an order of magnitude lower than the reported no observed effect concentration of 8 mg/L (Flury and Papritz 1993), indicating that it is not likely contributing to toxicity.

- The lithium concentration in this test (0.04 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 concentration of selenium (129 µg/L) in this test was lower than the no effect concentration reported in the Golder (2013) mixture toxicity study in Fording River water (>139 µg/L).
- The  $\Sigma$ TUs were also higher in this test than in reference waters and/or test site waters categorized as no adverse response. However,  $\Sigma$ TUs for this test were largely driven by the hazard quotient for selenium. When calculated using BC WQGs and EVWQP benchmarks, the selenium hazard quotient accounted for 57% of the  $\Sigma$ TU value. When calculated using BC WQGs only, the selenium hazard quotient accounted for 87% of the  $\Sigma$ TU value. These results indicate that the relationship between  $\Sigma$ TU and reduced survival/viability is largely driven by selenium, which was discussed above as not likely contributing to toxicity. If the hazard quotient for selenium were excluded from the calculation, then the  $\Sigma$ 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  $\Sigma$ TUs) are not contributing to toxicity.
- **GH\_ERC (Q2):** Overall, TSS was the only parameter identified as the potential cause of the observed response in this test. Concentrations of chromium, iron, lead, phosphorus, TSS, and turbidity in this test were higher 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 parameters. The TSS concentration in this test (104 mg/L) was greater than concentrations reported to reduce survival in rainbow trout eggs and larvae. BC MoE (1997) summarized effect concentrations from five studies with rainbow trout eggs and larvae; survival effect concentrations ranged from 6.6 mg/L (48-day test resulting in 40% mortality) to 101 mg/L (60-day test resulting in 98% mortality). Based on this comparison, TSS may have contributed to the observed response in this test. Other exposure parameters exhibited weaker evidence for potential causation:
  - The chromium concentration in this test (2.35 µg/L) was an order of magnitude lower than the reported 60-day lowest observable effects concentration of 100 µg/L for hexavalent chromium (CCME 1999), indicating that it is not likely contributing to toxicity.
  - The concentration of iron was higher in this test than reference waters and test site waters categorized as no adverse response, but this difference was small (9%), indicating that it is not likely contributing to toxicity.
  - Phosphorus is a constituent that may result in ecological changes in the receiving environment under long-term discharge conditions, but is not expected to have direct aquatic toxicity. Therefore, phosphorus is not likely contributing to toxicity.
  - The lead concentration in this test (4.9 µg/L) was lower than the 19-month EC<sub>10</sub> of 167 µg/L that was estimated by the lead biotic ligand model tool<sup>18</sup>, indicating that it is not likely contributing to toxicity.
- **GH\_FR1 (Q4):** Overall, no parameter was identified as a potential cause of the observed response in this test. Concentrations of selenium, TDS, and several parameters related to TDS (e.g., magnesium) in this test were higher than reference waters and test site waters categorized as no adverse response. Concentrations of selenium (63 µg/L) and TDS (672 mg/L) in this test were lower than the effect concentrations reported in

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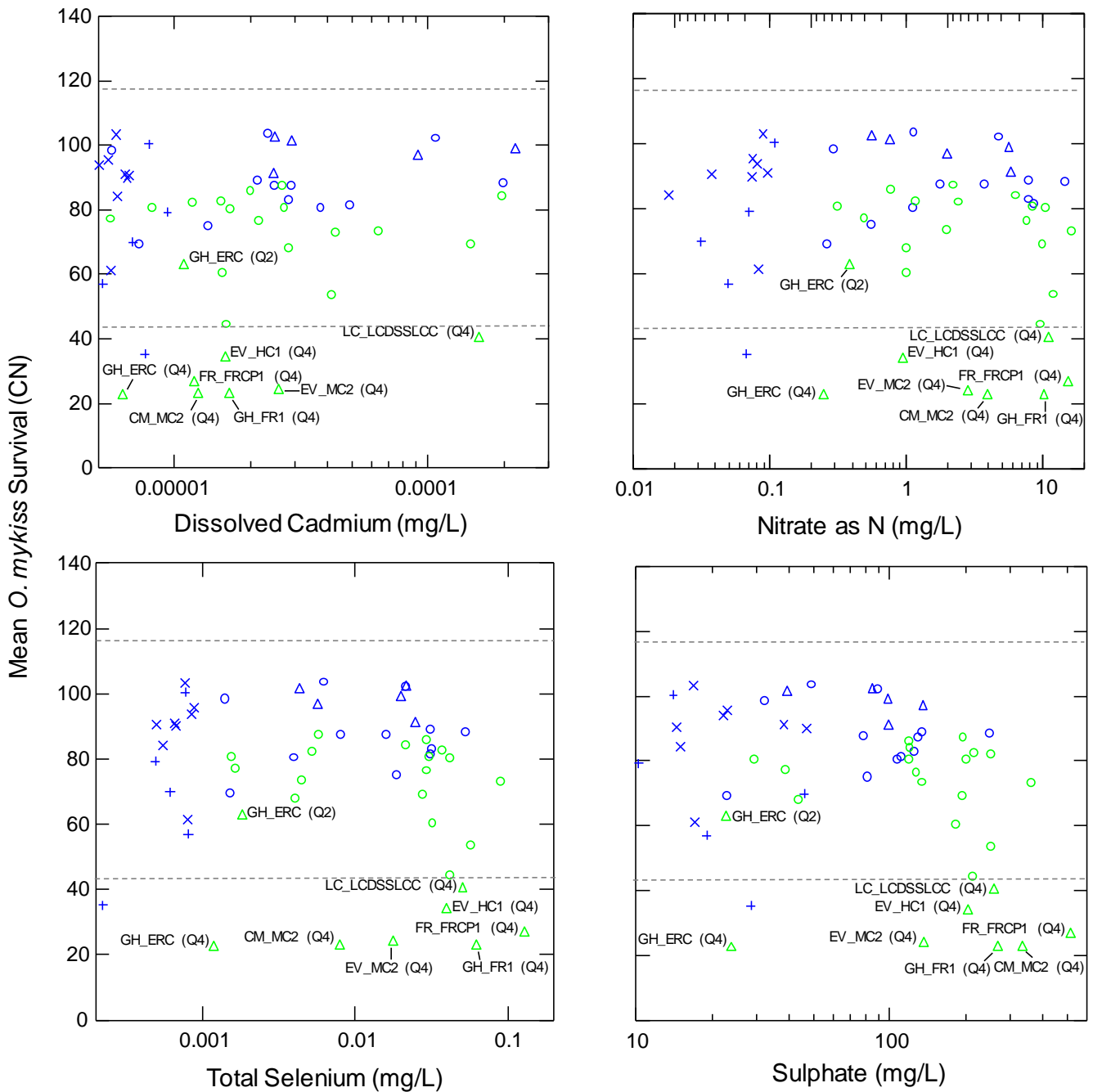
<sup>18</sup> Available at: <https://www.ila-lead.org/responsibility/lead-blm-tool>

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 parameters are not likely contributing to toxicity. In addition to the parameters discussed above, the  $\Sigma$ TU (calculated using BC WQGs) in this test was higher than in reference waters and/or test site waters categorized as no adverse response. However,  $\Sigma$ TU value was largely driven by the hazard quotient for selenium which accounted for 84%. These results indicate that the relationship between  $\Sigma$ TU and reduced survival/viability is largely driven by selenium, which is not likely contributing to toxicity. When the  $\Sigma$ TU was calculated using BC WQGs and EVWQP benchmarks (i.e., using a site-specific selenium concentration in the calculation), the  $\Sigma$ TU was lower than test site waters categorized as no adverse response (Table D-4). This interpretation indicates that mixture-related effects (as evaluated by  $\Sigma$ TUs) are not contributing to toxicity.

- **LC\_LCDSSLCC (Q4):** Overall, no parameter was identified as a potential cause of the observed response result in this test. Concentrations of lithium and TDS in this test were higher than reference waters and test site waters categorized as no adverse response. The lithium concentration in this test (0.041 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 TDS concentration in this test (677 mg/L) was lower than the effect concentrations reported in the Golder (2013) mixture toxicity study in Fording River water (923 mg/L), indicating that it is not likely contributing to toxicity. In addition to the parameters discussed above, the  $\Sigma$ TU (calculated using BC WQGs) in this test was higher than in reference waters and/or test site waters categorized as no adverse response. However,  $\Sigma$ TU value was largely driven by the hazard quotient for selenium which accounted for 78%. These results indicate that the relationship between  $\Sigma$ TU and reduced survival/viability is largely driven by selenium, which is not likely contributing to toxicity. When the  $\Sigma$ TU was calculated using BC WQGs and EVWQP benchmarks (i.e., using a site-specific selenium concentration in the calculation), the  $\Sigma$ TU was lower than test site waters categorized as no adverse response (Table D-4). This interpretation indicates that mixture-related effects (as evaluated by  $\Sigma$ TUs) are not contributing to toxicity.
- **EV\_MC2 (Q4) and GH\_ERC (Q4):** No water quality parameter was identified as a potential cause of the adverse responses in these tests. Concentrations of all parameters in these tests were equal to or lower than concentrations in reference waters and/or test site categorized as no adverse response (Table D-4), and/or were lower than the chronic BC WQG (Appendix C). No water quality parameter was identified as a potential cause of the adverse responses in these tests.

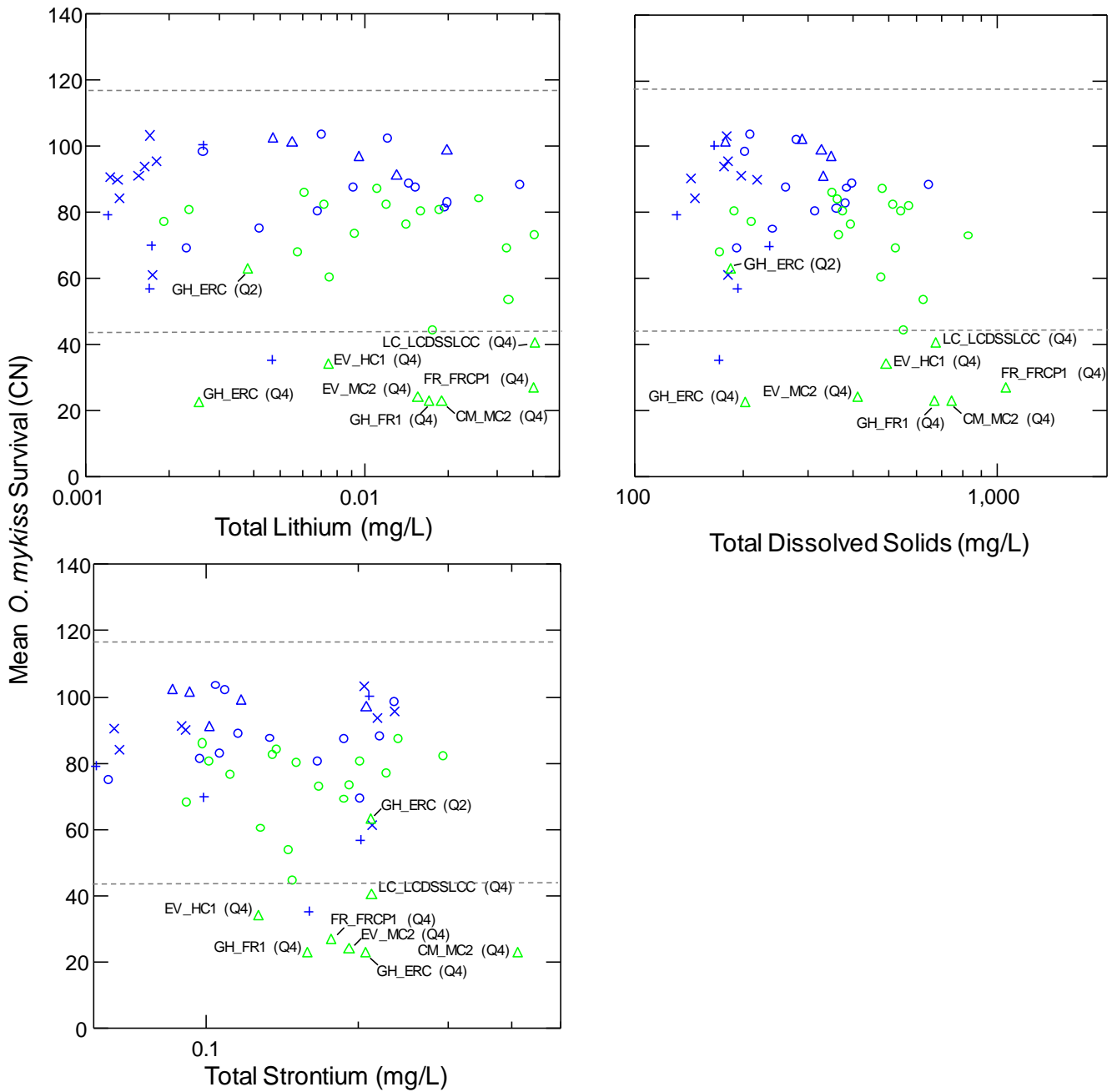


**Figure 3.4-14: Mean *O. mykiss* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).**



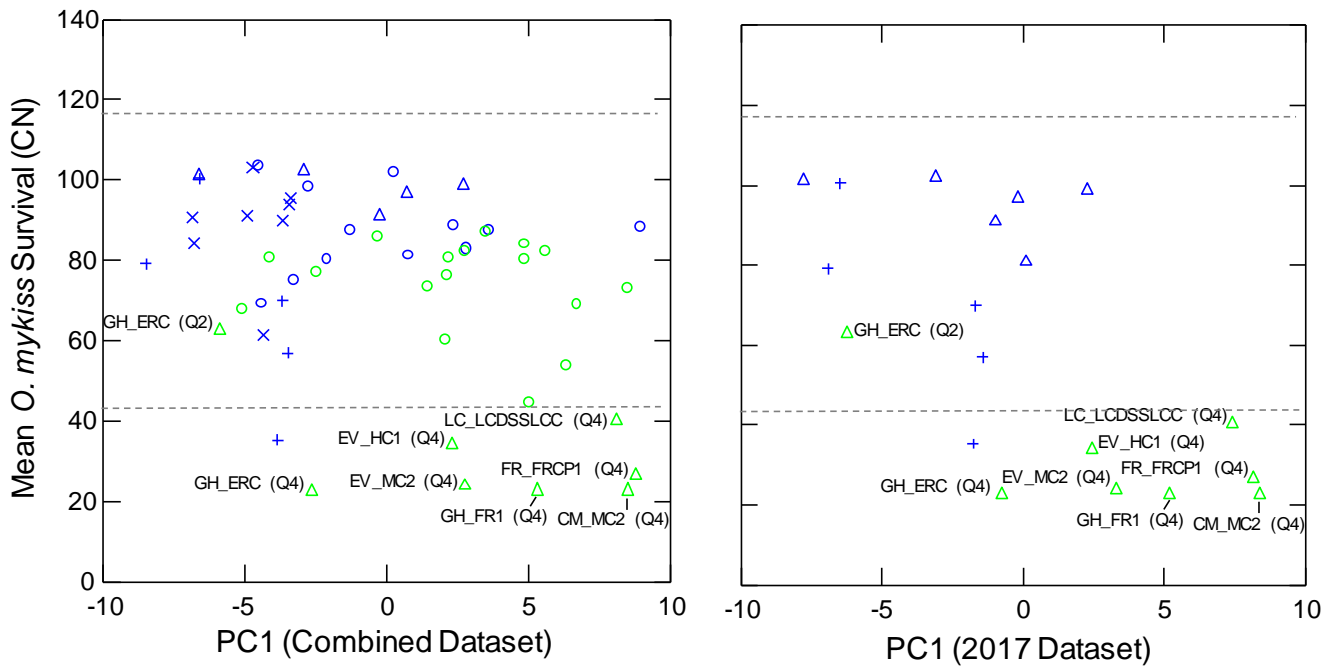
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-15: Mean *O. mykiss* survival versus concentrations of total lithium (top left), total dissolved solids (top right), and total strontium (bottom left).**



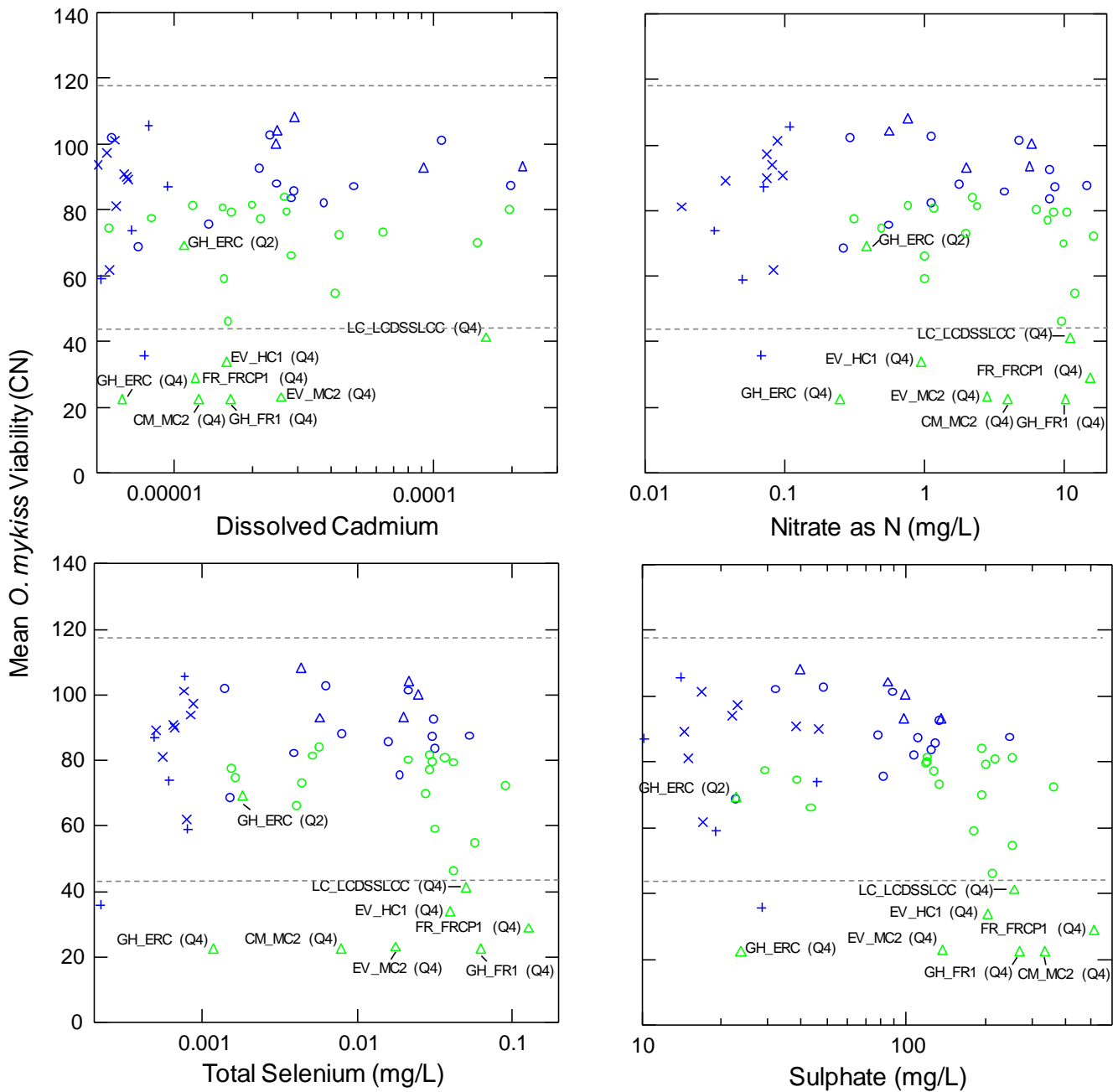
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labeled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-16: Mean *O. mykiss* survival versus PC1 of the combined dataset (left) and PC1 of the 2017 only dataset (right).**



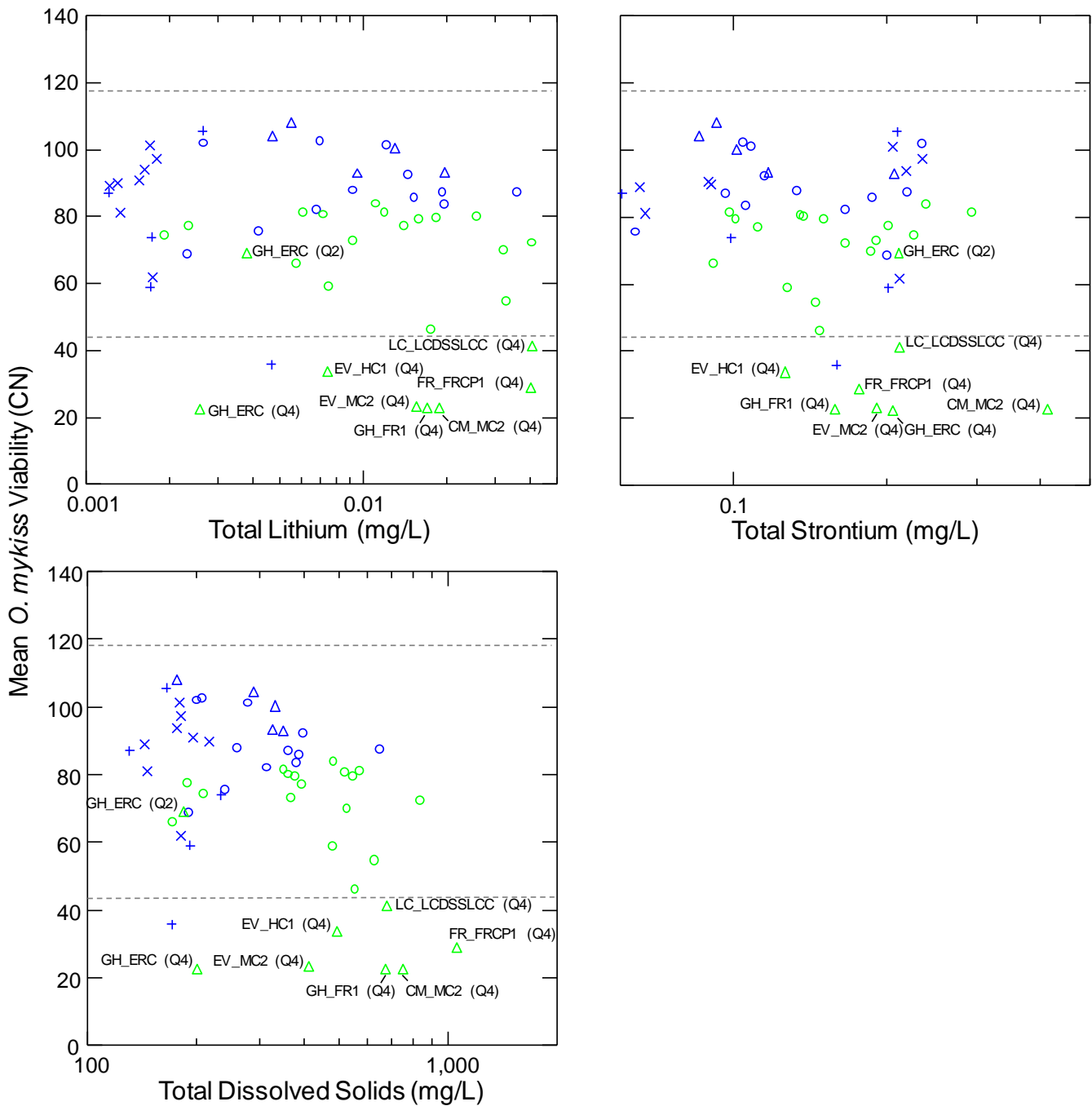
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-17: Mean *O. mykiss* viability versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).**



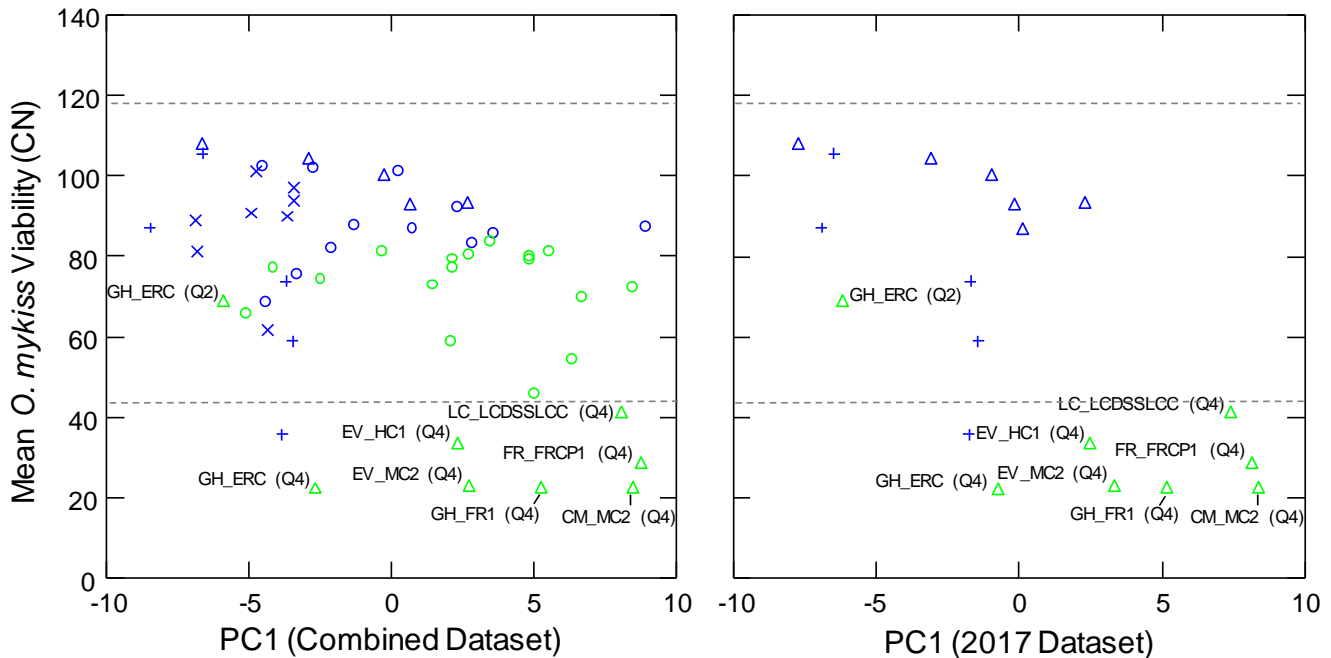
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-18: Mean *O. mykiss* viability versus concentrations of total lithium (top left), total strontium (top right), and total dissolved solids (bottom left).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-19: Mean *O. mykiss* viability versus PC1 for the combined dataset (left) and 2017 dataset (right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

### 3.4.4 *Pimephales promelas* Survival and Biomass

The four Order constituents (dissolved cadmium, nitrate, sulphate, total selenium) and two additional parameters were carried through to graphical analysis (Table F-4). The latter included parameters with statistically significant negative Spearman rank correlations (TDS for survival and PC4 [combined dataset] for biomass) that did not screen out when compared to water quality guidelines. Although bromide and titanium had significant negative correlations, they were not included in graphical analysis because of low detection frequency<sup>19</sup>. PC4 (combined dataset), which was the only PC with significant correlations, accounted for 7.7% of the variance, had strong positive loadings for iron and silver, and had strong negative loadings for ammonia and cobalt (Table E-4).

Concentration-response data for survival are plotted in Figure 3.4-20 (Order constituents) and Figure 3.4-21 (TDS). Biomass data are plotted in Figure 3.4-22 (Order constituents) and Figure 3.4-23 (PC4 [combined dataset only]). None of the evaluated parameters exhibited a consistent concentration-response relationship across all tests.

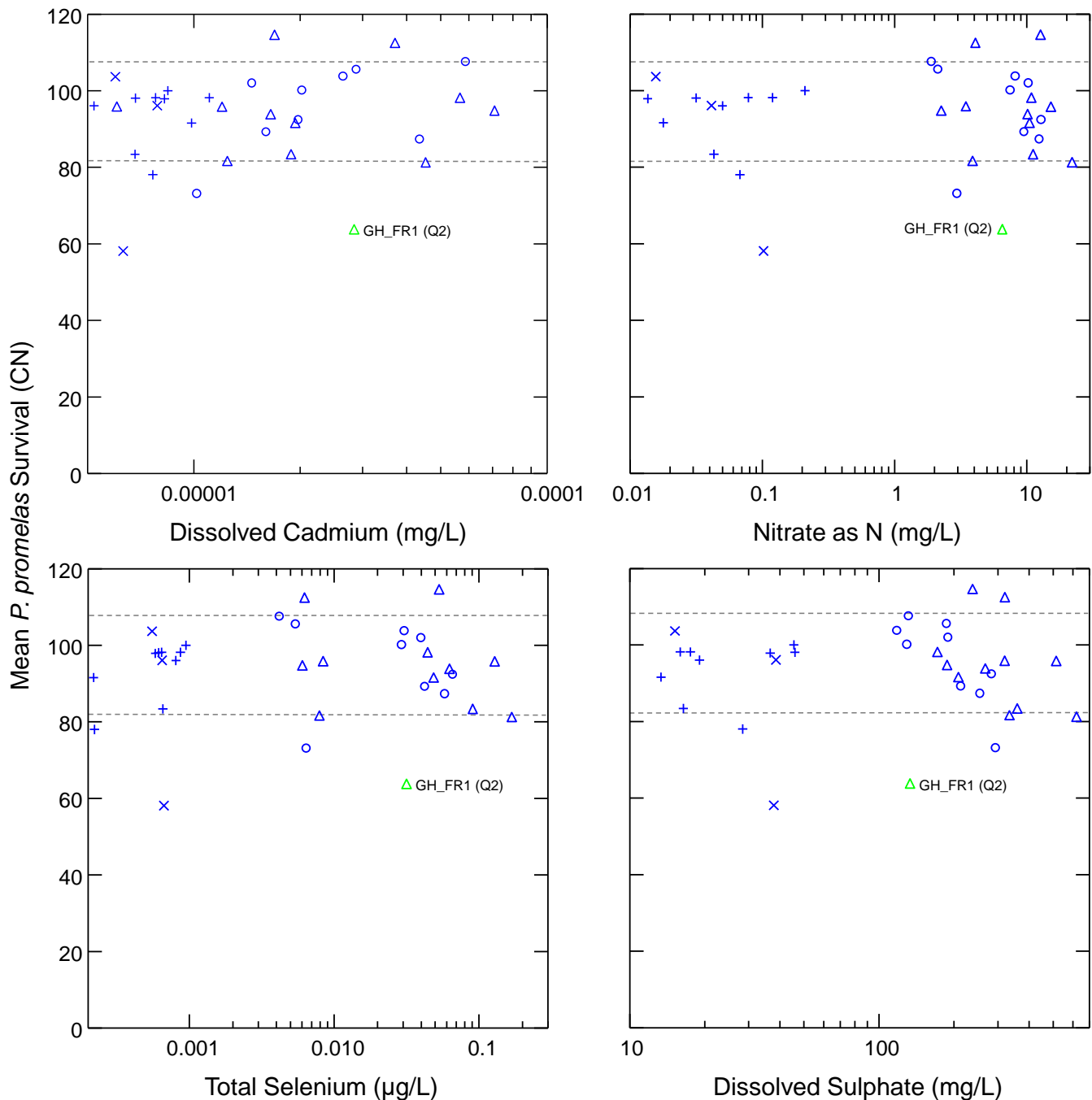
In the Q2 GH\_FR1 test (i.e., the only test identified as having a possible or likely response), concentrations of most parameters were equal to or lower than concentrations in reference waters and/or test site waters categorized as no adverse response (Table D-5), and/or were lower than the chronic BC WQG (Table C-5). Such parameters are not expected to contribute to toxicity in these tests. Overall, no water quality parameter was

<sup>19</sup> Of 21 samples, four had detected concentrations of boron and zero had detected concentrations of titanium (Table D-5).

identified as a potential cause of the observed response in this test. As discussed in Section 3.3.1.5, there was evidence of microbial effects in this test.

Parameters that were greater than concentrations in reference waters and/or test site waters categorized as no adverse response were TOC, turbidity, and vanadium. TOC is considered a toxicity-modifying factor rather than a toxicant, indicating that it is not likely contributing to toxicity. The vanadium concentration in this test (1.7 µg/L) was more than two orders of magnitude lower than the reported lowest observed effect concentration of 480 µg/L for growth (Environment Canada 2016), indicating that it is not likely contributing to toxicity. Turbidity in this test (16.4 Nephelometric Turbidity Units) was approximately 33% higher than tests with reference waters and/or test site waters categorized as no adverse response. However, TSS, which is correlated with turbidity and used to evaluate effects of suspended materials in the BC MoE (1997) guideline, was lower in this test (22.1 mg/L) relative to the Q2 2017 test with the Elk River reference (24.3 mg/L).

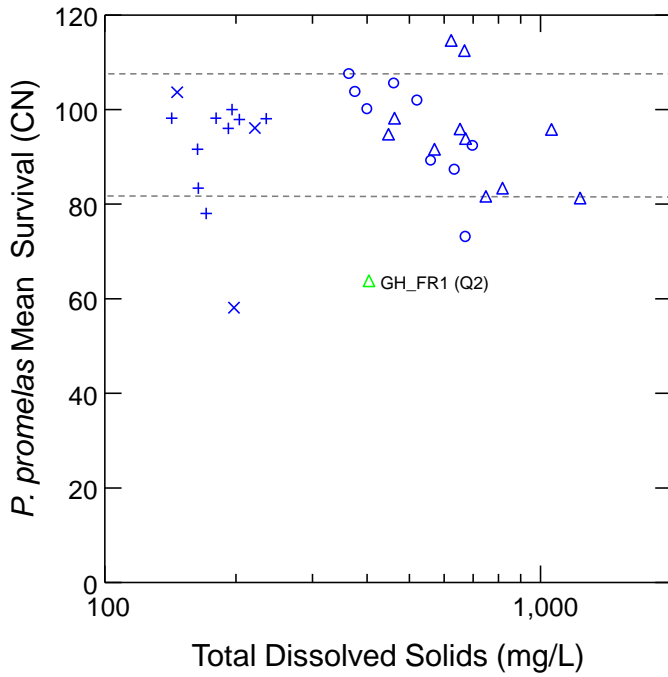
**Figure 3.4-20: Mean *P. promelas* survival versus concentrations of dissolved cadmium (top left), nitrate (top right), total selenium (bottom left), and sulphate (bottom right).**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

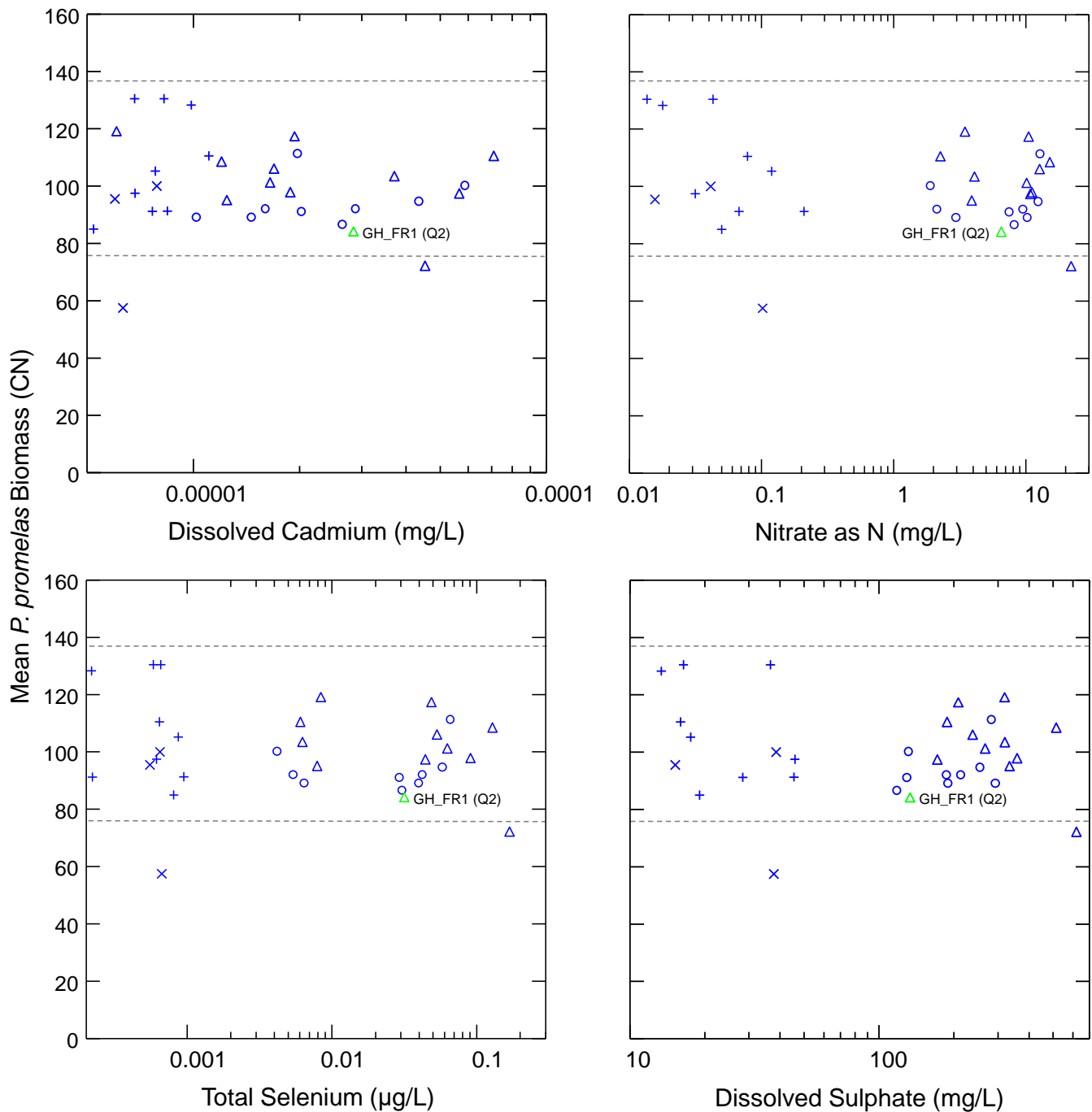


**Figure 3.4-21: Mean *P. promelas* survival versus concentrations of total dissolved solids.**



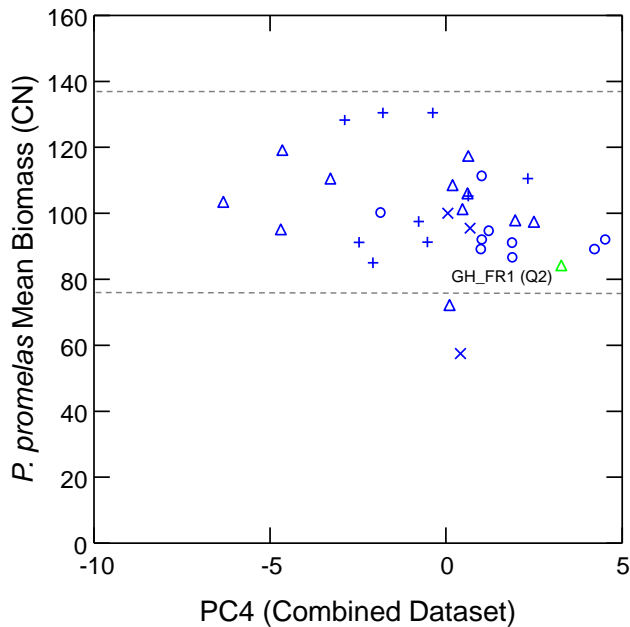
Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-22: 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 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

**Figure 3.4-23: Mean *P. promelas* biomass versus PC4 for the combined dataset.**



Note: Responses are control normalized (CN). Symbols indicate reference waters (blue x = 2015 and 2016; blue + = 2017), test site waters with mean results categorized as no adverse response (blue o = 2015 and 2016; blue Δ = 2017), and test site waters with mean results categorized as possible or likely adverse response (green o = 2015 and 2016; green Δ = 2017). Test site waters categorized as possible or likely in 2017 (green Δ) are labelled with the test site and quarter. Lines are regional normal range (dashed grey lines) (see Figure 2.3-3 for description).

### 3.5 Comparison of 2017 Results to Previous Years

Mean results for 2015, 2016, and 2017 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], and 2017 results were categorized in Section 3.3.1).
- Open symbols indicate test sites with a mean response statistically similar 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

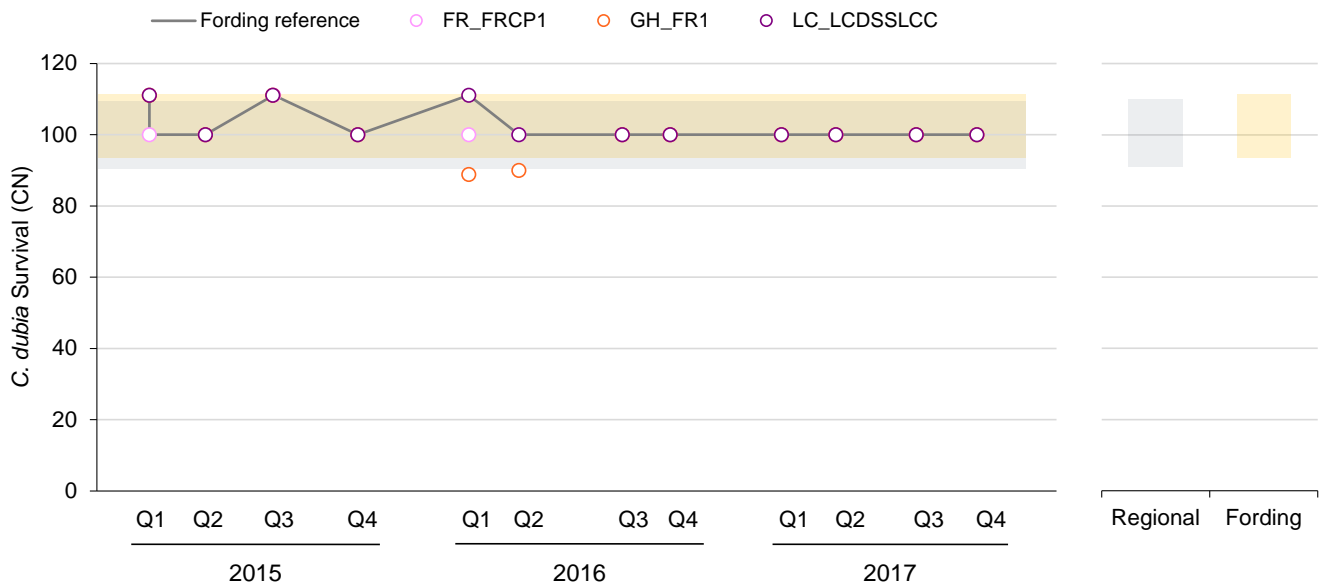
conclusions) as “no”, “possible”, or “likely” adverse response have changed over time, these graphics are intended to represent a coarse-level inter-annual comparison<sup>20</sup>.

Mean results are plotted in the following figures:

- *C. dubia* survival (Figures 3.5-1 to 3.5-2) and reproduction (Figures 3.5-3 to 3.5-4)
- *P. subcapitata* cell yield (Figures 3.5-5 to 3.5-6)
- *H. azteca* survival (Figure 3.5-7) and dry weight (Figure 3.5-8)
- *O. mykiss* survival (Figures 3.5-9 to 3.5-10), viability (Figures 3.5-11 to 3.5-12), length (Figures 3.5-13 to 3.5-14), and weight (Figures 3.5-15 to 3.5-16)
- *P. promelas* hatch (Figure 3.5-17), survival (Figure 3.5-18), biomass (Figure 3.5-19), length (Figure 3.5-20), and development (Figure 3.5-21)

The following sections compare 2017 test results to previous years (i.e., 2015 and 2016) for each test site.

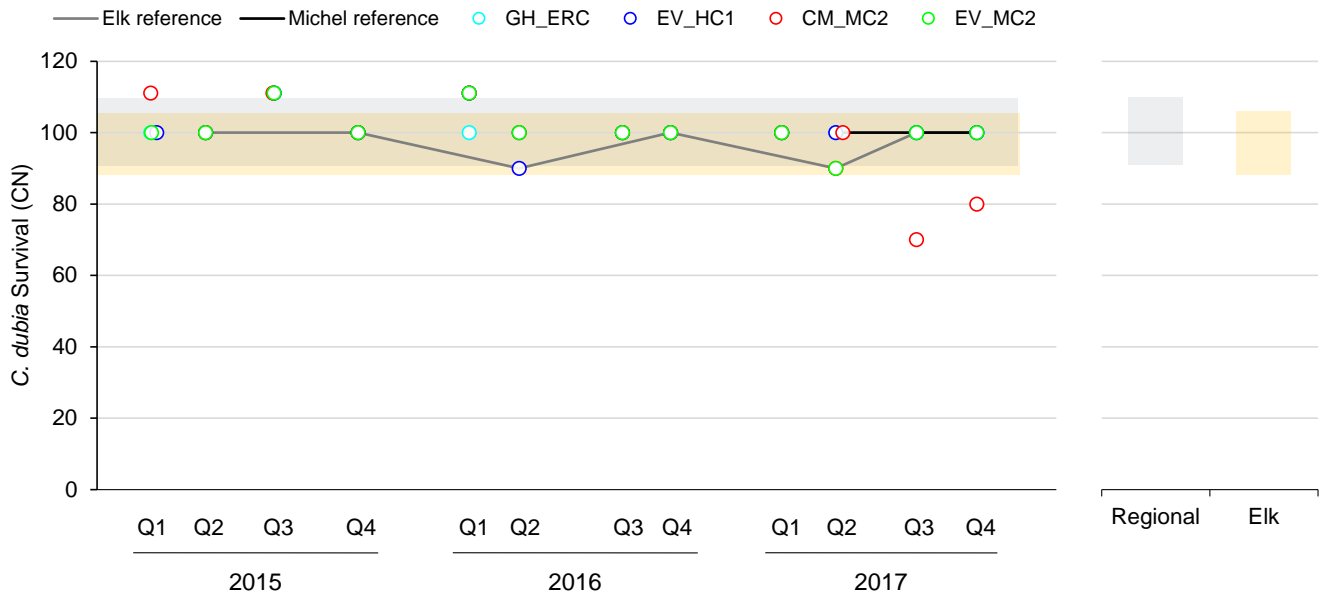
**Figure 3.5-1: Mean results for *C. dubia* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

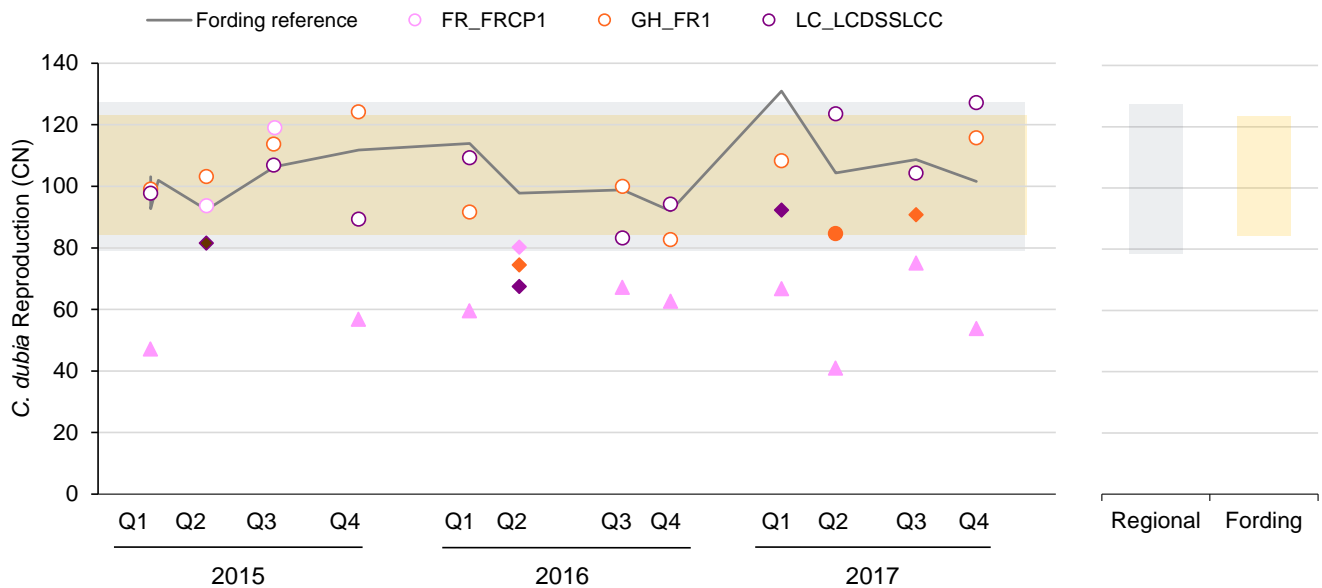
<sup>20</sup> In 2016 only, there was a fourth narrative conclusion called “significant (no category)”. This narrative conclusion occurred when there was insufficient information to categorize the test as possible or likely. Specifically, this narrative occurred when the following was true: 1) a single 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 3.5-2: Mean results for *C. dubia* survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



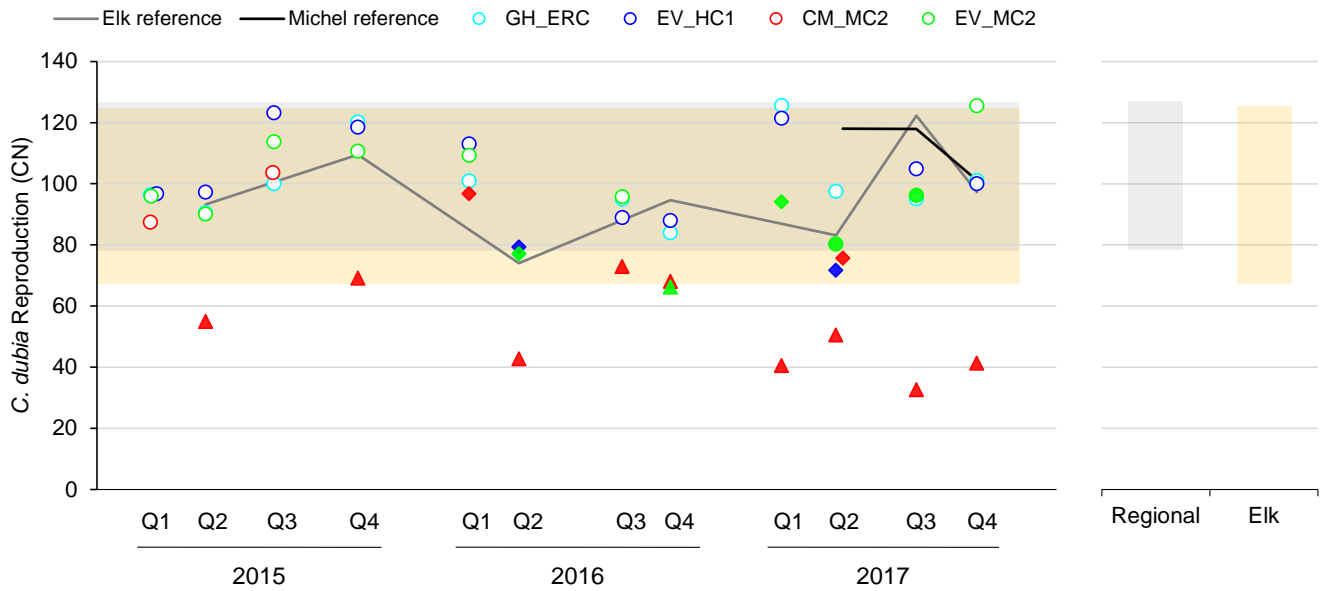
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-3: Mean results for *C. dubia* reproduction in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



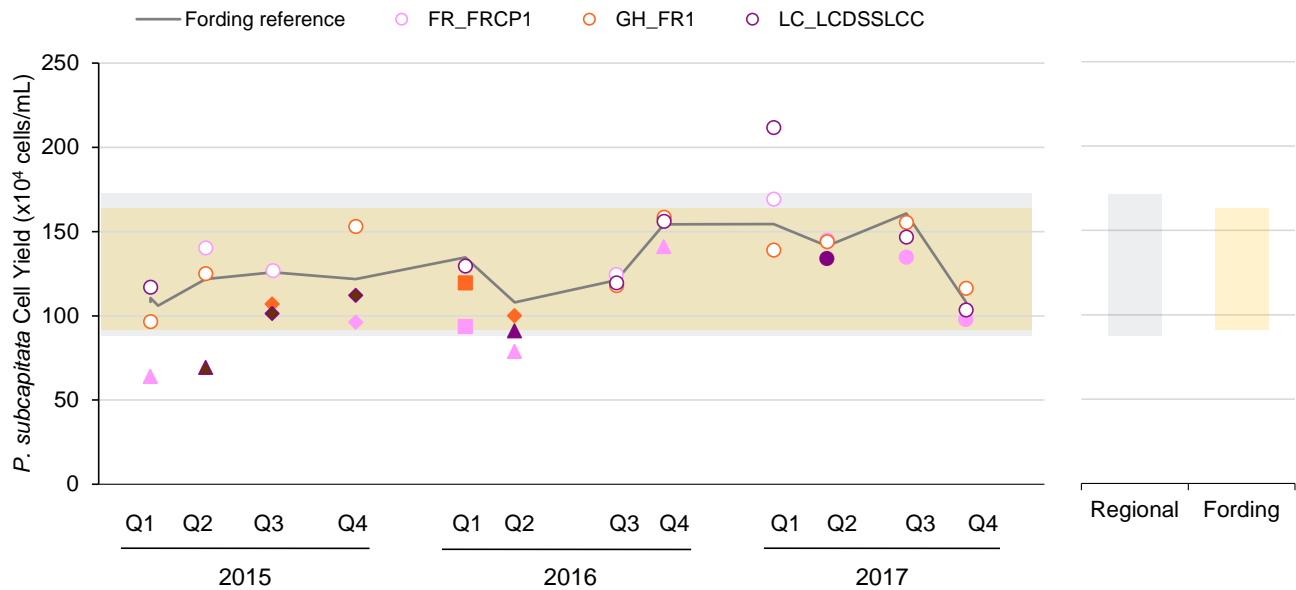
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-4: Mean results for *C. dubia* reproduction in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



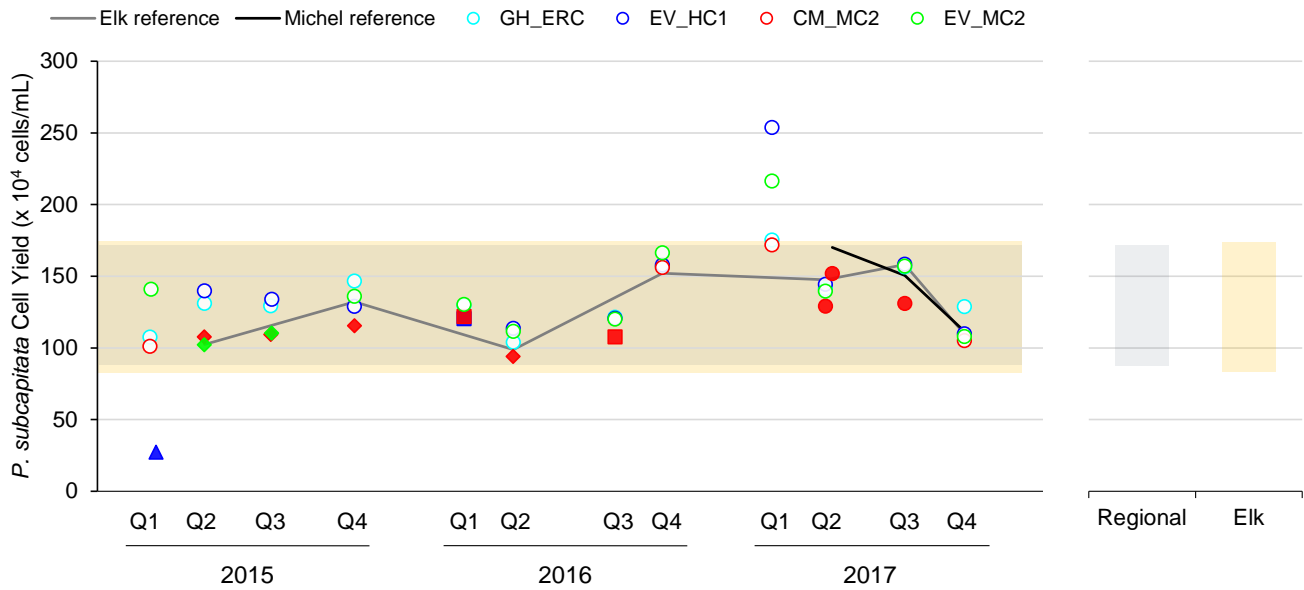
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-5: Mean results for *P. subcapitata* cell yield in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



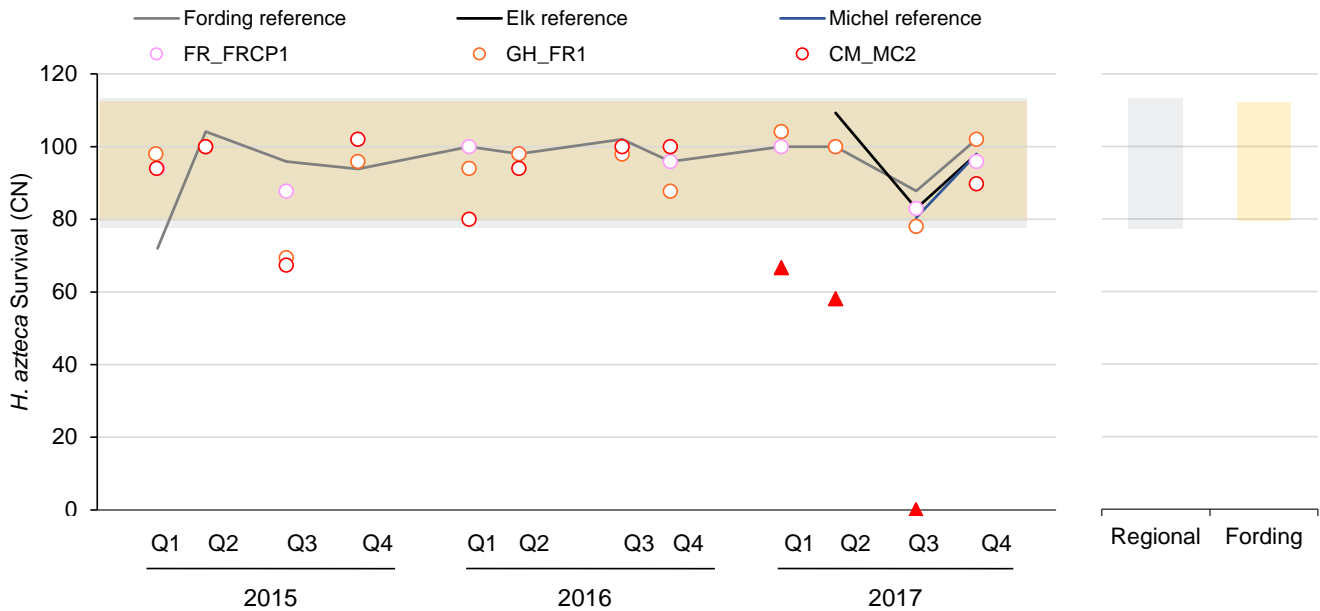
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-6: Mean results for *P. subcapitata* cell yield in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



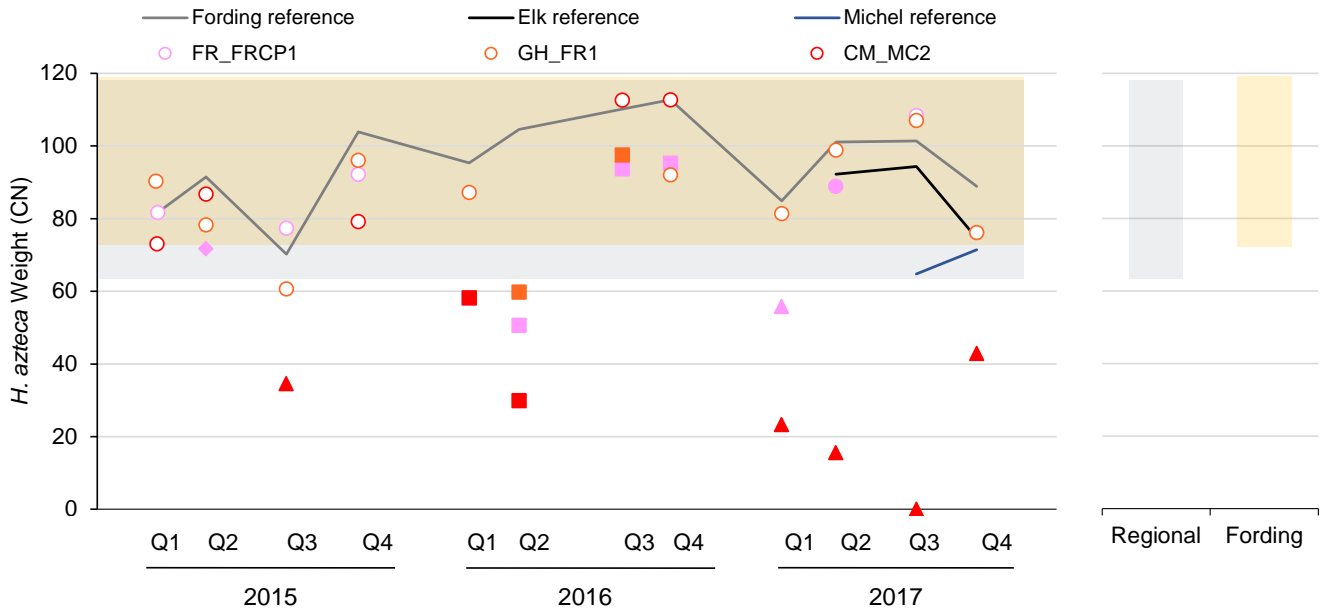
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-7: Mean results for *H. azteca* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



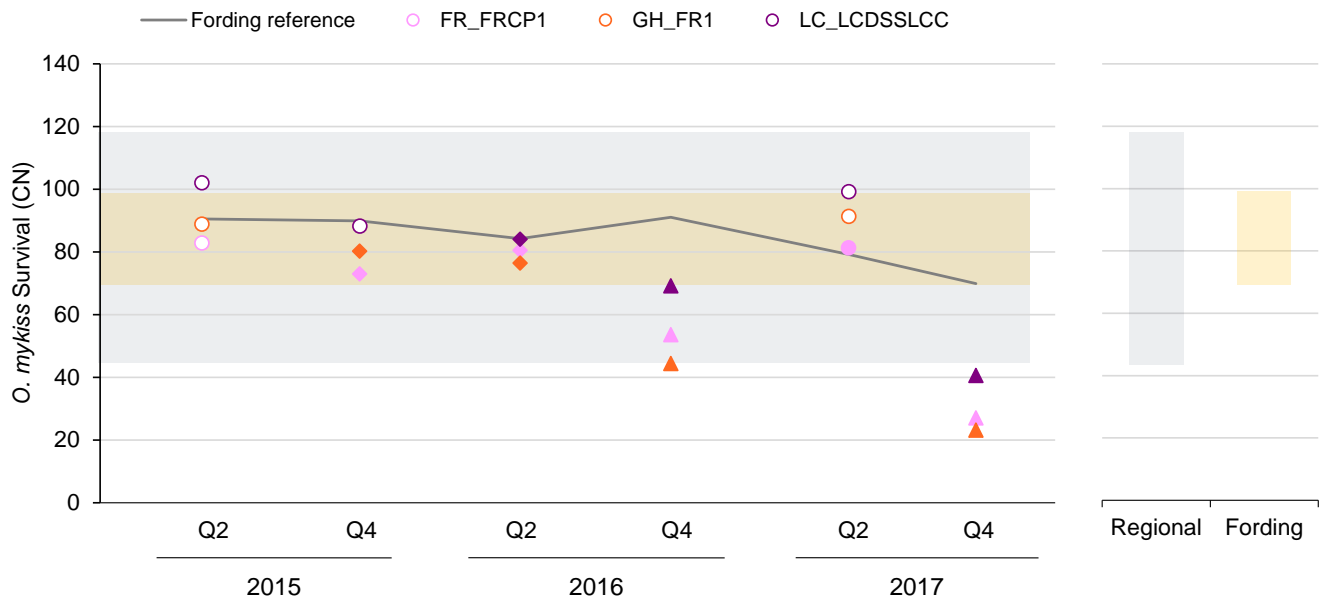
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-8: Mean results for *H. azteca* dry weight in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

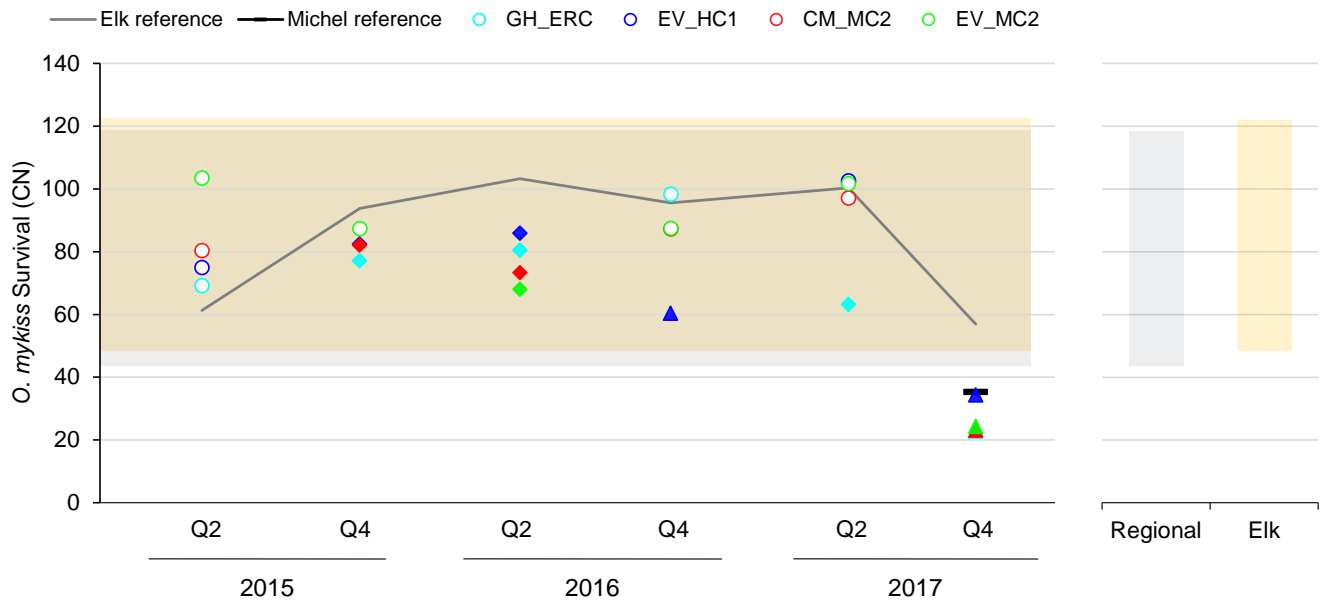
**Figure 3.5-9: Mean results for *O. mykiss* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

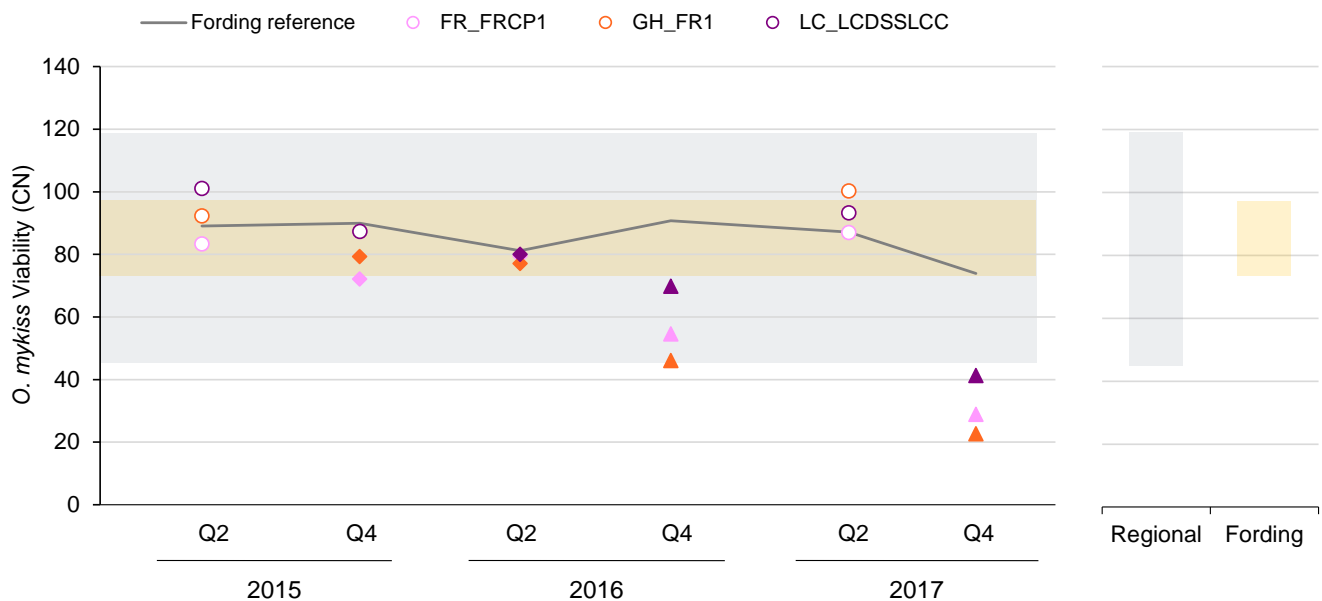


**Figure 3.5-10: Mean results for *O. mykiss* survival in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



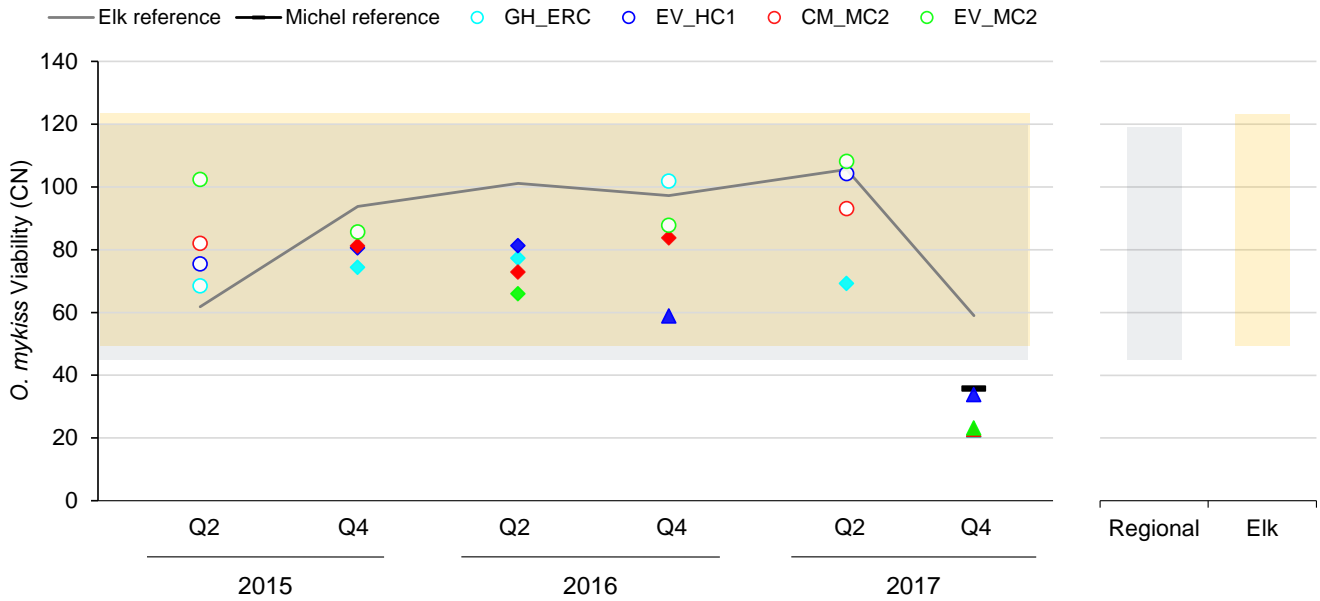
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-11: Mean results for *O. mykiss* viability in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



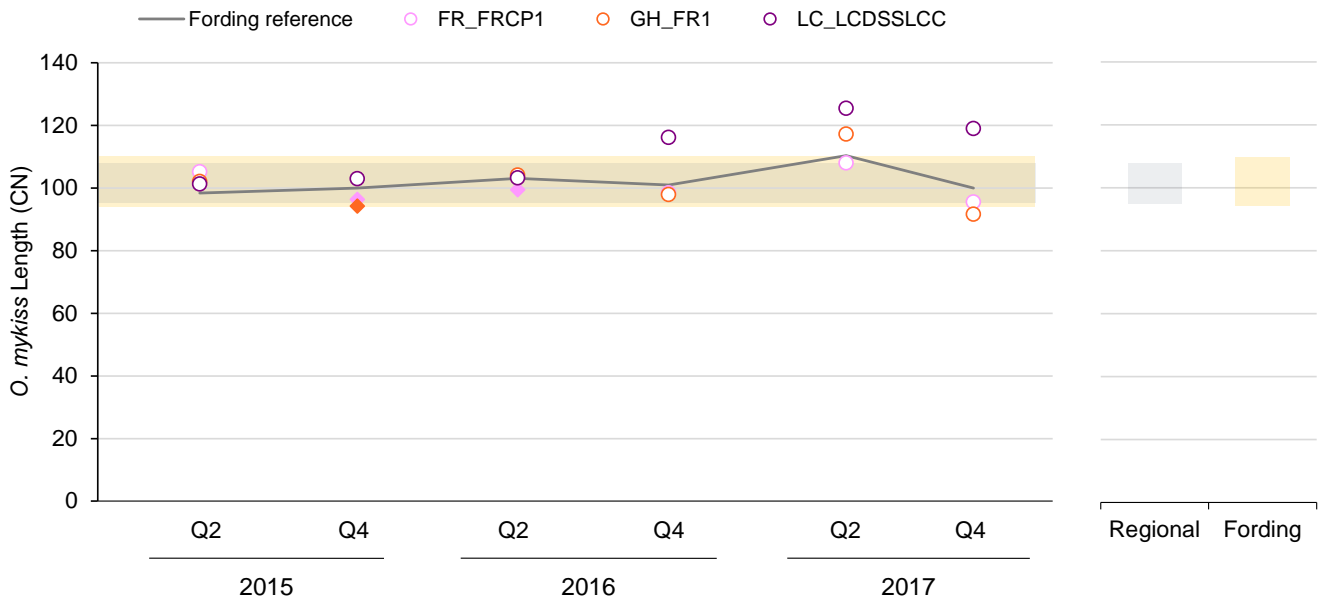
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-12: Mean results for *O. mykiss* viability in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



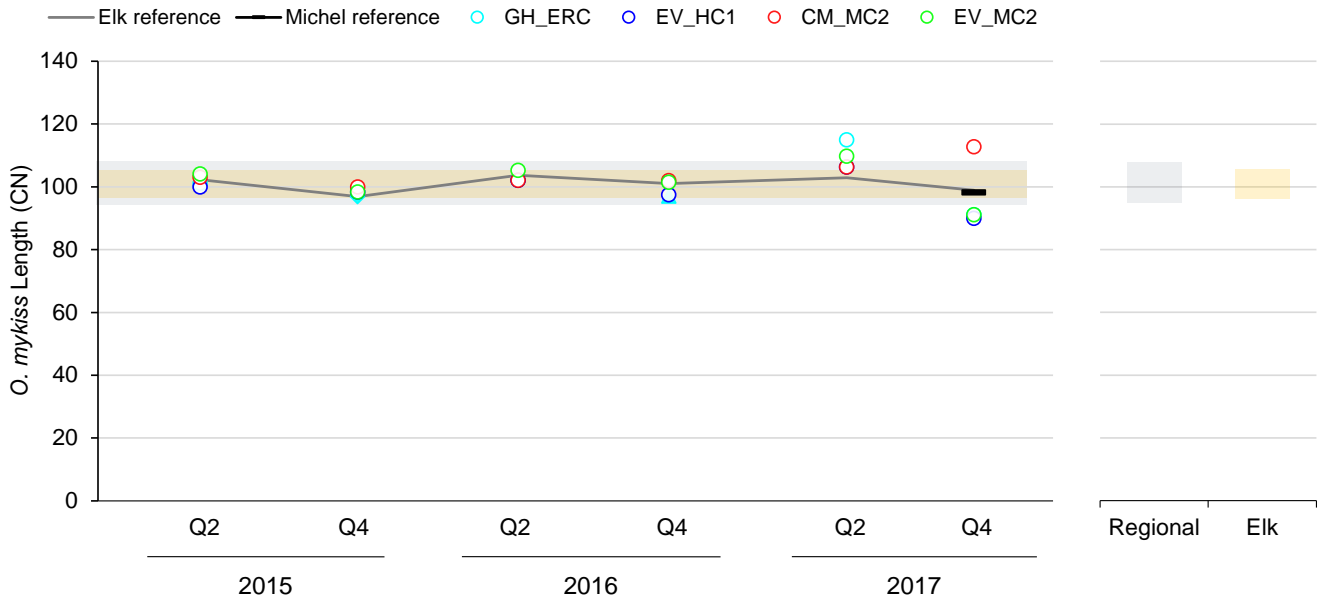
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-13: Mean results for *O. mykiss* length in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



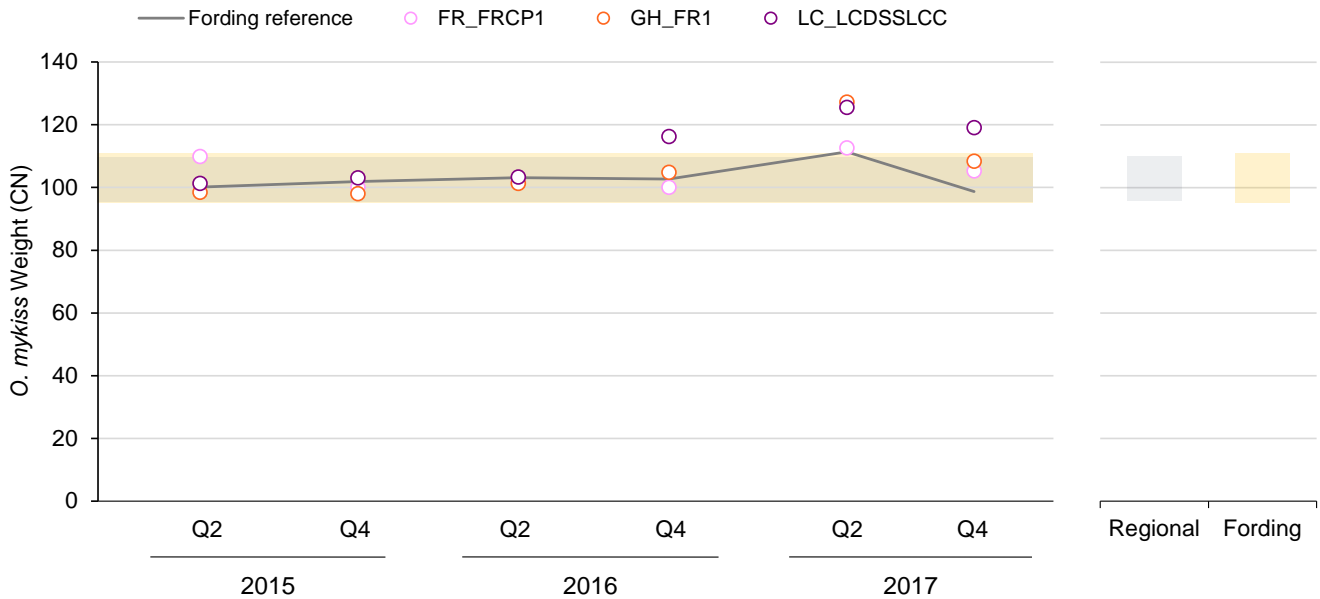
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-14: Mean results for *O. mykiss* length in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



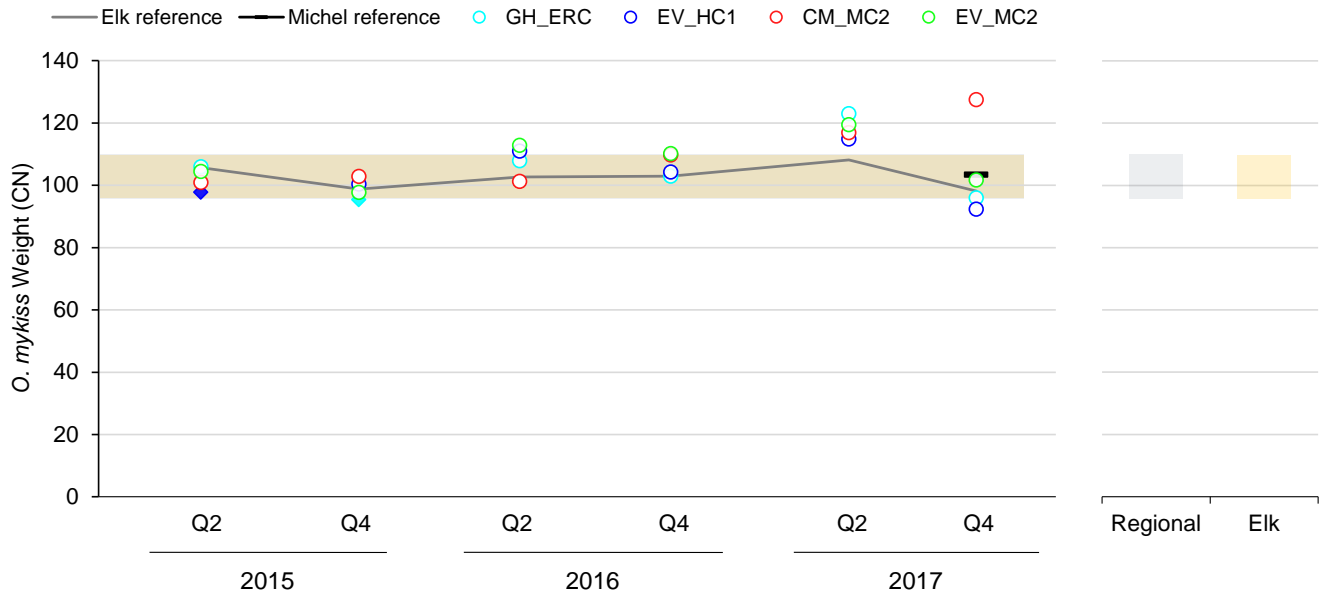
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-15: Mean results for *O. mykiss* weight in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



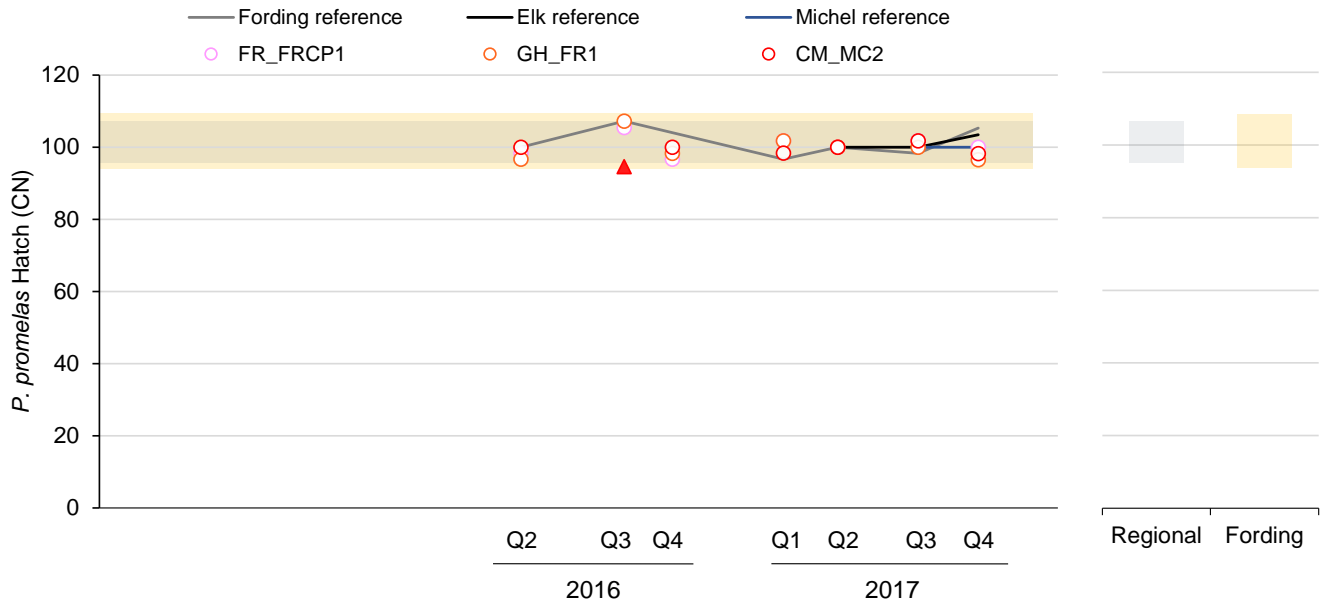
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-16: Mean results for *O. mykiss* weight in the Elk River and Michel Creek references and their paired test site waters (left panel). Regional and local normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



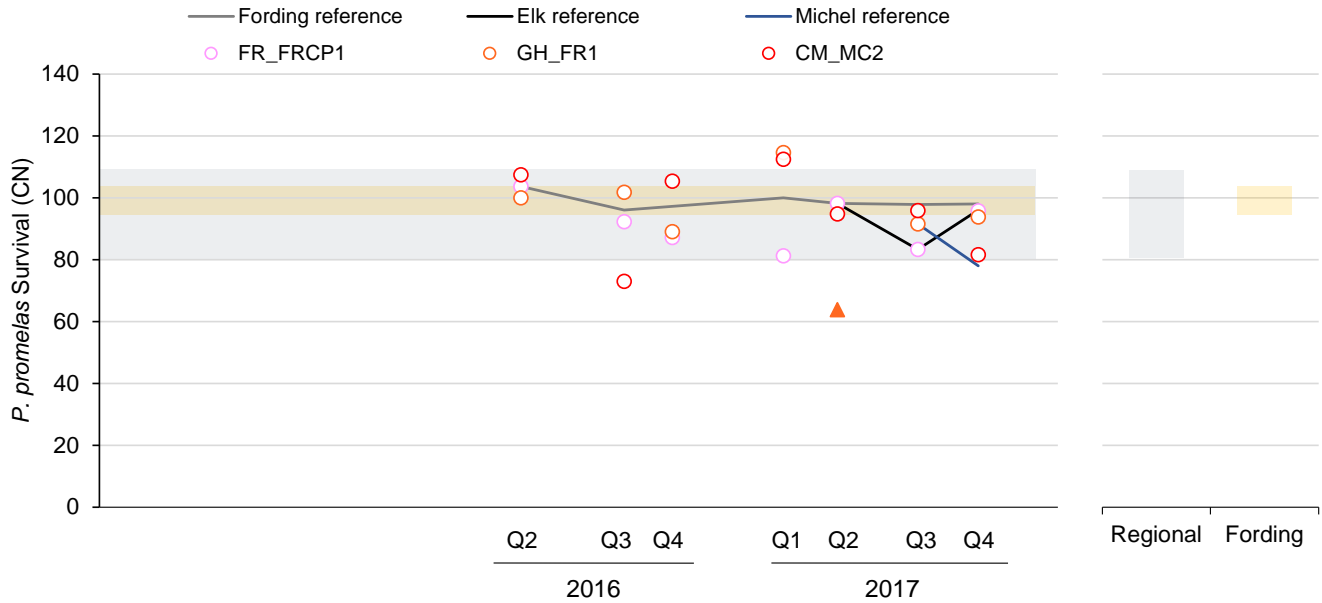
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-17: Mean results for *P. promelas* hatch in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



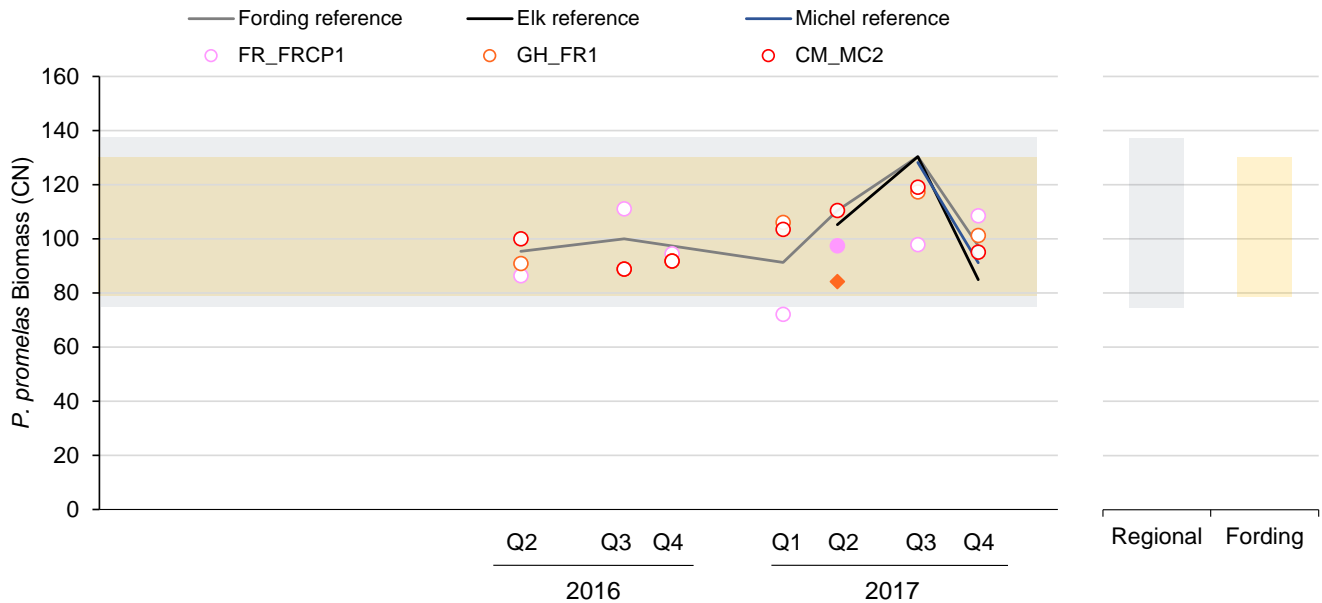
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-18: Mean results for *P. promelas* survival in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



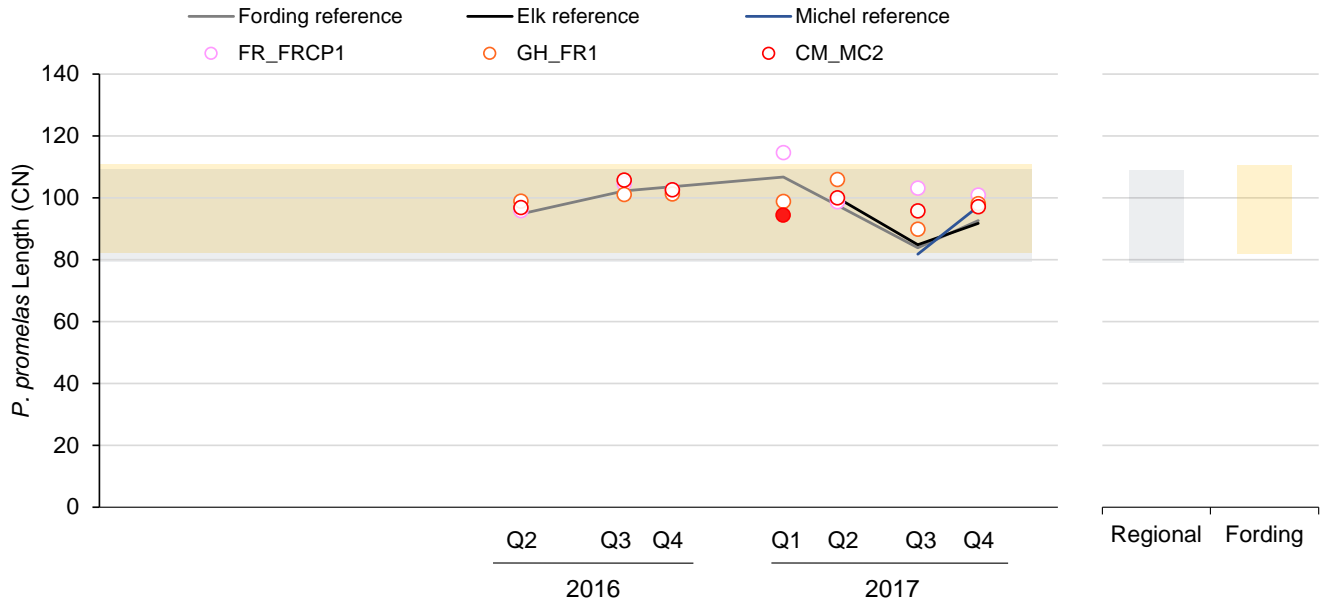
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3).

**Figure 3.5-19: Mean results for *P. promelas* biomass in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



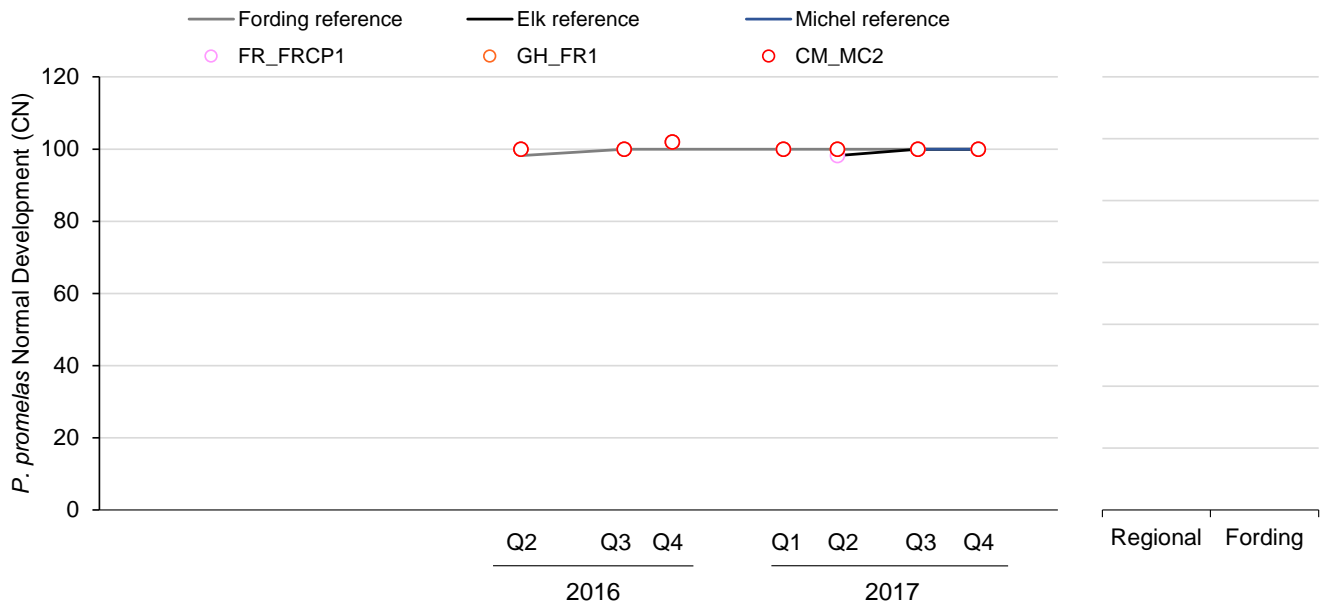
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Fording (Section 2.3.3).

**Figure 3.5-20: Mean results for *P. promelas* length in the Fording River reference and its paired test site waters between (left panel). Regional and Fording River normal ranges (2.5<sup>th</sup> to 97.5<sup>th</sup> percentile) are shown as bars (right panel).**



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

**Figure 3.5-21: Mean results for *P. promelas* development in the Fording River reference and its paired test site waters between.**



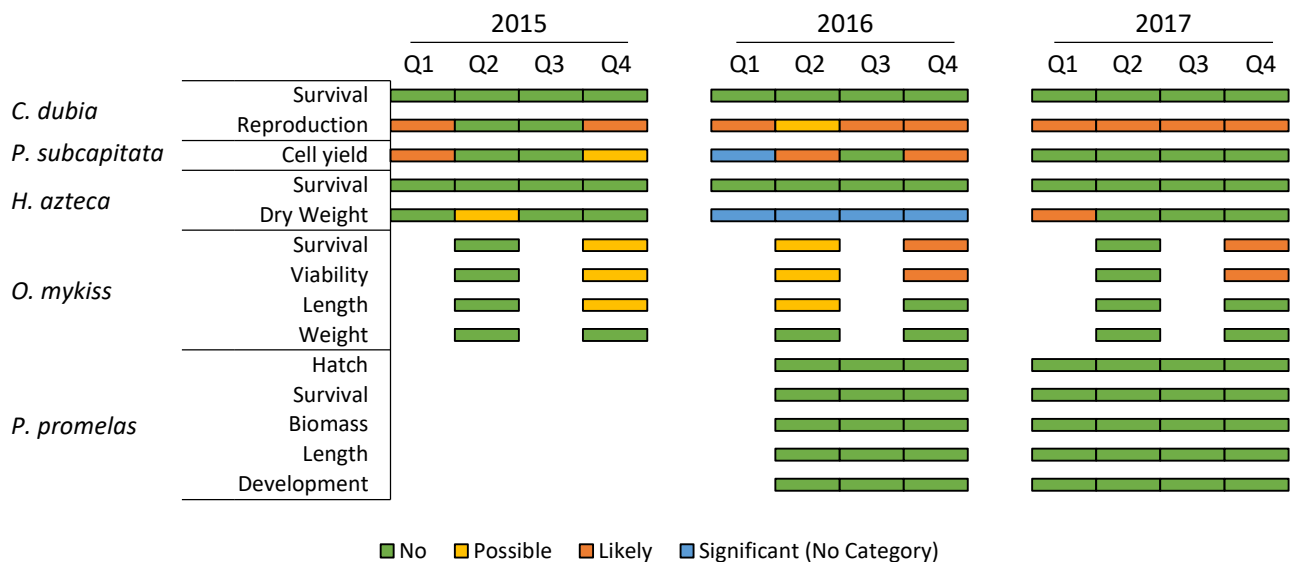
Note: See Figure 2.3-3 for description of lines and symbols. Test sites were compared to the local NR for the Elk (Section 2.3.3). NRs were not calculated for this endpoint due to minimal variability in test response (Section 3.2.3).

### 3.5.1 FR\_FRCP1

Results for FR\_FRCP1 in 2015, 2016, and 2017 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 below the local and regional NRs (Figure 3.5-3), with mean responses near 60% in most tests. These results have been confirmed over multiple sampling years. Several parameters have been identified as potentially contributing to observed response, including nickel (Q1 and Q4 2017), nitrate (Q1 2015, Q1 to Q4 2016), and sulphate/TDS (Q1 2015; Q1 2016) were identified. Although not expected, selenium could not be ruled out as a potential contributor.
- P. subcapitata.** Mean cell yield was within the local and regional NRs in most quarterly tests (Figure 3.5-5). There is a trend towards fewer and smaller responses over time. No water quality parameter was identified as potentially contributing to observed responses.
- H. azteca.** There was no adverse response on survival in any test in any year (Figure 3.5-7). Mean dry weight was generally within the local and regional NRs (Figure 3.5-8). Nitrate was identified as potentially contributing to observed responses in Q1 2016 and Q1 2017. Although not expected, selenium could not be ruled out as a potential contributor.
- O. mykiss.** Mean length and weight were within the local and regional NRs (Figure 3.5-13; Figure 3.5-15). Mean survival and viability were below the local NR in approximately half of the tests, and below the regional NR in Q4 2017 (Figure 3.5-9; Figure 3.5-11). Sulphate and TDS were identified as potentially contributing to observed responses in Q4 2017. No water quality parameter was identified as potentially contributing to observed responses in other tests. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- P. promelas.** There were no adverse responses on *P. promelas* endpoints (Figures 3.5-17 to 3.5-21). Mean responses were consistent over time and generally within the regional and local NRs.

Figure 3.5-22: Summary of test results by category at FR\_FRCP1.



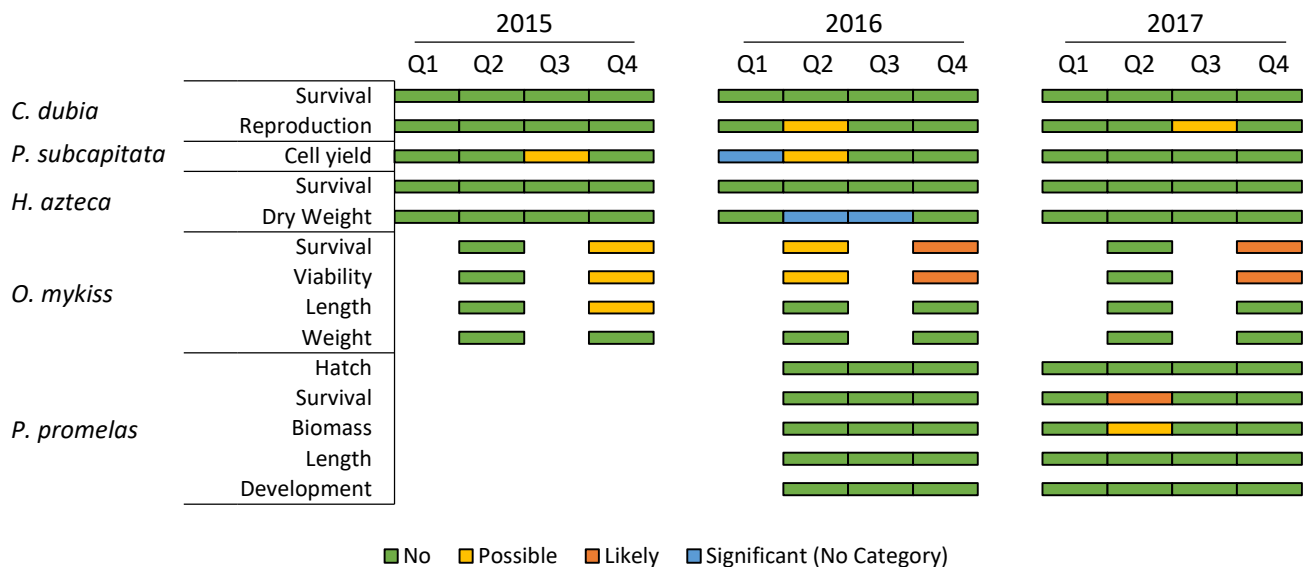
Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), and 2017 tests in Section 3.3.1.

### 3.5.2 GH\_FR1

Results for GH\_FR1 in 2015, 2016, and 2017 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 NRs (Figure 3.5-3). Nitrate was identified as potentially contributing to the observed response in Q2 2016. No water quality parameter was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-5). There is a trend towards fewer responses over time. No water quality parameter 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 (Figure 3.5-7). Mean dry weight was generally within the local and regional NRs (Figure 3.5-8). No water quality parameter was identified as potentially contributing to observed responses.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-13; Figure 3.5-15). Mean survival and viability were within the local NRs in most tests, but were below the local NR in one test (Q4 2016) and below the regional NR in one test (Q4 2017) (Figure 3.5-9; Figure 3.5-11). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **P. promelas.** Mean responses were consistent over time and generally within the regional and local NRs, except for reduced survival and biomass and Q2 2017 (Figures 3.5-17 to 3.5-21). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 may have been related to naturally-occurring microbes (Section 3.3.1.5).

Figure 3.5-23: 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), and 2017 tests in Section 3.3.1.

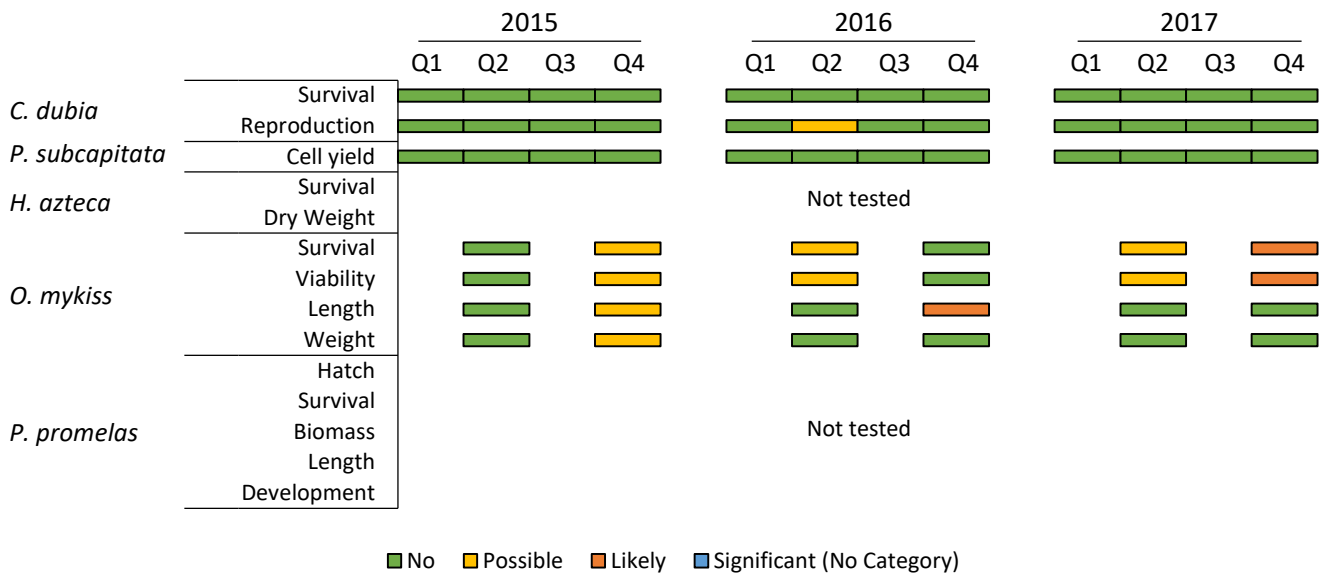


### 3.5.3 GH\_ERC

Results for GH\_ERC in 2015, 2016, and 2017 are summarized in Figure 3.5-24. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival or reproduction in any test in any year (Figure 3.5-2; Figure 3.5-4), except for reproduction in Q2 2016. Mean reproduction was within the local and regional NRs. No water quality parameter 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 3.5-6). Mean cell yield was within the local and regional NRs.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-14; Figure 3.5-16). Mean survival and viability were within the local and regional NRs, except for Q4 2017 (Figure 3.5-10; Figure 3.5-12). TSS was identified as potentially contributing to observed responses in Q2 2017. No water quality parameter was identified as potentially contributing to observed responses in other tests. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

Figure 3.5-24: Summary of test results by category at GH\_ERC.



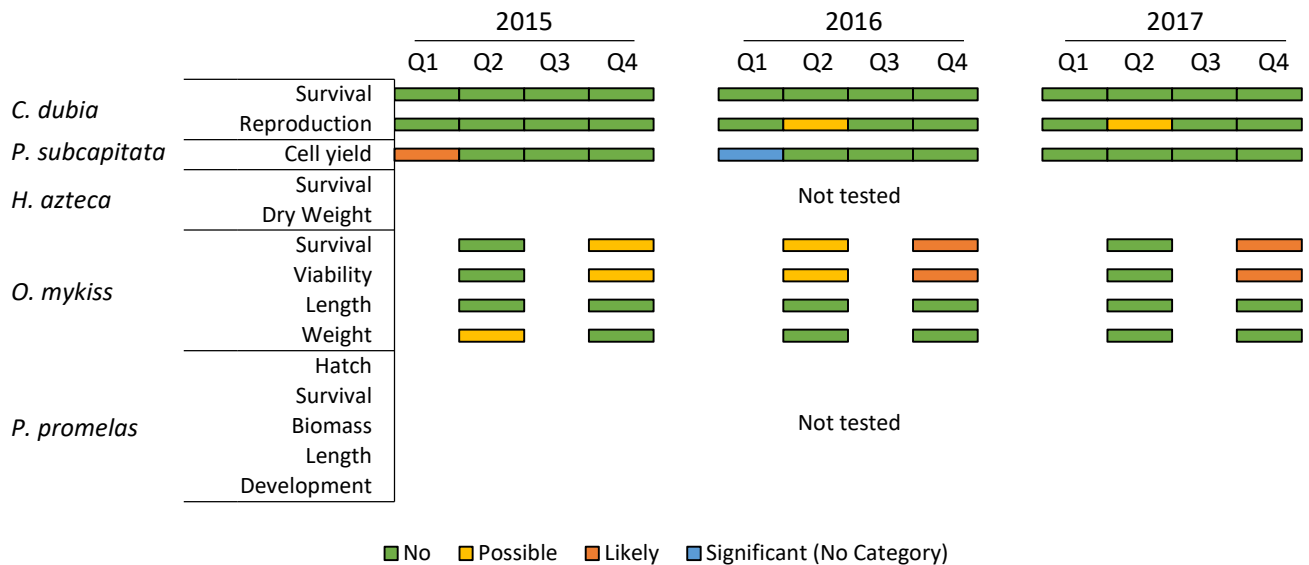
Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), and 2017 tests in Section 3.3.1.

### 3.5.4 EV\_HC1

Results for EV\_HC1 in 2015, 2016, and 2017 are summarized in Figure 3.5-25. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival or reproduction in any test in any year (Figure 3.5-2; Figure 3.5-4), except for reproduction in Q2 2016 and Q2 2017. Mean reproduction was generally within the local and regional NRs. No water quality parameter was identified as potentially contributing to observed responses.
- **P. subcapitata.** Mean cell yield was generally within the local and regional NRs (Figure 3.5-6), except for Q1 2015. No water quality parameter was identified as potentially contributing to observed responses.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-14; Figure 3.5-16). Mean survival and viability were within the local and regional NRs, except for Q4 2017 (Figure 3.5-10; Figure 3.5-12). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

Figure 3.5-25: Summary of test results by category at EV\_HC1.



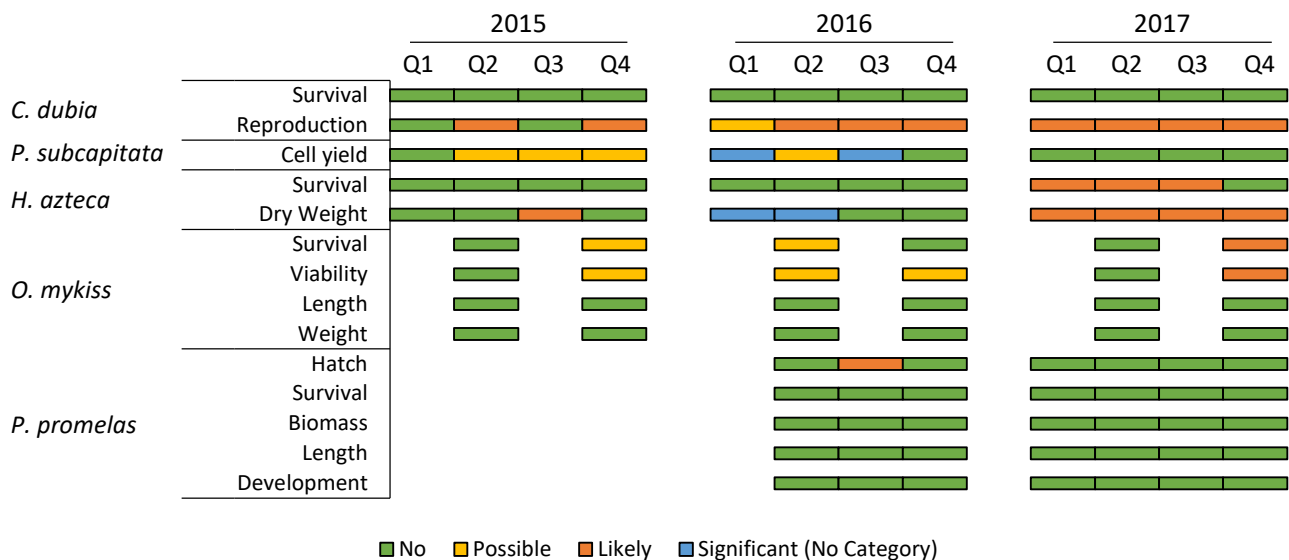
Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), and 2017 tests in Section 3.3.1.

### 3.5.5 CM\_MC2

Results for CM\_MC2 in 2015, 2016, and 2017 are summarized in Figure 3.5-26. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-2). Mean reproduction was generally below the local and regional NRs (Figure 3.5-4). There is a trend towards more and larger responses over time. Nickel was identified as potentially contributing to observed responses in 2017 tests. The trend in responses corresponds with an increase in aqueous nickel concentrations from 2015 (generally ranged from 5 to 15 µg/L) to 2017 (generally ranged from 10 to 45 µg/L).
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-6). TSS was identified as potentially contributing to the observed response in Q2 2015. No water quality parameter was identified as potentially contributing to observed responses in other tests.
- **H. azteca.** Mean survival was generally within the local and regional NRs, except for Q1 to Q3 2017 (Figure 3.5-7). Mean dry weight was below the local and regional NRs in approximately half of the tests (Figure 3.5-8). There is a trend towards more and larger responses over time. Nickel was identified as potentially contributing to observed responses. As discussed above for *C. dubia*, the trend in responses corresponds with an increase in aqueous nickel concentrations from 2015 to 2017.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-14; Figure 3.5-16). Mean survival and viability were within the local and regional NRs, except for Q4 2017 (Figure 3.5-10; Figure 3.5-12). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **P. promelas.** There was no adverse response on *P. promelas* endpoints (Figures 3.5-17 to 3.5-21), except for hatch in Q3 2016. Mean responses were consistent over time and generally within the regional and local NRs. No water quality parameter was identified as potentially contributing to observed response in Q3 2016.

Figure 3.5-26: Summary of test results by category at CM\_MC2.



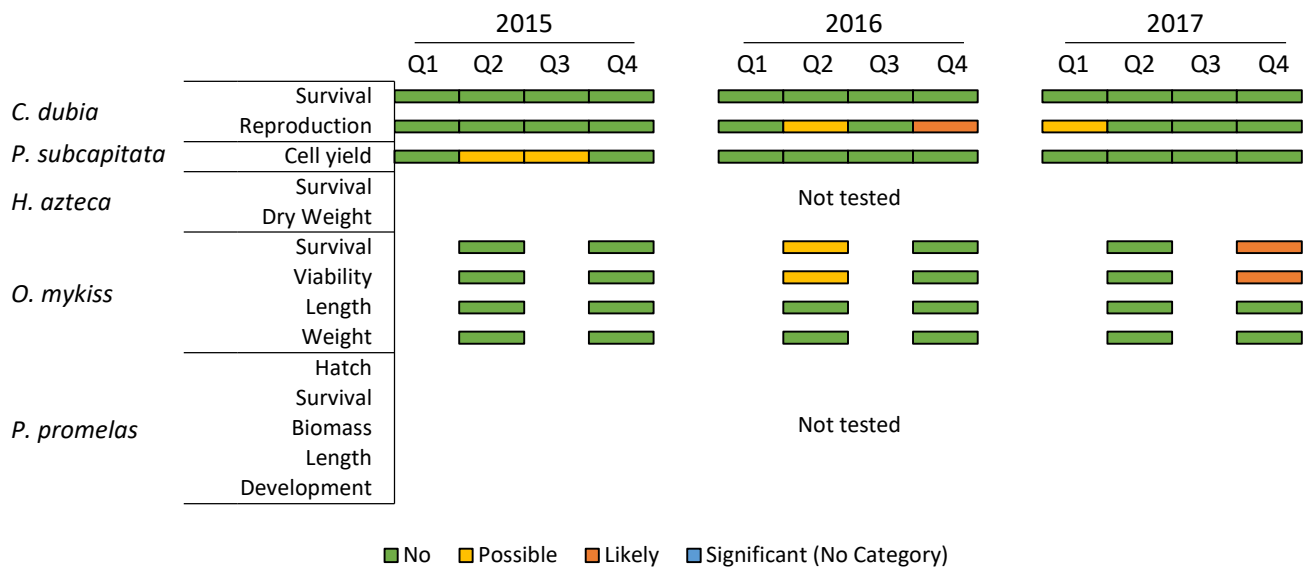
Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), and 2017 tests in Section 3.3.1

### 3.5.6 EV\_MC2

Results for EV\_MC2 in 2015, 2016, and 2017 are summarized in Figure 3.5-27. An overview of the results is provided below:

- **C. dubia.** There was no adverse response on survival in any test in any year (Figure 3.5-2). Mean reproduction was generally within the local and regional NRs (Figure 3.5-4). Turbidity was identified as potentially contributing to observed responses in Q2 2016. No water quality parameter was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was generally within the local and regional NRs (Figure 3.5-6). No water quality parameter was identified as potentially contributing to observed responses.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-14; Figure 3.5-16). Mean survival and viability were within the local and regional NRs, except for Q4 2017 (Figure 3.5-10; Figure 3.5-12). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

Figure 3.5-27: Summary of test results by category at EV\_MC2.



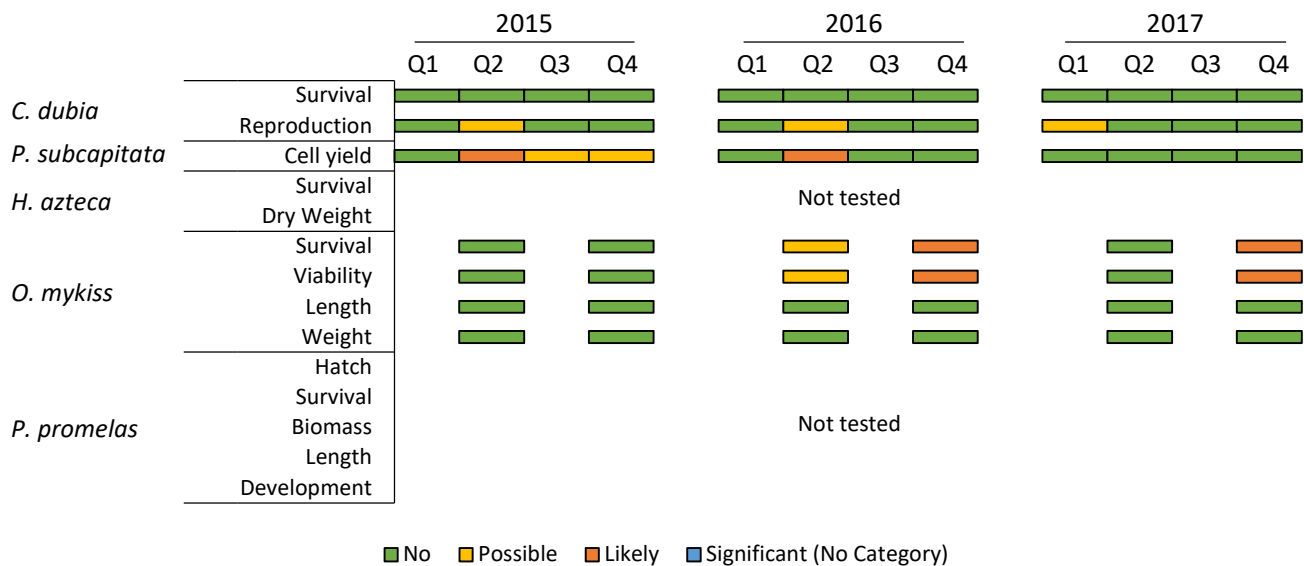
Note: Results are categorized in the following: 2015 tests in Golder (2016), 2016 tests in Golder (2017), and 2017 tests in Section 3.3.1.

### 3.5.7 LC\_LCDSSLCC

Results for LC\_LCDSSLCC in 2015, 2016, and 2017 are summarized in Figure 3.5-28. 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 (Figure 3.5-3). Nitrate was identified as potentially contributing to the observed response in Q2 2016. No water quality parameter was identified as potentially contributing to observed responses in other tests.
- **P. subcapitata.** Mean cell yield was within the local and regional NRs (Figure 3.5-5), except for Q2 2015 and Q2 2016. There is a trend towards fewer responses over time. No water quality parameter was identified as potentially contributing to observed responses.
- **O. mykiss.** Mean length and weight were generally within the local and regional NRs (Figure 3.5-13; Figure 3.5-15). Mean survival and viability were within the local NR in most tests, but were below the local NR in one test (Q4 2016) and below the regional NR in one test (Q4 2017) (Figure 3.5-9; Figure 3.5-11). No water quality parameter was identified as potentially contributing to observed responses. Responses observed in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

Figure 3.5-28: 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), and 2017 tests in Section 3.3.1.

## 4.0 SUMMARY

A summary of the 2017 results is provided below (Section 4.1), followed by a summary of the comparison of 2017 results to previous years (Section 4.2).

### 4.1 2017 Results

#### *C. dubia*

A total of 39 tests were conducted with *C. dubia* in 2017, including 10 tests with reference waters and 29 tests with waters collected from test sites. There was no evidence of statistically significant adverse effects on mean *C. dubia* survival in any test.

Reproduction was significantly reduced relative to one or more references in 16 of 29 tests, including four FR\_FRCP1 tests (Q1 to Q4), two GH\_FR1 tests (Q2, Q3), three EV\_MC2 tests (Q1, Q2, Q3), one EV\_HC1 test (Q2), five CM\_MC2 tests (Q1 to Q4; two tests were conducted in Q2), and one LC\_LCDSSLCC test (Q1). Approximately half (16 of 29) of the tests were categorized as no adverse response, including three tests with significant results (EV\_MC2 [Q2, Q3]; GH\_FR1 [Q2]). Five of 29 tests were categorized as a possible adverse response (EV\_MC2 [Q1], LC\_LCDSSLCC [Q1], EV\_HC1 [Q2], CM\_MC2 [Q2; second test], GH\_FR1 [Q3]). Eight of 29 tests were categorized as a likely adverse response (FR\_FRCP1 [Q1 to Q4] and CM\_MC2 [Q1 to Q4; first Q2 test]).

In six of the 13 tests categorized as possible or likely, no water quality parameter was identified as a potential cause of the adverse response. However, in all of the CM\_MC2 tests (Q1 to Q4) and two of the FR\_FRCP1 tests (Q1 and Q4), nickel was the only parameter identified as potentially contributing to observed responses. The evidence for nickel toxicity as the primary explanatory factor was stronger for CM\_MC2 relative to FR\_FRCP1, and was supported by the results of a preliminary TIE conducted with a subset of CM\_MC2 samples in 2017.

#### *P. subcapitata*

A total of 39 tests were conducted with *P. subcapitata* in 2017, including 10 tests with reference waters and 29 tests with waters collected from test sites. Cell yield was significantly reduced relative to one or more references in six of 29 tests, including two FR\_FRCP1 tests (Q3, Q4), three CM\_MC2 tests (Q2 [both tests], Q3), and one LC\_LCDSSLCC test (Q2). All of the tests were categorized as no adverse response, including the six tests listed in the previous sentence. These findings support the findings from previous work that although *P. subcapitata* yields variable results, the test does not appear to be sensitive to mine-related influence relative to crustacean and salmonid chronic test endpoints.

#### *H. azteca*

A total of 21 tests were conducted with *H. azteca* in 2017, including nine tests with reference waters and 12 tests with waters collected from test sites.

Survival was significantly reduced in three of 12 tests (CM\_MC2 [Q1, Q2, Q3]). These three tests were categorized as a likely adverse response. The remaining nine of 12 tests were categorized as no adverse response. Dry weight was significantly reduced in six of 12 tests, including two FR\_FRCP1 tests (Q1, Q2) and four CM\_MC2 tests (Q1 to Q4). Seven of 12 tests were categorized as no adverse response, including one test with a significant result (Q2 FR\_FRCP1). The remaining five of 12 tests were categorized as a likely adverse response.

In three of five tests categorized as possible or likely, nickel was identified as potentially contributing to observed responses (CM\_MC2 [Q1, Q3, Q4]). The evidence for nickel toxicity as the primary explanatory factor was weaker than that documented above for *C. dubia*, but matches the observation from published literature that crustacean

taxa are sensitive to bioavailable nickel in laboratory toxicity tests. In the Q1 FR\_FRCP1 test, nitrate was identified as potentially contributing to the observed response. Although not expected, selenium could not be ruled out as potentially contributing to the observed response in the FR\_FRCP1 test. In the Q2 CM\_MC2 test, no water quality parameter was identified as a potential cause of the adverse response.

### ***O. mykiss***

A total of 19 tests were conducted with *O. mykiss* in 2017, including two Q2 tests and three Q4 tests with reference waters and seven Q2 tests and seven Q4 tests with waters collected from test sites. The most sensitive test endpoints were survival and viability—there was no evidence of statistically significant adverse effects on mean length or weight in any test.

Survival and viability were significantly reduced relative to one or more references in two Q2 tests (FR\_FRCP1 [survival only], GH\_ERC) and all of the Q4 tests. Approximately half of the tests (6 of 14) were categorized as no adverse response, including the Q2 FR\_FRCP1 test with a significant response. One test (Q2 GH\_ERC) was categorized as a possible adverse response. Half of the tests (7 of 14), all of which were conducted in Q4), were categorized as a likely adverse response.

In six of eight tests categorized as possible or likely, no water quality parameter was identified as a potential cause of the adverse responses. In the Q2 GH\_ERC test, TSS was identified as potentially contributing to the observed response. In the Q4 FR\_FRCP1 test, sulphate and TDS were identified as potentially contributing to the observed response. The laboratory concluded that responses observed in Q4 were consistent with effects caused by microbial growth (Appendix B-4).

### ***P. promelas***

A total of 21 tests were conducted with *P. promelas* in 2017, including nine tests with reference waters and 12 tests with waters collected from test sites. There was no evidence of statistically significant adverse effects on mean hatch, survival, biomass, length, or development, except for length in the Q1 CM\_MC2 test, biomass in the Q2 FR\_FRCP1 test, and survival and biomass in the Q2 GH\_FR1 test.

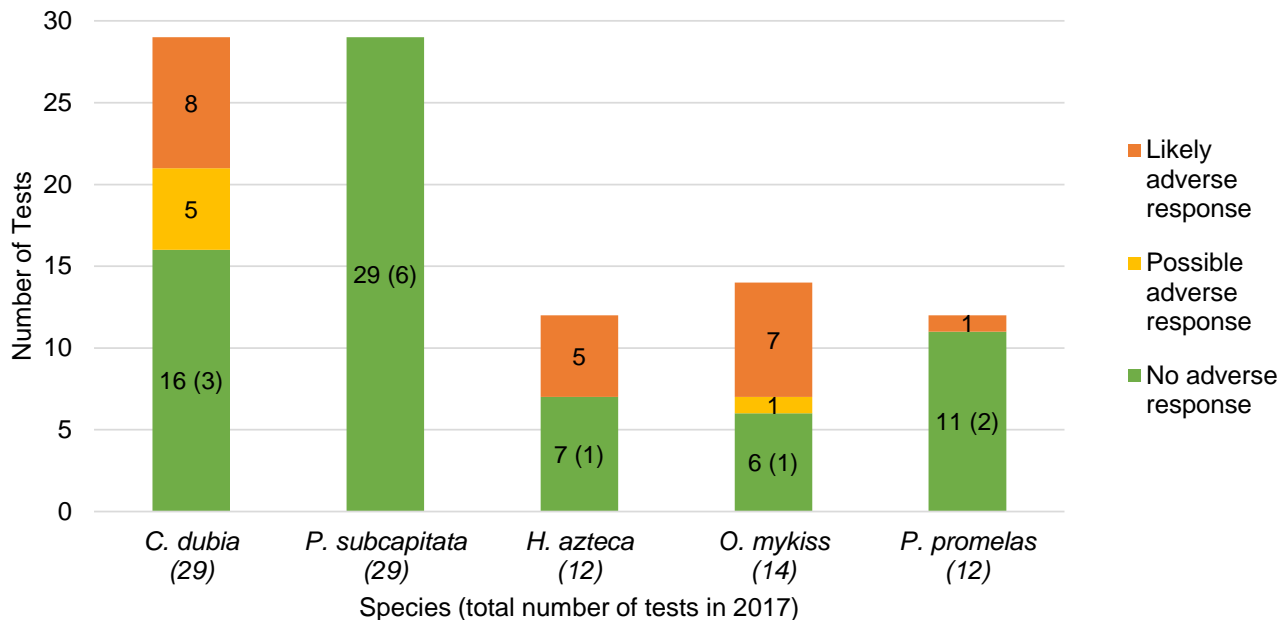
The majority of tests (11 of 12) were categorized as no adverse response, including two tests with significant results (Q1 CM\_MC2 and Q2 FR\_FRCP1). One of 12 tests (Q2 GH\_FR1) was categorized as a possible adverse response for biomass and likely adverse response for survival. In the Q2 GH\_FR1 test, the addition of 10 µg/L copper successfully curtailed fungal growth, with the exception of one replicate in which fungal growth was noted to be present on some of the mortalities. No water quality parameter was identified as a potential cause of the adverse response.

### **Overall Summary**

There was no evidence of adverse effects in most quarterly and semi-annual toxicity tests conducted in test site waters with *P. subcapitata* (23 of 29 tests) and *P. promelas* (9 of 12 tests). Significant effects were observed relative to one or more references in half of the tests conducted with *C. dubia* (16 of 29 tests) and *H. azteca* (6 of 12 tests) and the majority of tests conducted with *O. mykiss* (9 of 14 tests). Of the tests for which a statistically significant response was identified in laboratory reports, approximately 33% (13 of 40 tests) were categorized as no adverse response. Approximately 15% (6 of 40 tests) were categorized as a possible adverse response. For the remaining tests with significant results (21 of 40 tests), the mean result was categorized as a likely adverse response.

Categories for 2017 tests are illustrated on Figure 4.1-1. All of the *P. subcapitata* tests (29 of 29) and the majority of *C. dubia* (16 of 29), *H. azteca* (7 of 12), and *P. promelas* (11 of 12) tests were categorized as no adverse response. Likely adverse responses were identified in one or more tests for all species except *P. subcapitata*, including those for *C. dubia* (8 of 29), *H. azteca* (5 of 12), *O. mykiss* (7 of 12), and *P. promelas* (1 of 12). Fewer tests were categorized as possible, including those for *C. dubia* (5 of 29) and *O. mykiss* (1 of 14).

**Figure 4.1-1: Summary of 2017 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.

A summary of 2017 results by test site is provided in the following bullets.

- FR\_FRCP1**—No adverse responses were observed in the majority of test endpoints (10 of 14). Likely adverse responses were observed in four of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* dry weight (Q1), and *O. mykiss* survival and viability (Q4). Nickel was identified as potentially contributing to the observed *C. dubia* responses in Q1 and Q4; no water quality parameter was identified as potentially contributing to observed responses in other *C. dubia* tests. Nitrate was identified as potentially contributing to the observed response for *H. azteca* dry weight in Q1. Although not expected, selenium could not be ruled out as potentially contributing to the observed response in this test. Sulphate and TDS were identified as potentially contributing to the observed response for *O. mykiss* survival and viability in Q4, although microbial effects may also have contributed to this response.
- GH\_FR1**—No adverse responses were observed in the majority of test endpoints (9 of 14). Possible adverse responses were observed in two of 14 endpoints: *C. dubia* reproduction (Q3) and *P. promelas* biomass (Q2). Likely adverse responses were observed in three of 14 endpoints: *O. mykiss* survival and viability (Q4) and *P. promelas* survival (Q2). No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the *P. promelas* and *O. mykiss* tests.



- **GH\_ERC**—No adverse responses were observed in the majority of test endpoints (5 of 7). Possible adverse responses were observed in Q2 for *O. mykiss* survival and viability. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. Total suspended solids was identified as potentially contributing to the observed response on *O. mykiss* survival and viability in Q2. No water quality parameter was identified as potentially contributing to observed responses in Q4. There was evidence of microbial effects in the Q4 *O. mykiss* test.
- **EV\_HC1**—No adverse responses were observed in the majority of test endpoints (4 of 7). Possible adverse response was observed in Q2 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.
- **CM\_MC2**—No adverse responses were observed in the majority of test endpoints (9 of 14). Likely adverse responses were observed for five of 14 endpoints: *C. dubia* reproduction (Q1 to Q4), *H. azteca* survival (Q1 to Q3), *H. azteca* dry weight (Q1 to Q4), and *O. mykiss* survival and viability (Q4). Nickel was identified as potentially contributing to the observed responses in all *C. dubia* tests (Q1 to Q4) and the majority of *H. azteca* tests (Q1, Q3, Q4). No water quality parameter was identified as potentially contributing to observed responses in other tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.
- **EV\_MC2**—No adverse responses were observed in the majority of test endpoints (4 of 7). Possible adverse response was observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4. No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.
- **LC\_LCDSSLCC**—No adverse responses were observed in the majority of test endpoints (4 of 7). Possible adverse response was observed in Q1 for *C. dubia* reproduction. Likely adverse responses were observed in Q4 for *O. mykiss* survival and viability. As discussed in Section 3.3.1.4, there was evidence of microbial effects on *O. mykiss* survival and viability in Q4. No water quality parameter was identified as potentially contributing to observed responses in these tests. There was evidence of microbial effects in the Q4 *O. mykiss* test.

## 4.2 Comparison of 2017 Results to Previous Years

An overview of the results is provided below by test site.

- **FR\_FRCP1**—Mean responses were within the local and regional NRs in the majority of tests conducted between 2015 and 2017. Noteworthy exceptions are *C. dubia* reproduction and *O. mykiss* survival and viability. Mean *C. dubia* reproduction was generally below the local and regional NRs, with mean responses near 60% in most tests. Several parameters have been identified as potentially contributing to observed *C. dubia* responses, including nickel (Q1 and Q4 2017), nitrate (Q1 2015 and 2016, Q1 to Q4 2016), and sulphate/TDS (Q1 2015; Q1 2016). Mean *O. mykiss* survival and viability were below the local NR in approximately half of the tests, and below the regional NR in Q4 2017. Sulphate and TDS were identified as potentially contributing to observed responses in Q4 2017. No water quality parameter was identified as potentially contributing to observed responses in other tests. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

- **GH\_FR1**—Mean responses were within the local and regional NRs in most tests conducted between 2015 and 2017. Nitrate was identified as potentially contributing to the observed response on *C. dubia* reproduction in one test. In all other tests, no water quality parameter was identified as potentially contributing to observed responses. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **GH\_ERC**—Mean responses were within the local and regional NRs in most tests conducted between 2015 and 2017. TSS was identified as potentially contributing to the observed response on *O. mykiss* survival and viability in one test. In all other tests, no water quality parameter was identified as potentially contributing to observed responses. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **EV\_HC1**—Mean responses were within the local and regional NRs in the majority of tests conducted between 2015 and 2017. No water quality parameter was identified as potentially contributing to observed responses. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **CM\_MC2**—Mean responses were within the local and regional NRs in the majority of tests conducted between 2015 and 2017. Noteworthy exceptions are *C. dubia* reproduction and *H. azteca* survival and dry weight, which were below the local and regional NRs in several tests. There is a trend towards more and larger responses over time for these endpoints. Nickel was identified as potentially contributing to observed responses in 2017, although the evidence was weaker for *H. azteca* relative to *C. dubia*. No water quality parameter was identified as potentially contributing to observed responses in other tests. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **EV\_MC2**—Mean responses were within the local and regional NRs in most tests conducted between 2015 and 2017. Turbidity was identified as potentially contributing to the observed response on *C. dubia* reproduction in one test. In all other tests, no water quality parameter was identified as potentially contributing to observed responses. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).
- **LC\_LCDSSLCC**—Mean responses were within the local and regional NRs in most tests conducted between 2015 and 2017. Nitrate was identified as potentially contributing to the observed response on *C. dubia* reproduction in one test. In all other tests, no water quality parameter was identified as potentially contributing to observed responses. Responses observed on *O. mykiss* survival and viability in 2017 were consistent with effects caused by microbial growth (Section 3.3.1.4).

## 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 parameters were higher (or lower) in one of the weekly samples, then examination of weekly samples may have resulted in different conclusions regarding parameters 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 parameters 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 weekly variations tend to be low (Golder 2018a).
- **Mixture effects**—The concentration-response analysis presented in Section 3.4 evaluated individual water quality parameters potentially contributing to observed test responses. Although  $\Sigma$ TUs were used in the concentration-response analysis as an exposure metric for mixtures, it cannot be ruled out that some parameters may act in combination in such a way that is not captured by the  $\Sigma$ 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.

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 parameters 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 parameters 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 the predicted changes to 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 GH\_FR1 test, and the timing of mortalities suggested insufficient control for 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 2017, to the extent that fathead minnows currently yield 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 whole effluent 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). Suggestions of potential interferences in these tests include:
  - High inter-replicate variability in response
  - Significant difference between responses observed in the Michel Creek reference and Fording River reference
  - Responses to survival endpoint, rather than chronic endpoint that is usually more sensitive to toxicity mechanisms
  - Moderate to large response sizes that are unrelated to chemical constituents in water samples
  - Similar response sizes across test sites, even though the chemical profile in each test is variable

In addition, other testing programs with rainbow trout in Elk Valley water have observed significant sudden and sporadic mortality in a number of replicates during days 13–24. For example, indications of mortality consistent with microbial influence were observed in the unamended GH\_FR1 test conducted for the Fall 2016 nitrate/sulphate supplemental investigation. 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.

Uncertainty related to microbial activity in the rainbow trout tests was not sufficiently reduced with 10 µg/L copper amendment (Section 3.3.1.4). Suggestions of potential interferences in these tests were still observed after the addition of 10 µg/L copper. One possible explanation is that the copper treatment was insufficient to curtail microbial growth in these samples. This explanation is consistent with a subset of *P. promelas* tests conducted in 2017 that indicated a higher copper dose (20 µg/L) was required to address microbial influences.

## 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 in 2016 with unamended site water and copper-treated site water (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 2017 that indicated a higher copper dose (20 µg/L) was required to address microbial influences. For future testing, only copper-treated *P. promelas* tests are recommended. A copper amendment of 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).
- **Modify *O. mykiss* test procedures**—Nautilus conducted *O. mykiss* semi-annual tests in 2017 with unamended site water and copper-treated site water for a subset of reference and test sites (Section 3.3.1.4). The use of 10 µg/L copper amendment was insufficient to curtail microbial growth in these tests, indicating that additional copper (e.g., 20 µg/L or more) may be required to effectively mitigate microbial/fungal interference, while still allowing a relevant measure of the presence of other toxicants in the samples. If copper amendment does not sufficiently curtail microbial growth in these tests, then efficacy of alternative treatments should be considered, either in combination with copper or on their own.
- **Continue toxicity testing with Elk River, Fording River, and Michel 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 three references provided useful information about the natural variability in reference responses and important context for the interpretation of test site results.
- **Integrate Permit 107517 and Permit 106970 chronic toxicity testing programs.** As outlined in Golder (2018b), there are several areas in which the Elk Valley Regional Chronic Toxicity Testing Program (i.e., Permit 107517 testing discussed herein) and the Line Creek Operations Dry Creek Chronic Toxicity Testing Program (i.e., Permit 106970) would benefit from integration. These include alignment and consistency of toxicity test endpoint data, elimination of redundancy across the two programs, and maximizing the value of upstream reference water toxicity tests. It is recommended that the integration approach outlined in Golder (2018b) be adopted for future quarterly and semi-annual toxicity testing programs.

## 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**

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Gary Lawrence, MRM, RP Bio  
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EJC/AdB/GL/al/kpl/crm

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**APPENDIX A**

**Summary of Legal 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, *Hyalella 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 Toxicity Testing and  
Summary of Acute Toxicity Testing**

## Appendix B-1

# First Quarter 2017 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*,  
*Hyaella azteca* and *Pimephales  
promelas***

First Quarter 2017 Results

Final Report

July 25, 2017

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
4.0 QA/QC .....	13
5.0 References.....	14

### 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. ....	11
Table 8.	Results: <i>Hyalella azteca</i> survival and growth test. ....	12
Table 9.	Results: <i>Pimephales promelas</i> survival and growth test. ....	12
Table 10.	Reference toxicant test results. ....	13

### List of Figures

Figure 1.	Chronic toxicity monitoring locations.....	3
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### 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

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**SIGNATURE PAGE****Original Signed By**

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Report By:  
Krysta Percy, R.P.Bio.  
Laboratory Coordinator

**Original Signed By**

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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 permit number 107517 in the first quarter of 2017 are provided in the tables below.

### Sample and Test Type Information

Sample IDs	FR_UFR1 (site control), FR_FCP1, GH_FR1, GH_ERC*, EV_MC2*, EV_HC1*, CM_MC2 and LC_LCDSSLCC*
Sample collection dates	February 21 and 28, March 7, 14 and 21, 2017
Sample receipt dates	February 22, March 1, 8, 15 and 22, 2017
Sample receipt temperatures	Ranged from 0.0 to 13.0°C
Test types	<i>Ceriodaphnia dubia</i> 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

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

## Summary of Results

Endpoint	Mean ± SD								
	Laboratory Control	FR_UFR1 (Site Control)	FR_FRCP1	GH_FR1	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<b><i>C. dubia</i></b>									
Survival (%)	100	100	100	100	100	100	100	100	100
Reproduction	16.8 ± 6.4	22.0 ± 3.9	11.2 ± 3.2 <sup>*α</sup>	18.2 ± 4.0	21.1 ± 3.1	15.8 ± 3.3 <sup>α</sup>	20.4 ± 2.2	6.8 ± 4.6 <sup>*α</sup>	15.5 ± 6.3 <sup>α</sup>
<b><i>P. subcapitata</i></b>									
Cell Yield (x 10 <sup>4</sup> cells/mL)	29.0 ± 2.8	154.4 ± 8.2	169.3 ± 6.2	139.0 ± 11.0	175.3 ± 8.5	216.3 ± 13.3	253.8 ± 13.8	171.8 ± 7.4	211.8 ± 15.4
<b><i>H. azteca</i></b>									
Survival (%)	96.0 ± 5.5	96.0 ± 5.5	96.0 ± 5.5	100 ± 0.0	NT	NT	NT	64.0 ± 41.6 <sup>*α</sup>	NT
Dry weight (mg)	0.86 ± 0.03	0.73 ± 0.15	0.48 ± 0.14 <sup>*α</sup>	0.70 ± 0.18	NT	NT	NT	0.20 ± 0.03 <sup>*α</sup>	NT
<b><i>P. promelas</i></b>									
Hatch (%)	98.3 ± 3.3	95.0 ± 6.4	100 ± 0.0	100 ± 0.0	NT	NT	NT	96.7 ± 3.8	NT
Survival (%)	80.0 ± 17.2	80.0 ± 18.0	65.0 ± 44.4	91.7 ± 6.4	NT	NT	NT	90.0 ± 8.6	NT
Biomass (mg)	1.15 ± 0.12	1.05 ± 0.09	0.83 ± 0.56	1.22 ± 0.04	NT	NT	NT	1.19 ± 0.06	NT
Length (mm)	8.9 ± 0.2	9.5 ± 0.7	10.2 ± 1.1	8.8 ± 0.3	NT	NT	NT	8.4 ± 0.2 <sup>α</sup>	NT
Normal development (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	NT	NT	NT	100 ± 0.0	NT

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

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## 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 permit number 107517. Test species required to be tested quarterly included 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 quarterly testing) using rainbow trout (*Oncorhynchus mykiss*).

Water samples used for testing were transported in 20-L plastic containers in coolers containing ice packs. Samples were received at temperatures ranging from 0.0 to 13.0°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; the other toxicity tests were conducted at the Burnaby, BC location.

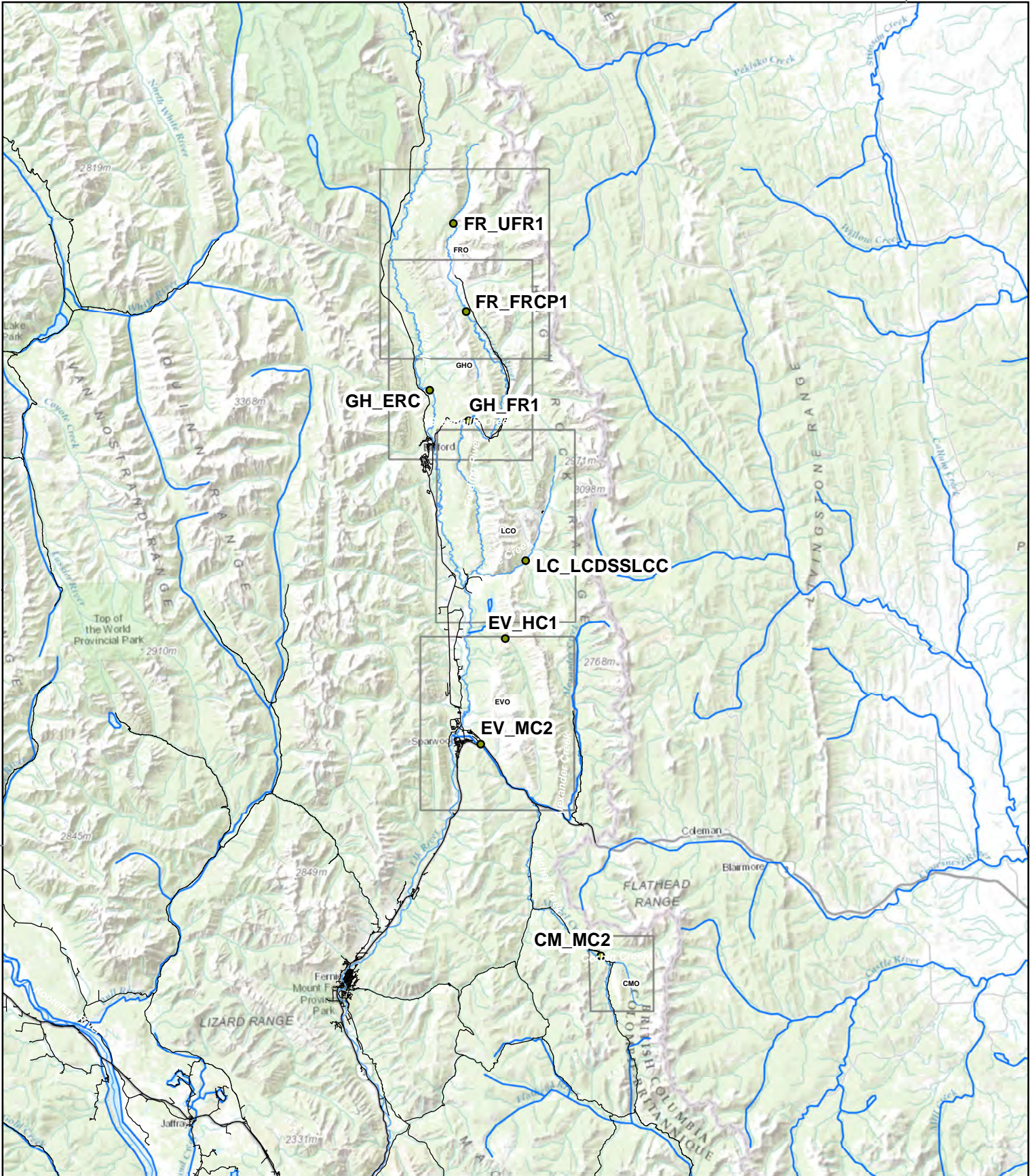
This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through D. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management 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.**

<b>Sample ID</b>	<b>EMS Location ID</b>	<b>Species Tested</b>	<b>Sample Collection Dates</b>
FR_UFR1*	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	February 21 and 28, March 7, 14 and 21, 2017
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	February 21 and 28, March 7, 14 and 21, 2017
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	February 21 and 28, March 7, 14 and 21, 2017
GH_ERC	E300090	<i>C. dubia</i> and <i>P. subcapitata</i>	February 21, 2017
EV_MC2	E300091	<i>C. dubia</i> and <i>P. subcapitata</i>	February 21, 2017
EV_HC1	E102682	<i>C. dubia</i> and <i>P. subcapitata</i>	February 21, 2017
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	February 21 and 28, March 7, 14 and 21, 2017
LC_LCDSSLCC	E297110	<i>C. dubia</i> and <i>P. subcapitata</i>	February 21, 2017

\* Site water control

<sup>†</sup> *P. promelas* tests were conducted on copper-amended samples

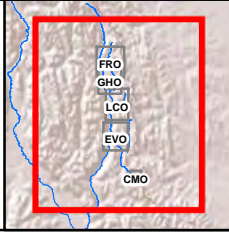


5,500,000

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**Teck**

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### Chronic Toxicity Monitoring Locations

- Roads
- Rivers
- Monitoring Locations

N

0 4,000 8,000 16,000

Meters

DATE: 7/24/2015	MINE OPERATION: Elk Valley
SCALE: 1:550,000	COORDINATE SYSTEM: NAD 1983 UTM Zone 11N

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## 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 with supplemented nutrients for *P. subcapitata*; City of Calgary dechlorinated municipal tap water for *P. promelas*; and reconstituted water prepared by addition of reagent grade salts to dechlorinated 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; Ksoz et al., 2000; 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 the addition of 10 µg/L copper, in order to reduce the potential adverse effects caused by fungi and microbes in the samples. A copper-amended control water treatment was 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/dilution 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/dilution 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 endpoint	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 <sub>4</sub> )

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

Test species	<i>Hyaella azteca</i>
Organism source	Aquatic Research Organisms, Hampton, 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/dilution water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples 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) samples amended with 10 µg/L Cu, plus laboratory control
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control/dilution 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)

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### 3.0 RESULTS

Results of the toxicity tests using *C. dubia* are provided in Table 6. Survival in the Fording River site control (FR\_UFR1) and the laboratory control were the same (100%), indicating that there was no adverse effect on survival associated with the upstream Fording River site control. Reproduction in the Fording River site water control was statistically significantly higher than the laboratory control, indicating a stimulatory effect (31%) on reproduction associated with the upstream Fording River station.

No adverse effect was observed on survival of *C. dubia*; survival was 100% in all of the samples. Compared to the laboratory water control, a statistically significant reduction in *C. dubia* reproduction was observed in two samples (FR\_FRCP1 and CM\_MC2); percent reduction was 33% and 60% for FR\_FRCP1 and CM\_MC2, respectively. Compared to the Fording River site water control, a statistically significant reduction in *C. dubia* reproduction was observed in four samples (FR\_FRCP1, EV\_MC2, CM\_MC2 and LC\_LCDSSLCC); percent reduction was 49% for FR\_FRCP1, 28% for EV\_MC2, 69% for CM\_MC2 and 30% for LC\_LCDSSLCC.

Results of the toxicity tests using *P. subcapitata* are provided in Table 7. In these tests, the Fording River site water control produced 4.3-fold greater growth than the laboratory water 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. Similarly, the other samples also exhibited a stimulation of cell growth relative to the laboratory water control. Compared to the Fording River site water control, most samples exhibited a stimulation of cell growth; there were no statistically significant reductions in cell yield.

Results of the toxicity tests using *H. azteca* are provided in Table 8. Survival and dry weight in the Fording River site water control and laboratory water control were similar for this species, indicating that there were no adverse effects associated with the sample from the upstream Fording River station. A statistically significant effect on *H. azteca* survival was observed only in sample CM\_MC2. Survival was reduced by 33% in CM\_MC2, compared to the Fording River site water control and laboratory water control. A statistically significant effect on *H. azteca* dry weight was observed in two samples (FR\_FRCP1 and CM\_MC2) compared to the Fording river site water control and laboratory control. For sample FR\_FRCP1, percent reduction in dry weight was 34% and 44% compared to the site water and laboratory water controls, respectively. Percent reduction in dry weight for sample CM\_MC2 was 72% compared to the site water control and 77% compared to the laboratory water control.

Results of the toxicity tests using *P. promelas* are provided in Table 9. Hatch, survival, biomass, length and normal development (i.e., incidence of deformities) were similar in the Fording River site water control and laboratory control, indicating that there was no adverse or stimulatory effects associated with the upstream Fording River station. Compared to the laboratory control, there were no statistically significant differences in hatch, survival, biomass, length and normal development (i.e., incidence of deformities) for the samples. Compared to the Fording River site water control, only length in sample CM\_MC2 was statistically significantly reduced (11% reduction).

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Ksoz et al., 1997; Downey et al. 2000). Amending the samples with 10 µg/L copper successfully curtailed fungal growth which has been observed in prior rounds of testing, with the exception of one of the four replicates for sample FR\_FRCP1. This replicate had no survival, with the mortalities occurring predominantly between days 7 and 9 of the test; microbial growth was noted on the mortalities in this replicate. Survival in the other three replicates for this sample was  $86.7 \pm 11.5\%$ , which was similar to control performance. Results of the laboratory control and copper-treated laboratory control were similar, indicating that there was no adverse effect associated with the 10 µg/L copper addition.

**Table 6. Results: *Ceriodaphnia dubia* survival and reproduction test.**

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	16.8 ± 6.4
FR_UFR1 (Site Control)	100	22.0 ± 3.9
FR_FRCP1	100	11.2 ± 3.2* <sup>α</sup>
GH_FR1	100	18.2 ± 4.0
GH_ERC	100	21.1 ± 3.1
EV_MC2	100	15.8 ± 3.3 <sup>α</sup>
EV_HC1	100	20.4 ± 2.2
CM_MC2	100	6.8 ± 4.6* <sup>α</sup>
LC_LCDSSLCC	100	15.5 ± 6.3 <sup>α</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

**Table 7. Results: *Pseudokirchneriella subcapitata* growth inhibition test.**

Sample ID	Cell Yield (x 10 <sup>4</sup> cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
Laboratory Control	29.0 ± 2.8	-
FR_UFR1 (Site Control)	154.4 ± 8.2	432.3
FR_FRCP1	169.3 ± 6.2	483.6
GH_FR1	139.0 ± 11.0	379.3
GH_ERC	175.3 ± 8.5	504.3
EV_MC2	216.3 ± 13.3	645.7
EV_HC1	253.8 ± 13.8	775.0
CM_MC2	171.8 ± 7.4	492.2
LC_LCDSSLCC	211.8 ± 15.4	630.2

SD = Standard Deviation

**Table 8. Results: *Hyaella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	96.0 ± 5.5	0.86 ± 0.03
FR_UFR1 (Site Control)	96.0 ± 5.5	0.73 ± 0.15
FR_FRCP1	96.0 ± 5.5	0.48 ± 0.14 * <sup>α</sup>
GH_FR1	100 ± 0.0	0.70 ± 0.18
CM_MC2	64.0 ± 41.6 * <sup>α</sup>	0.20 ± 0.03 * <sup>α</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

**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	88.3 ± 10.0	1.02 ± 0.11	8.7 ± 0.3	100 ± 0.0
Laboratory Control [+Cu]	98.3 ± 3.3	80.0 ± 17.2	1.15 ± 0.12	8.9 ± 0.2	100 ± 0.0
FR_UFR1 (Site Control) [+Cu]	95.0 ± 6.4	80.0 ± 18.0	1.05 ± 0.09	9.5 ± 0.7	100 ± 0.0
FR_FRCP1 [+Cu]	100 ± 0.0	65.0 ± 44.4	0.83 ± 0.56	10.2 ± 1.1	100 ± 0.0
GH_FR1 [+Cu]	100 ± 0.0	91.7 ± 6.4	1.22 ± 0.04	8.8 ± 0.3	100 ± 0.0
CM_MC2 [+Cu]	96.7 ± 3.8	90.0 ± 8.6	1.19 ± 0.06	8.4 ± 0.2 <sup>α</sup>	100 ± 0.0

SD = Standard Deviation

<sup>α</sup> Result was significantly lower than the copper amended site control FR\_UFR1



#### 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 methodology, 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 the 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 with these tests. Thus, the sensitivity of the organisms used in these tests was considered to be 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): 2.0 g/L NaCl	2.0 (1.8 – 2.3)	6	February 14, 2017
	Reproduction (IC50): 1.7 g/L NaCl	1.6 (1.2 – 2.1)	16	
<i>P. subcapitata</i>	Growth (IC50): 35.4 µg/L Zn	33.2 (24.5 – 45.0)	16	February 24, 2017
<i>H. azteca</i>	Survival (LC50): 6.4 g/L NaCl	5.6 (5.0 – 6.4)	7	February 23, 2017
<i>P. promelas</i>	Survival (LC50): 4.0 g/L NaCl	5.6 (2.6 – 12.0)	26	February 27, 2017
	Biomass (IC25): 2.8 g/L NaCl	3.4 (1.5 – 7.4)	26	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration

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## 5.0 REFERENCES

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**APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data**

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## Ceriodaphnia dubia Summary Sheet

Client: Teck Coal  
 Work Order No.: 170123

Start Date/Time: Feb 23/17 @ 1040  
 Set up by: JS KEMM

**Sample Information:**

Sample ID: various: see results table for 10s  
 Sample Date: Feb 21/17  
 Date Received: Feb 22/17  
 Sample Volume: various

**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  $\geq 15$  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) =  $25 \pm 1$ ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

**Test Organism Information:**

Broodstock No.: 021517  
 Age of young (Day 0): <24-h (within 12-h)  
 Avg No. young in first 3 broods of previous 7 d: 27  
 Mortality (%) in previous 7 d: 0  
 Individual female # used  $\geq 8$  young on test day: 21, 26, 27, 31, 34, 37, 38, 40

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: CD156  
 Stock Solution ID: 16Na02  
 Date Initiated: Feb 14/17

7-d LC50 (95% CL): 2.0 (1.7 - 2.4) g/L NaCl  
 7-d IC50 (95% CL): 1.7 (1.3 - 2.0) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.8 - 2.3) g/L NaCl CV (%): 6  
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.6 (1.2 - 2.1) g/L NaCl CV (%): 16

**Test Results:**

	Survival (%)	Reproduction (Mean $\pm$ SD)
<u>20% permix</u>		
Negative Control	100	16.8 $\pm$ 6.4 <sup>a</sup>
Site control		
FR WFL @ 02012017-N	100	22.0 $\pm$ 3.9
FR FCP1 @ 02012017-N	100	11.2 $\pm$ 3.2 * <sup>a</sup>
GH FCL US 2017-02-21-N	100	18.2 $\pm$ 4.0
GH FCL US 2017-02-21-N	100	21.1 $\pm$ 3.1
EV M2 US 2017-02-21-N	100	15.8 $\pm$ 3.3 <sup>a</sup>
EV HCL US 2017-02-21-N	100	20.4 $\pm$ 2.2
OM M12 US 2017-02-21-N	100	6.8 $\pm$ 4.6 * <sup>a</sup>
LC LCP SSC US 2017-02	100	15.5 $\pm$ 6.3 <sup>a</sup>

Reviewed by: [Signature]  
 \* reproduction significantly <sup>at</sup> less than 20% permix (lab control)

<sup>a</sup> reproduction significantly less than site control  
 Date reviewed: April 21, 2017

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck coal  
 Sample ID: Teck pass/fail VANCOUS  
 Work Order #: 170122

Start Date & Time: Feb 21/17 @ 1040h  
 Stop Date & Time: Mar 2/17 @ 1000h  
 Test Species: Ceriodaphnia dubia

Concentration	Days													
	0	1		2		3		4		5		6		7
lab control	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.9	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.5	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.1	8.0	8.0	7.7	8.0	7.5	8.1	7.4	8.0	7.4	8.0	7.5	8.2	7.0
pH	8.0	7.7	8.0	8.0	8.0	7.7	8.1	7.8	7.9	7.7	8.0	7.7	7.9	7.1
Cond. (µS/cm)	226	224		215		226		226		226		224		247
Initials	JS	JS	EMM	EMM		A		JS		JS		JS		EL

Site control Concentration	Days													
	0	1		2		3		4		5		6		7
FR-UFRI 100%	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)	8.3	7.9	8.2	7.7	8.1	7.5	8.1	7.3	8.1	7.4	8.2	7.5	8.2	7.1
pH	7.8	7.7	7.8	7.9	7.9	7.9	8.0	8.0	7.9	7.8	8.0	7.8	7.9	7.5
Cond. (µS/cm)	348	350		351		361		351		353		348		347
Initials	JS	JS	EMM	EMM		A		JS		JS		JS		EL

100% CVLV Concentration	Days													
	0	1		2		3		4		5		6		7
FR-FRCP1	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)	8.3	7.9	8.2	7.6	8.1	7.6	8.2	7.3	8.2	7.4	8.2	7.4	8.2	7.2
pH	8.1	8.0	8.0	8.1	7.9	8.0	8.0	7.9	7.9	7.9	8.0	7.8	7.9	7.6
Cond. (µS/cm)	1527	1475		1475		1461		1480		1473		1454		1381
Initials	JS	JS	EMM	EMM		A		JS		JS		JS		EL

100% CVLV Concentration	Days													
	0	1		2		3		4		5		6		7
GH-FR1	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)	8.3	7.9	8.2	7.6	8.1	7.5	8.1	7.3	8.2	7.4	8.2	7.5	8.2	7.2
pH	8.1	8.0	8.0	8.1	8.0	8.0	8.1	7.9	8.0	7.9	8.0	8.0	8.0	7.8
Cond. (µS/cm)	1465	870		871		862		869		870		871		860
Initials	JS	JS	EMM	EMM		A		JS		JS		JS		EL

Thermometer: 4 DO meter: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control	FR-UFRI	FR-FRCP1	GH-FR1
Hardness*	100	240	920	600
Alkalinity*	98	150	250	199

Analysts: JS, AWD, EC, ML, MCT, EMM  
 Reviewed by: [Signature]  
 Date reviewed: April 21, 2017

Sample Description: see COC for sample descriptions page 1/3

Comments: Broodboard Used: 021517 (1# 21, 26, 27, 31-33, 37, 39, 40)

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck coal  
 Sample ID: Teck pass/fail vanco  
 Work Order #: 170122

Start Date & Time: Feb 13/17 01:00  
 Stop Date & Time: MAR 2/17 01:00  
 Test Species: Ceriodaphnia dubia

100% (v/v) Concentration GH-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	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	24.0	25.0
DO (mg/L)	8.3	8.1	8.2	7.6	8.1	7.5	8.2	7.5	8.2	7.4	8.2	7.3	8.2	7.1	8.1	7.1
pH	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.8	7.9	7.8	8.0	8.0	7.5	8.0	7.5
Cond. (µS/cm)	215	366		369		364		370		369		366		319		319
Initials	JS	JS	EMM	EMM		AS		JS		JS		JS		EL		EL

100% (v/v) 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	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	24.0	25.0
DO (mg/L)	8.3	8.1	8.2	7.7	8.1	7.5	8.2	7.4	8.2	7.5	8.2	7.5	8.2	7.2	8.2	7.2
pH	8.6	8.1	8.1	8.1	8.1	8.2	8.0	8.1	7.8	8.0	7.9	8.1	8.0	7.9	8.0	7.9
Cond. (µS/cm)	359	660	637	655		638		650		642		639		624		624
Initials	JS	JS	EMM	EMM		AS		JS		JS		JS		EL		EL

100% (v/v) Concentration EV-HCl	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	25.0	24.0	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.3	8.0	8.2	7.7	8.1	7.6	8.1	7.5	8.2	7.5	8.2	7.5	8.2	7.3	8.2	7.3
pH	8.2	8.1	8.2	8.1	8.1	8.2	8.1	8.2	8.0	8.2	8.1	8.2	8.1	7.8	8.1	7.8
Cond. (µS/cm)	373	728		730		727		740		730		722		728		728
Initials	JS	JS	EMM	EMM		AS		JS		JS		JS		EL		EL

100% (v/v) 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	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	24.0	25.0
DO (mg/L)	8.3	8.0	8.2	7.6	8.2	7.5	8.1	7.5	8.2	7.6	8.2	7.6	8.2	7.4	8.2	7.4
pH	8.2	8.1	8.2	8.2	8.1	8.3	8.0	8.1	7.9	8.1	8.1	8.1	8.1	7.7	8.1	7.7
Cond. (µS/cm)	389	960	967	960		962		961		954		974		918		918
Initials	JS	JS	EMM	EMM		AS		JS		JS		JS		EL		EL

Thermometer: 4 DO meter: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control	EV-MC2	EV-HCl	CM-MC2
Hardness*	182	510	490	680
Alkalinity*	152	132	204	202

Analysts: JS, AWD, EC, YL, MLT, EMM  
 Reviewed by: JS  
 Date reviewed: April 21, 2017

Sample Description: see page 1/3 for sample description and Brood Board used, page 2/3  
 Comments: Broodboard Used:

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Rock coal  
 Sample ID: Rock Moss/Fall Vanus  
 Work Order #: 70122

Start Date & Time: Feb 13/17 10:00am  
 Stop Date & Time: Mar 2/17 2:00pm  
 Test Species: Ceriodaphnia dubia

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)	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	24.0	25.0
DO (mg/L)	8.3	7.6	8.2	7.6	8.1	7.6	8.1	7.5	8.2	7.5	8.2	7.6	8.1	7.1	7.1	7.1
pH	8.2	8.1	8.1	8.2	8.0	8.2	8.1	8.1	8.0	8.1	8.1	8.2	8.1	8.1	8.1	7.6
Cond. (µS/cm)	979	985	985	981	974	974	979	979	978	978	978	978	978	971	971	971
Initials	JS	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM

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: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control			
Hardness*	860			
Alkalinity*	182			

Analysts: JS, AUD, FC, YML  
ML, EMM  
 Reviewed by: EMM  
 Date reviewed: April 21, 2017

Sample Description: see page 4/3 for sample description and Brood Board used page 3/3

Comments: Broodboard Used:



**Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data**

Client: Teck coal  
 Sample ID: Teck Pass/fail Vanous  
 Work Order: 170122

100% (v/v)

Start Date & Time: Feb 23/17 @ 1040h  
 Stop Date & Time: Mar 2/17 @ 1000h  
 Set up by: JS/AMM

Days	Concentration: <u>lab control</u>											Concentration: <u>FR-UF21 (Site control)</u>											Concentration: <u>FR-FCPI</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	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS
2	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM
3	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A
4	4	/	3	/	3	3	3	3	3	2	VM	2	/	2	3	4	4	2	/	3	4	VM	3	2	3	3	3	/	2	2	2	2	VM
5	7	✓	6	✓	5	6	7	7	8	5	ML	✓	4	6	7	8	7	6	5	8	9	ML	5	6	4	2	6	✓	2	5	2	5	ML
6	11	✓	12	✓	10	/	/	/	/	/	VM	6	8	✓	✓	9	✓	13	✓	✓	✓	VM	9	✓	✓	✓	✓	✓	3	7	7	9	VM
7	/	4	/	6	/	10	10	10	10	10	EL	10	10	9	13	13	/	9	10	14	12	EL	/	/	6	4	5	3	/	/	✓	/	EL
8																																	
Total	22	4	21	6	18	19	20	20	21	17	AMM	18	22	17	23	25	20	17	28	25	25	AMM	14	9	12	9	14	10	5	12	11	16	AMM

Days	Concentration: <u>GH-FC1</u>											Concentration: <u>GH-ERC</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	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS
2	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM
3	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A
4	4	3	3	3	4	3	3	2	3	/	VM	3	2	3	2	3	3	/	3	3	3	VM	2	2	3	3	/	3	3	4	3	3	VM
5	7	7	6	8	7	6	6	8	6	4	ML	8	6	8	6	8	7	5	8	9	7	ML	6	8	4	7	6	4	5	7	7	8	ML
6	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	VM	✓	✓	12	✓	✓	9	✓	✓	✓	✓	VM	10	7	✓	✓	✓	8	/	/	/	/	VM
7	2	16	10	10	12	10	3	10	11	/	EL	9	7	/	10	11	12	11	8	11	14	EL	4	13	8	8	2	/	4	6	8	8	EL
8																																	
Total	13	22	19	21	23	19	12	20	20	13	AMM	20	15	23	18	22	22	25	19	23	15	AMM	20	17	14	18	11	12	12	16	19	19	AMM

Days	Concentration: <u>EV-HC1</u>											Concentration: <u>EM-MC2</u>											Concentration: <u>LC-LCDSLCC</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	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS	/	/	/	/	/	/	/	/	/	/	JS
2	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM	/	/	/	/	/	/	/	/	/	/	AMM
3	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A
4	3	3	3	2	2	3	3	2	/	3	VM	3	3	3	/	2	2	2	2	/	2	VM	3	3	3	2	4	2	2	/	2	2	VM
5	8	8	9	6	7	8	9	7	3	8	ML	6	6	4	5	✓	✓	✓	5	✓	✓	ML	8	6	7	4	7	6	6	5	✓	7	ML
6	✓	✓	11	/	/	11	/	7	12	✓	VM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	VM	✓	✓	✓	✓	10	✓	✓	✓	✓	✓	VM
7	6	/	/	10	11	9	12	10	12	16	EL	/	4	/	8	/	5	/	3	/	3	EL	8	5	12	5	✓	4	6	8	2	8	EL
8																																	
Total	17	19	23	18	20	20	23	19	22	23	AMM	9	13	7	13	7	7	2	10	0	5	AMM	19	14	22	11	21	12	14	23	2	17	AMM

Notes: X = mortality.

Sample Description: See water quality datasheet page 1/3.  
 Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JGh

Date reviewed: Apr. 12/17

Client: Teck coal

W.O.#: 17022

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
20/pemer	Feb 23/17	Feb 23/17	50	5.0	5.1	98	50	5.0	100	K
FR UFR1				7.7	7.9	150	100	2.4	240	
FR FRC P1				12.8	13.0	252	100	9.2	920	
GHFR1				10.0	10.3	194	100	6.0	600	
GHFRC				7.8	8.0	152	50	9.1	182	
FM C2				6.8	7.0	132	100	5.1	510	
FV HCl				10.4	10.6	204	100	4.9	490	
CM C2				10.3	10.5	202	100	6.8	680	
LC-LC855CC	Feb 23/17	Feb 23/17	50	9.3	9.5	182	100	8.6	860	V

Notes: ① Diluted to 100ml w/ DI water

Reviewed by:

Date Reviewed: April 21, 2017

**CETIS Summary Report**

Report Date: 21 Mar-17 10:04 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Batch ID: 10-1280-7302      Test Type: Reproduction-Survival (7d)      Analyst: Emma Marus  
 Start Date: 23 Feb-17 10:40      Protocol: EC/EPS 1/RM/21      Diluent:  
 Ending Date: 02 Mar-17 10:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 6d 23h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	48h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

**7d Survival Rate Summary**

C-%	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
20% Perrier ctr	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%
FR_FRCP1	10	1	1	1	1	1	0	0	0.0%	0.0%
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%

**Reproduction Summary**

C-%	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
20% Perrier ctr	10	16.8	12.22	21.38	4	22	2.026	6.408	38.14%	0.0%
FR_UFR1	10	22	19.24	24.76	17	28	1.22	3.859	17.54%	-30.95%
FR_FRCP1	10	11.2	8.943	13.46	5	16	0.9978	3.155	28.17%	33.33%
GH_FR1	10	18.2	15.32	21.08	12	23	1.272	4.022	22.1%	-8.33%
GH_ERC	10	21.1	18.9	23.3	15	25	0.9713	3.071	14.56%	-25.6%
EV_MC2	10	15.8	13.42	18.18	11	20	1.052	3.327	21.05%	5.95%
EV_HC1	10	20.4	18.81	21.99	17	23	0.7024	2.221	10.89%	-21.43%
CM_MC2	10	6.8	3.534	10.07	0	13	1.444	4.566	67.14%	59.52%
LC_LCDSSLCC	10	15.5	10.96	20.04	2	23	2.007	6.346	40.95%	7.74%

**CETIS Summary Report**

Report Date: 21 Mar-17 10:04 (p 2 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

**7d Survival Rate Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	1	1	1	1	1	1	1	1	1	1
FR_UFR1	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_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

**Reproduction Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	22	4	21	6	18	19	20	20	21	17
FR_UFR1	18	22	17	23	25	20	17	28	25	25
FR_FRCP1	14	9	12	9	14	10	5	12	11	16
GH_FR1	13	22	19	21	23	19	12	20	20	13
GH_ERC	20	15	23	18	22	22	25	19	23	24
EV_MC2	20	17	14	18	11	12	12	16	19	19
EV_HC1	17	19	23	18	20	20	23	19	22	23
CM_MC2	9	13	7	13	2	7	2	10	0	5
LC_LCDSSLCC	19	14	22	11	21	12	14	23	2	17

**7d Survival Rate Binomials**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	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
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_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

**CETIS Analytical Report**

Report Date: 21 Mar-17 10:00 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

<b>Analysis ID:</b> 06-3006-2376	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:58	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

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%)
20% Perrier ctr		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		GH_FR1	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		GH_ERC	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		EV_MC2	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		EV_HC1	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		CM_MC2	1	1.0000	Exact	Non-Significant Effect
20% Perrier ctr		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

C-%	NR	R	NR + R	Prop NR	Prop R	%Effect
20% Perrier ctr Negative Contr	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_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%

# CETIS Analytical Report

Report Date: 21 Mar-17 10:00 (p 2 of 2)  
 Test Code: 170122 | 13-6793-5506

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 06-3006-2376      Endpoint: 7d Survival Rate  
 Analyzed: 21 Mar-17 9:58      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

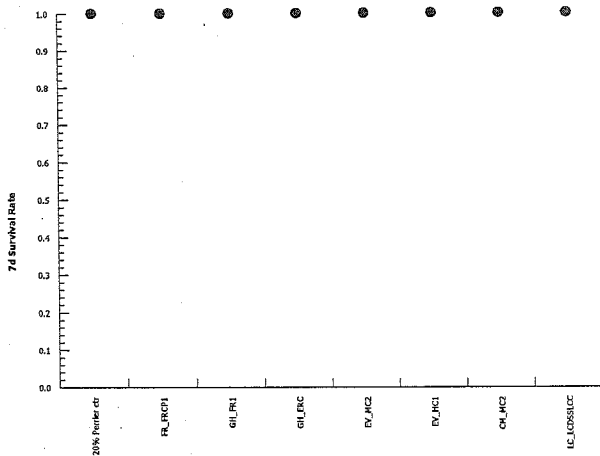
### 7d Survival Rate Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	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_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

### 7d Survival Rate Binomials

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	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_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

### Graphics



**CETIS Analytical Report**

Report Date: 21 Mar-17 10:01 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 06-7117-1007	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:58	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	48h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

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		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

**Data Summary**

C-%		NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	Upstream Contr	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_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%

**CETIS Analytical Report**

Report Date: 21 Mar-17 10:01 (p 2 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 06-7117-1007  
 Analyzed: 21 Mar-17 9:58

Endpoint: 7d Survival Rate  
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

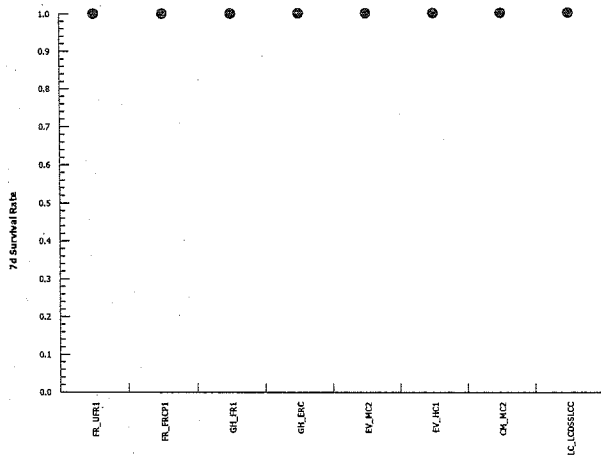
**7d Survival Rate Detail**

C-%	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
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_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

**7d Survival Rate Binomials**

C-%	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
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_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

**Graphics**





**CETIS Analytical Report**

Report Date: 21 Mar-17 10:01 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

<b>Analysis ID:</b> 00-6171-7354	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:58	<b>Analysis:</b> Parametric-Paired Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	48h (2.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C < T	NA	NA	25.0%	

**Paired Sample t Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
20% Perrier ctr		FR_UFR1	0	1.833	2E-08	9	0.5000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0	0	1	65540	<0.0001	Significant Effect
Error	0	0	18			
Total	0		19			

**7d Survival Rate Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
20% Perrier ctr	10	1	1	1	1	1	1	0	0.0%	0.0%
FR_UFR1	10	1	1	1	1	1	1	0	0.0%	0.0%

**Angular (Corrected) Transformed Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
20% Perrier ctr	10	1.047	1.047	1.047	1.047	1.047	1.047	0	0.0%	0.0%
FR_UFR1	10	1.047	1.047	1.047	1.047	1.047	1.047	0	0.0%	0.0%

**7d Survival Rate Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	1	1	1	1	1	1	1	1	1	1
FR_UFR1	1	1	1	1	1	1	1	1	1	1

**Angular (Corrected) Transformed Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047
FR_UFR1	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047	1.047

**7d Survival Rate Binomials**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	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

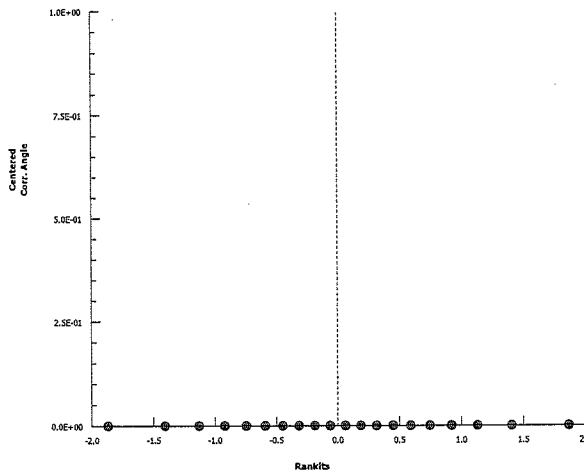
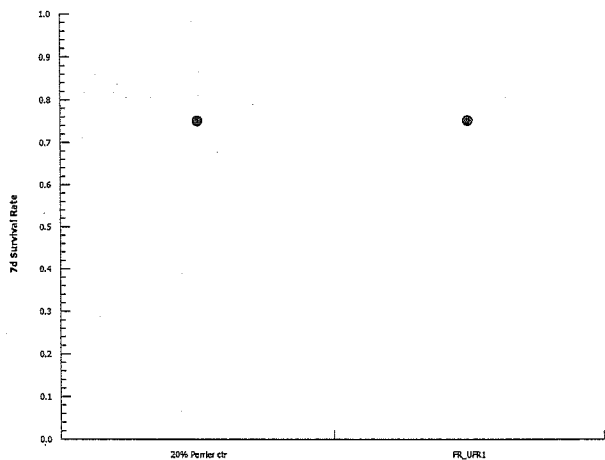
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 00-6171-7354      Endpoint: 7d Survival Rate  
Analyzed: 21 Mar-17 9:58      Analysis: Parametric-Paired Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

**Report Date:** 21 Mar-17 10:03 (p 1 of 2)  
**Test Code:** 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 10-0769-1631	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:59	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	27.8%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
20% Perrier ctr		FR_FRCP1	74	74	0	18	0.0496	Asymp	Significant Effect
		GH_FR1	109.5	74	4	18	0.9415	Asymp	Non-Significant Effect
		GH_ERC	130	74	4	18	0.9998	Asymp	Non-Significant Effect
		EV_MC2	86	74	4	18	0.2801	Asymp	Non-Significant Effect
		EV_HC1	121.5	74	5	18	0.9964	Asymp	Non-Significant Effect
		CM_MC2	68	74	0	18	0.0150	Asymp	Significant Effect
		LC_LCDSSLCC	97.5	74	4	18	0.6774	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1582.15	226.0214	7	11.76	<0.0001	Significant Effect
Error	1383.8	19.21944	72			
Total	2965.95		79			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	16.19	18.48	0.0235	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9444	0.9579	0.0017	Non-normal Distribution

# CETIS Analytical Report

Report Date: 21 Mar-17 10:03 (p 2 of 2)  
 Test Code: 170122 | 13-6793-5506

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 10-0769-1631      Endpoint: Reproduction  
 Analyzed: 21 Mar-17 9:59      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

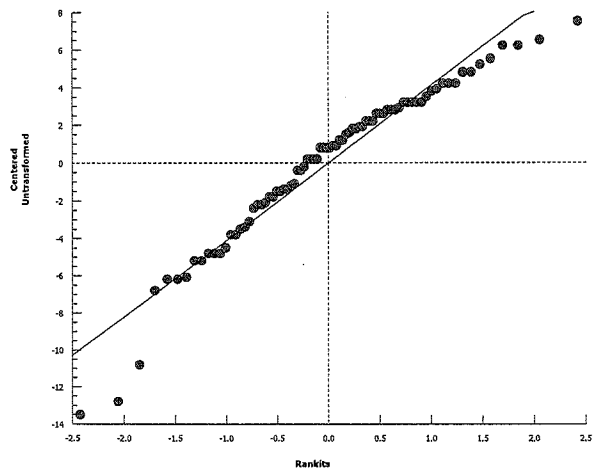
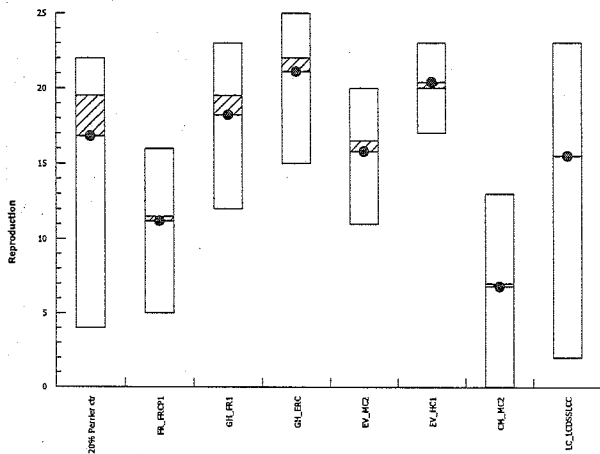
### Reproduction Summary

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
20% Perrier ctr	10	16.8	12.22	21.38	19.5	4	22	2.026	38.14%	0.0%
FR_FRCP1	10	11.2	8.943	13.46	11.5	5	16	0.9978	28.17%	33.33%
GH_FR1	10	18.2	15.32	21.08	19.5	12	23	1.272	22.1%	-8.33%
GH_ERC	10	21.1	18.9	23.3	22	15	25	0.9713	14.56%	-25.6%
EV_MC2	10	15.8	13.42	18.18	16.5	11	20	1.052	21.05%	5.95%
EV_HC1	10	20.4	18.81	21.99	20	17	23	0.7024	10.89%	-21.43%
CM_MC2	10	6.8	3.534	10.07	7	0	13	1.444	67.14%	59.52%
LC_LCDSSLCC	10	15.5	10.96	20.04	15.5	2	23	2.007	40.95%	7.74%

### Reproduction Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	22	4	21	6	18	19	20	20	21	17
FR_FRCP1	14	9	12	9	14	10	5	12	11	16
GH_FR1	13	22	19	21	23	19	12	20	20	13
GH_ERC	20	15	23	18	22	22	25	19	23	24
EV_MC2	20	17	14	18	11	12	12	16	19	19
EV_HC1	17	19	23	18	20	20	23	19	22	23
CM_MC2	9	13	7	13	2	7	2	10	0	5
LC_LCDSSLCC	19	14	22	11	21	12	14	23	2	17

### Graphics



**CETIS Analytical Report**

Report Date: 21 Mar-17 10:03 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 09-9233-9827	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:59	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	27.8%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
20% Perrier ctr		FR_FRCP1	136	74	0	18	1.0000	Asymp	Non-Significant Effect
		GH_FR1	100.5	74	4	18	0.7690	Asymp	Non-Significant Effect
		GH_ERC	80	74	4	18	0.1317	Asymp	Non-Significant Effect
		EV_MC2	124	74	4	18	0.9983	Asymp	Non-Significant Effect
		EV_HC1	88.5	74	5	18	0.3604	Asymp	Non-Significant Effect
		CM_MC2	142	74	0	18	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	112.5	74	4	18	0.9676	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1582.15	226.0214	7	11.76	<0.0001	Significant Effect
Error	1383.8	19.21944	72			
Total	2965.95		79			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	16.19	18.48	0.0235	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9444	0.9579	0.0017	Non-normal Distribution

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 09-9233-9827  
 Analyzed: 21 Mar-17 9:59

Endpoint: Reproduction  
 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

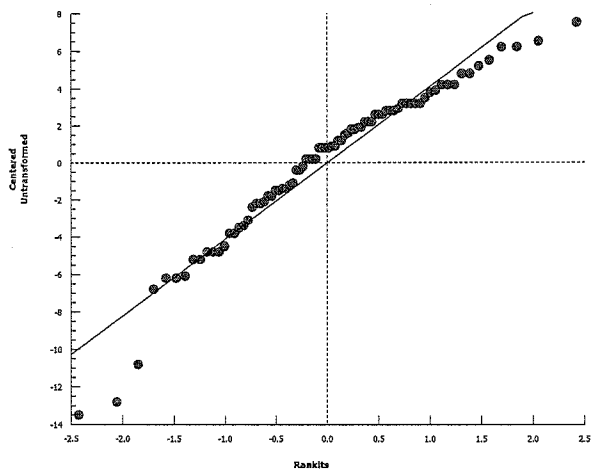
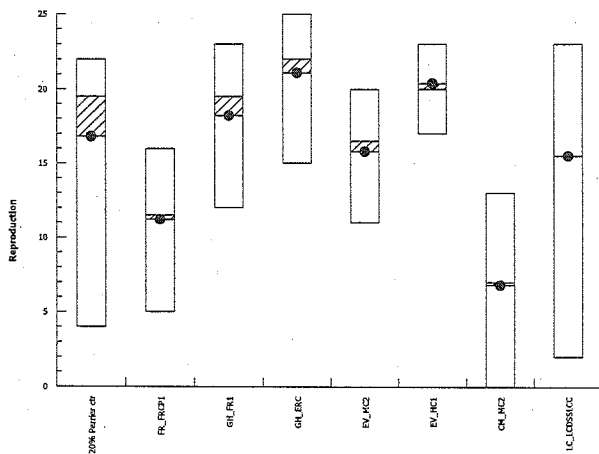
Reproduction Summary

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
20% Perrier ctr	10	16.8	12.22	21.38	19.5	4	22	2.026	38.14%	0.0%
FR_FRCP1	10	11.2	8.943	13.46	11.5	5	16	0.9978	28.17%	33.33%
GH_FR1	10	18.2	15.32	21.08	19.5	12	23	1.272	22.1%	-8.33%
GH_ERC	10	21.1	18.9	23.3	22	15	25	0.9713	14.56%	-25.6%
EV_MC2	10	15.8	13.42	18.18	16.5	11	20	1.052	21.05%	5.95%
EV_HC1	10	20.4	18.81	21.99	20	17	23	0.7024	10.89%	-21.43%
CM_MC2	10	6.8	3.534	10.07	7	0	13	1.444	67.14%	59.52%
LC_LCDSSLCC	10	15.5	10.96	20.04	15.5	2	23	2.007	40.95%	7.74%

Reproduction Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	22	4	21	6	18	19	20	20	21	17
FR_FRCP1	14	9	12	9	14	10	5	12	11	16
GH_FR1	13	22	19	21	23	19	12	20	20	13
GH_ERC	20	15	23	18	22	22	25	19	23	24
EV_MC2	20	17	14	18	11	12	12	16	19	19
EV_HC1	17	19	23	18	20	20	23	19	22	23
CM_MC2	9	13	7	13	2	7	2	10	0	5
LC_LCDSSLCC	19	14	22	11	21	12	14	23	2	17

Graphics



**CETIS Analytical Report**

Report Date: 21 Mar-17 10:02 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 12-7441-2817	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:59	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	48h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	50h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	46h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	48h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	51h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	46h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	47h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	50h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.4%	

**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	6.047	2.386	4.261	18	<0.0001	CDF	Significant Effect
		GH_FR1	2.128	2.386	4.261	18	0.0870	CDF	Non-Significant Effect
		GH_ERC	0.5039	2.386	4.261	18	0.7048	CDF	Non-Significant Effect
		EV_MC2	3.472	2.386	4.261	18	0.0027	CDF	Significant Effect
		EV_HC1	0.8959	2.386	4.261	18	0.5268	CDF	Non-Significant Effect
		CM_MC2	8.511	2.386	4.261	18	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	3.64	2.386	4.261	18	0.0016	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1930.55	275.7928	7	17.29	<0.0001	Significant Effect
Error	1148.2	15.94722	72			
Total	3078.75		79			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	12.05	18.48	0.0989	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9691	0.9579	0.0494	Normal Distribution

# CETIS Analytical Report

Report Date: 21 Mar-17 10:02 (p 2 of 2)  
 Test Code: 170122 | 13-6793-5506

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-7441-2817      Endpoint: Reproduction  
 Analyzed: 21 Mar-17 9:59      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

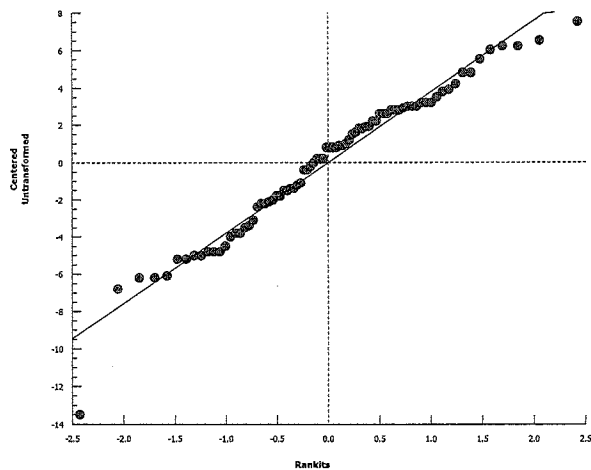
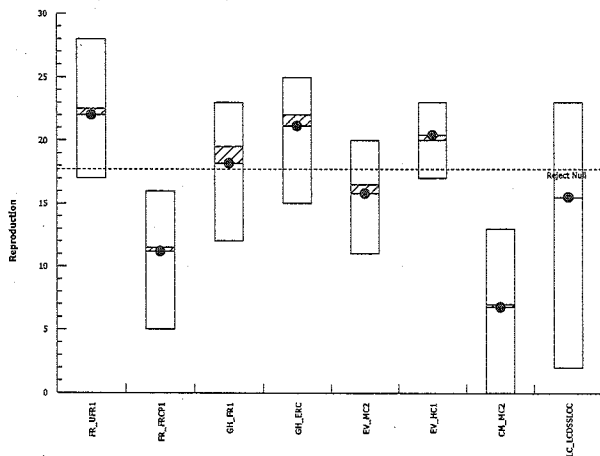
### Reproduction Summary

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	22	19.24	24.76	22.5	17	28	1.22	17.54%	0.0%
FR_FRCP1	10	11.2	8.943	13.46	11.5	5	16	0.9978	28.17%	49.09%
GH_FR1	10	18.2	15.32	21.08	19.5	12	23	1.272	22.1%	17.27%
GH_ERC	10	21.1	18.9	23.3	22	15	25	0.9713	14.56%	4.09%
EV_MC2	10	15.8	13.42	18.18	16.5	11	20	1.052	21.05%	28.18%
EV_HC1	10	20.4	18.81	21.99	20	17	23	0.7024	10.89%	7.27%
CM_MC2	10	6.8	3.534	10.07	7	0	13	1.444	67.14%	69.09%
LC_LCDSSLCC	10	15.5	10.96	20.04	15.5	2	23	2.007	40.95%	29.55%

### Reproduction Detail

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
FR_UFR1	18	22	17	23	25	20	17	28	25	25
FR_FRCP1	14	9	12	9	14	10	5	12	11	16
GH_FR1	13	22	19	21	23	19	12	20	20	13
GH_ERC	20	15	23	18	22	22	25	19	23	24
EV_MC2	20	17	14	18	11	12	12	16	19	19
EV_HC1	17	19	23	18	20	20	23	19	22	23
CM_MC2	9	13	7	13	2	7	2	10	0	5
LC_LCDSSLCC	19	14	22	11	21	12	14	23	2	17

### Graphics





**CETIS Analytical Report**

Report Date: 21 Mar-17 10:03 (p 1 of 2)  
 Test Code: 170122 | 13-6793-5506

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-4853-0916	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Mar-17 9:58	<b>Analysis:</b> Parametric-Paired Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1280-7302	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 23 Feb-17 10:40	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b>
<b>Ending Date:</b> 02 Mar-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 23h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
20% Perrier ctr	10-5705-2194	23 Feb-17	23 Feb-17	11h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	48h (2.8 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
20% Perrier ctr	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	27.6%	

**Paired Sample t Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
20% Perrier ctr		FR_UFR1	2.053	1.833	4.644	9	0.0352	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	135.2	135.2	1	4.832	0.0413	Significant Effect
Error	503.6	27.97778	18			
Total	638.8		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.758	6.541	0.1468	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8613	0.866	0.0083	Non-normal Distribution

**Reproduction Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
20% Perrier ctr	10	16.8	12.22	21.38	19.5	4	22	2.026	38.14%	0.0%
FR_UFR1	10	22	19.24	24.76	22.5	17	28	1.22	17.54%	-30.95%

**Reproduction Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
20% Perrier ctr	22	4	21	6	18	19	20	20	21	17
FR_UFR1	18	22	17	23	25	20	17	28	25	25

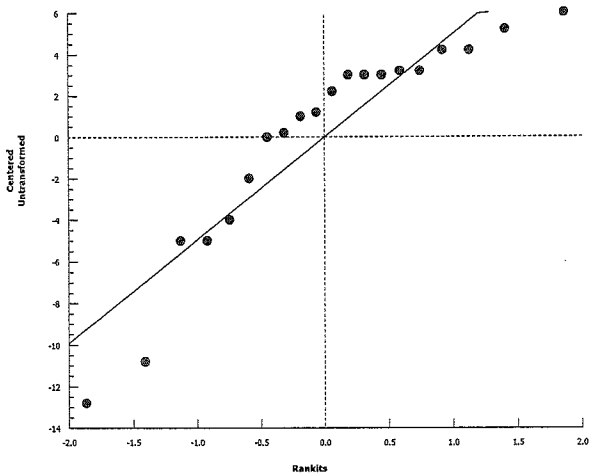
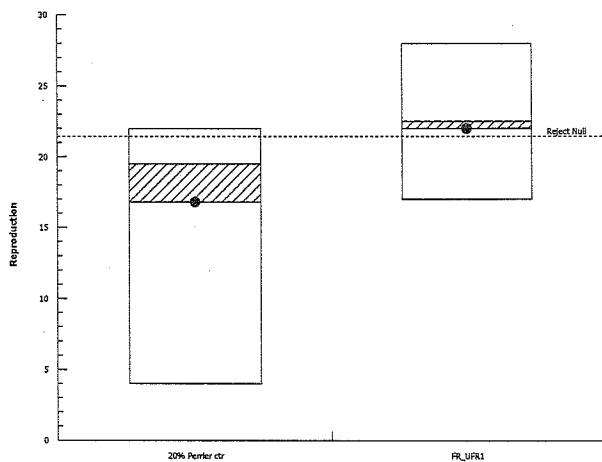
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-4853-0916      Endpoint: Reproduction  
Analyzed: 21 Mar-17 9:58      Analysis: Parametric-Paired Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data**

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**Pseudokirchneriella subcapitata Summary Sheet**

Client: Teck Coal  
 Work Order No.: 170123

Start Date: Feb 24/17  
 Set up by: MLT

**Sample Information:**

Sample ID: various; see ~~table~~<sup>MLT</sup> results table for IDs  
 Sample Date: Feb 21/17  
 Date Received: Feb 22/17  
 Sample Volume: various

**Test Organism Information:**

Culture Date: Feb 17/17  
 Age of culture (Day 0): 7d

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: SC154  
 Stock Solution ID: FZ001  
 Date Initiated: Feb 24/17

72-h IC50 (95% CL): 35.4 (29.3 - 40.7) mg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 33.2 (24.5 - 45.0) mg/L Zn CV (%): 16

Test Results:

	Cell Yield (Mean ± SD)
Negative Control	29.0 ± 2.8
FR-UFRI-Q-02012017-N (Site Control)	154.4 ± 8.2 *
FR-FRCP1-Q-02012017-N	169.3 ± 6.2 *
GH-FRI-WS-2017-02-21-N	139.0 ± 11.0 *
GH-ERC-WS-2017-02-21-N	175.3 ± 8.5 *a
EV-MC2-WS-2017-02-21-N	216.3 ± 13.3 *a
EV-HCI-WS-2017-02-21-N	253.8 ± 13.8 *a
CM-MC2-WS-20170221-N	171.8 ± 7.4 *a
LC-UCDSS-LCC-WS-2017-02-21	211.8 ± 15.4 *a

a. indicates cell yield that were significantly greater than the site controls FR-UFRI

\* indicates cell yield that were significantly greater than the lab control

Reviewed by: JOU

Date reviewed: March 17/17

## 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLT  
 Sample ID: Various Test Date/Time: Feb 24/17 @ 7:55h  
 Work Order No.: 170123 Test Species: Pseudokirchneriella subcapitata

Culture Date: Feb 17/17 Age of Culture: 7d Culture Health: Good  
 Culture Count: 1 358 2 382 Average: 370 Culture Cell Density (c1): 370 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \ 370 \times 10^4 \text{ cells/mL}} = 5.95 \text{ mL}$$

Time Zero Counts: 1 18 2 22 Average: 20

No. of Cells/mL: 20 x 10<sup>4</sup> Initial Density: # cells/mL ÷ 220 µL x 10 µL = 9091 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature (°C)				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	6.9	24.0	24.0	24.0	24.5	25.0	✓	✓	✓	✓
95.2% FR_WFRI (site)	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% FR_FRCP1	8.1	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% GH_WFRI	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% GH_ERC	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% EV_MC2	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% EV_HCI	8.1	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% CM_MC2	8.1	24.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2% WLED_SLCC	8.1	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	MLT	A	A	MLT	MLT	A	MLT

Initial control pH: Well 1: 6.9 Well 2: 6.9

Final control pH: Well 1: 6.8 Well 2: 6.8

Light intensity (lux): 3820 Date measured: Feb 24/17

Instruments: Thermometer 4 pH meter 2 Light meter 1

Sample Description: all samples: clear, colourless, odourless, no particulates

Comments: \_\_\_\_\_

Reviewed: MLT Date reviewed: March 17/17

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck Coal Start Date/Time: Feb 24/12 @ 0745h  
 Work Order #: 170123 Termination Date: Feb 27/12 @ 0745h  
 Sample ID: various Test set up by: MLJ  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	34					MLJ
	B	31					
	C	33					
	D	28					
	E	26					
	F	27					
	G	31					
	H	30					
(site control) FR-UPR1 95.2% (v/v)	A	155					
	B	152					
	C	164					
	D	<del>158</del> 168					
	EA	156					
	FB	144					
	GC	158					
	HD	146					
FR-FRCP1 (95.2% v/v)	A	170					
	B	165					
	C	179					
	D	167					
GH-FR1 (95.2% v/v)	A	149					
	B	157					
	C	130					
	D	131					
GH-ERC (95.2% v/v)	A	165					
	B	175					
	C	185					
	D	180					
EV-MC2 (95.2% v/v)	A	200					
	B	205					
	C	214					
	D	230					
EV-HC1 (95.2% v/v)	A	250					
	B	270					
	C	261					
	D	238					✓

Comments: \_\_\_\_\_

Reviewed by: JGh Date Reviewed: March 17/12

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck Coal Start Date/Time: Feb 24/17 @ 0745h  
 Work Order #: 170123 Termination Date: Feb 27/17 @ 0745h  
 Sample ID: various Test set up by: ML7  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
CN.MC7 (95.2% v/v)	A	169					ML7
	B	175					↓
	C	182					
	D	165					
LL.LCDSSLCC (95.2% v/v)	A	221					
	B	230					
	C	197					
	D	203					
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Comments: \_\_\_\_\_

Reviewed by: JOH Date Reviewed: March 17/17





**Pseudokirchneriella subcapitata Algal Counts**

Client: Teck Coal  
 WO#: 170123  
 Sample ID: Teck Coal samples pass/fail

Start Date/Time: 24-Feb-17 @ 0745h  
 Termination Date/Time 27-Feb-17 @ 0745h

Initial Cell Density: 9091 cell/mL  
 200000  
 0.22  
 0.01

Concentration % (v/v)	Rep	Count 1 (x 10 <sup>4</sup> )	Count 2 (x 10 <sup>4</sup> )	Count 3 (x 10 <sup>4</sup> )	Count 4 (x 10 <sup>4</sup> )	Mean (x 10 <sup>4</sup> )	Cell Yield (x 10 <sup>4</sup> )		9090.909
Control	A	34				34	33.1	mean	29.1
Lab Control	B	31				31	30.1	SD	2.828427
	C	33				33	32.1	CV	9.722718
	D	28				28	27.1		
	A	26				26	25.1		
CM_MC2 95.2% (v/v)	B	27				27	26.1		
	C	31				31	30.1		
	D	30				30	29.1		
	A	169				169	168.1		
LC_LCDSSLC 95.2% (v/v)	B	175				175	174.1		
	C	182				182	181.1		
	D	165				165	164.1		
	A	221				221	220.1		
	B	230				230	229.1		
	C	197				197	196.1		
	D	203				203	202.1		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		

Reviewed by:                     JCA                    

Date reviewed:                     March 17/17

**CETIS Summary Report**

Report Date: 16 Mar-17 13:48 (p 1 of 1)  
 Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Batch ID: 06-5297-6285      Test Type: Cell Growth      Analyst: Mimi Tran  
 Start Date: 24 Feb-17 07:45      Protocol: EC/EPS 1/RM/25      Diluent: Deionized Water + nutrients  
 Ending Date: 27 Feb-17 07:45      Species: Pseudokirchneriella subcapitata      Brine:  
 Duration: 72h      Source: In-House Culture      Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-4478-8207	24 Feb-17	24 Feb-17	8h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	69h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	71h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	67h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	69h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	72h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	68h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	68h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	71h (2 °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_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

*Lab control = Deionized water w/ nutrients  
 FR\_UFR1 = site control*

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	29	26.64	31.36	25	33	1	2.828	9.75%	0.0%
FR_UFR1	8	154.4	147.5	161.2	143	167	2.897	8.193	5.31%	-432.3%
FR_FRCP1	4	169.3	159.4	179.1	164	178	3.092	6.185	3.65%	-483.6%
GH_FR1	4	139	121.5	156.5	129	149	5.492	10.98	7.9%	-379.3%
GH_ERC	4	175.3	161.7	188.8	164	184	4.27	8.539	4.87%	-504.3%
EV_MC2	4	216.3	195.1	237.4	199	229	6.651	13.3	6.15%	-645.7%
EV_HC1	4	253.8	231.7	275.8	237	269	6.921	13.84	5.46%	-775.0%
CM_MC2	4	171.8	160	183.5	164	181	3.705	7.411	4.32%	-492.2%
LC_LCDSSLCC	4	211.8	187.3	236.2	196	229	7.685	15.37	7.26%	-630.2%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	33	30	32	27	25	26	30	29
FR_UFR1	154	151	163	167	155	143	157	145
FR_FRCP1	169	164	178	166				
GH_FR1	148	149	129	130				
GH_ERC	164	174	184	179				
EV_MC2	199	224	213	229				
EV_HC1	249	269	260	237				
CM_MC2	168	174	181	164				
LC_LCDSSLCC	220	229	196	202				

**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 1 of 2)  
 Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 03-9218-0017	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 16 Mar-17 13:46	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-5297-6285	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 24 Feb-17 07:45	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 27 Feb-17 07:45	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-4478-8207	24 Feb-17	24 Feb-17	8h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	69h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	71h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	67h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	69h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	72h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	68h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	68h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	71h (2 °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_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	51.3%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		FR_UFR1	26.22	2.541	12.15	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	23.95	2.541	14.88	10	<0.0001	CDF	Significant Effect
		GH_FR1	18.78	2.541	14.88	10	<0.0001	CDF	Significant Effect
		GH_ERC	24.98	2.541	14.88	10	<0.0001	CDF	Significant Effect
		EV_MC2	31.98	2.541	14.88	10	<0.0001	CDF	Significant Effect
		EV_HC1	38.38	2.541	14.88	10	<0.0001	CDF	Significant Effect
		CM_MC2	24.38	2.541	14.88	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	31.21	2.541	14.88	10	<0.0001	CDF	Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	198504.1	24813.01	8	271.4	<0.0001	Significant Effect
Error	3200.375	91.43929	35			
Total	201704.4		43			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.59	20.09	0.0677	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9807	0.9295	0.6613	Normal Distribution

**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 2 of 2)  
 Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 03-9218-0017      Endpoint: Cell Yield  
 Analyzed: 16 Mar-17 13:46      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

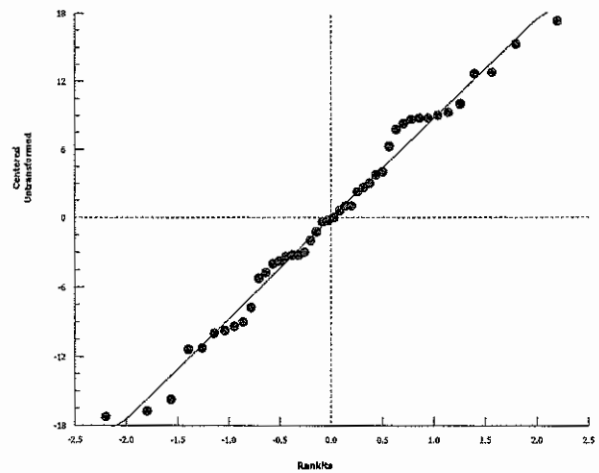
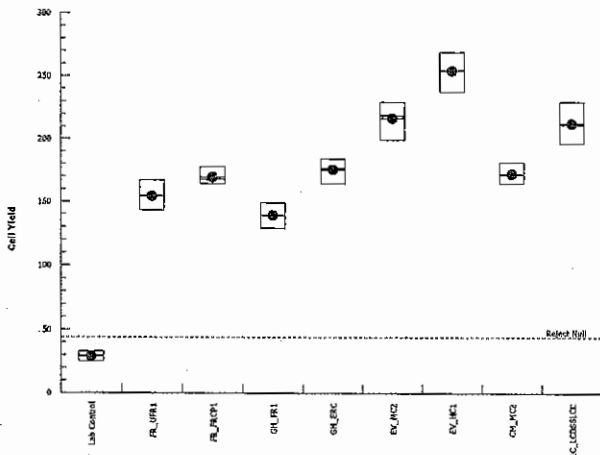
**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	29	26.64	31.36	29.5	25	33	1	9.75%	0.0%
FR_UFR1	8	154.4	147.5	161.2	154.5	143	167	2.897	5.31%	-432.3%
FR_FRCP1	4	169.3	159.4	179.1	167.5	164	178	3.092	3.65%	-483.6%
GH_FR1	4	139	121.5	156.5	139	129	149	5.492	7.9%	-379.3%
GH_ERC	4	175.3	161.7	188.8	176.5	164	184	4.27	4.87%	-504.3%
EV_MC2	4	216.3	195.1	237.4	218.5	199	229	6.651	6.15%	-645.7%
EV_HC1	4	253.8	231.7	275.8	254.5	237	269	6.921	5.46%	-775.0%
CM_MC2	4	171.8	160	183.5	171	164	181	3.705	4.32%	-492.2%
LC_LCDSSLCC	4	211.8	187.3	236.2	211	196	229	7.685	7.26%	-630.2%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	33	30	32	27	25	26	30	29
FR_UFR1	154	151	163	167	155	143	157	145
FR_FRCP1	169	164	178	166				
GH_FR1	148	149	129	130				
GH_ERC	164	174	184	179				
EV_MC2	199	224	213	229				
EV_HC1	249	269	260	237				
CM_MC2	168	174	181	164				
LC_LCDSSLCC	220	229	196	202				

**Graphics**



**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 1 of 2)  
 Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 18-6635-1757	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 16 Mar-17 13:47	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 06-5297-6285	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 24 Feb-17 07:45	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 27 Feb-17 07:45	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-4478-8207	24 Feb-17	24 Feb-17	8h	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	69h (2.8 °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_Q_02012017_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	18.6%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		FR_UFR1	40.91	1.761	5.397	14	<0.0001	CDF	Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	62875.56	62875.56	1	1674	<0.0001	Significant Effect
Error	525.875	37.5625	14			
Total	63401.44		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	8.391	8.885	0.0118	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9646	0.8408	0.7455	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	29	26.64	31.36	29.5	25	33	1	9.75%	0.0%
FR_UFR1	8	154.4	147.5	161.2	154.5	143	167	2.897	5.31%	-432.3%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	33	30	32	27	25	26	30	29
FR_UFR1	154	151	163	167	155	143	157	145

# CETIS Analytical Report

Report Date: 16 Mar-17 13:48 (p 2 of 2)  
Test Code: 170123 | 11-4244-3211

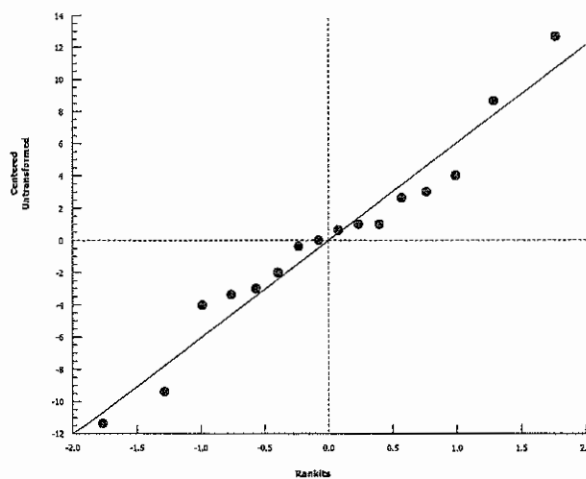
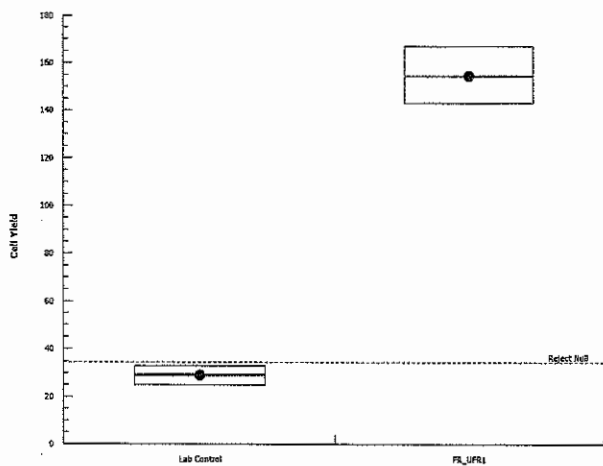
## EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 18-6635-1757      Endpoint: Cell Yield  
Analyzed: 16 Mar-17 13:47      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 1 of 2)  
 Test Code: 170123 | 11-4244-3211

<b>EC Alga Growth Inhibition Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 20-1513-1248	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7			
Analyzed: 16 Mar-17 13:47	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 06-5297-6285	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 24 Feb-17 07:45	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 27 Feb-17 07:45	Species: Pseudokirchneriella subcapitata	Brine:			
Duration: 72h	Source: In-House Culture	Age: 7d			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	69h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	71h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	67h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	69h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	72h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	68h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	68h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	71h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.6%	

**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	-2.292	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
	GH_FR1	2.369	2.526	16.39	10	0.0694	CDF	Non-Significant Effect
	GH_ERC	-3.217	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
	EV_MC2	-9.535	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
	EV_HC1	-15.31	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
	CM_MC2	-2.677	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
	LC_LCDSSLCC	-8.841	2.526	16.39	10	1.0000	CDF	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.7195	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	43551.93	6221.705	7	55.4	<0.0001	Significant Effect
Error	3144.375	112.2991	28			
Total	46696.3		35			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.356	18.48	0.7380	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9644	0.9166	0.2918	Normal Distribution

**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 2 of 2)  
 Test Code: 170123 | 11-4244-3211

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 20-1513-1248 Endpoint: Cell Yield CETIS Version: CETISv1.8.7  
 Analyzed: 16 Mar-17 13:47 Analysis: Parametric-Control vs Treatments Official Results: Yes

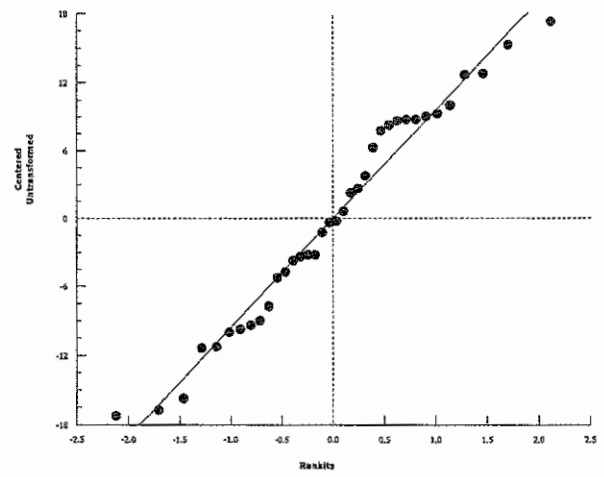
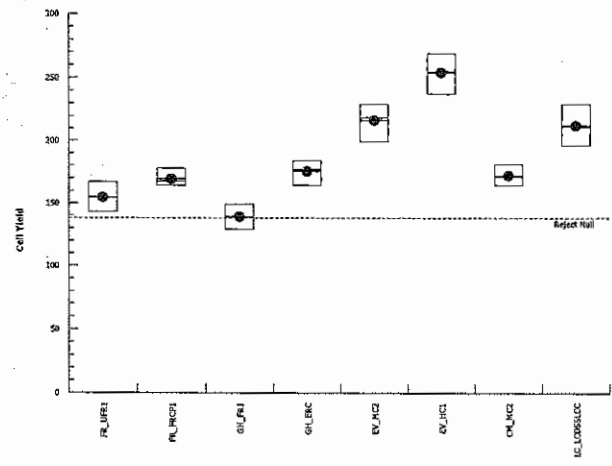
**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	154.4	147.5	161.2	154.5	143	167	2.897	5.31%	0.0%
FR_FRCP1	4	169.3	159.4	179.1	167.5	164	178	3.092	3.65%	-9.64%
GH_FR1	4	139	121.5	156.5	139	129	149	5.492	7.9%	9.96%
GH_ERC	4	175.3	161.7	188.8	176.5	164	184	4.27	4.87%	-13.52%
EV_MC2	4	216.3	195.1	237.4	218.5	199	229	6.651	6.15%	-40.08%
EV_HC1	4	253.8	231.7	275.8	254.5	237	269	6.921	5.46%	-64.37%
CM_MC2	4	171.8	160	183.5	171	164	181	3.705	4.32%	-11.26%
LC_LCDSSLCC	4	211.8	187.3	236.2	211	196	229	7.685	7.26%	-37.17%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	154	151	163	167	155	143	157	145
FR_FRCP1	169	164	178	166				
GH_FR1	148	149	129	130				
GH_ERC	164	174	184	179				
EV_MC2	199	224	213	229				
EV_HC1	249	269	260	237				
CM_MC2	168	174	181	164				
LC_LCDSSLCC	220	229	196	202				

**Graphics**





**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 1 of 2)  
 Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 06-0706-2608	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 16 Mar-17 13:47	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 06-5297-6285	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 24 Feb-17 07:45	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 27 Feb-17 07:45	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	69h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	71h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	67h (1.5 °C)		
GH_ERC	00-0005-7396	21 Feb-17 10:15	22 Feb-17 10:30	69h (1.5 °C)		
EV_MC2	04-6620-6754	21 Feb-17 08:05	22 Feb-17 10:30	72h (4.5 °C)		
EV_HC1	07-8133-2867	21 Feb-17 12:15	22 Feb-17 10:30	68h (2 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	68h (1.3 °C)		
LC_LCDSSLCC	17-3894-2443	21 Feb-17 08:15	22 Feb-17 10:30	71h (2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-02-21_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-02-21_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-02-21		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	10.6%	

**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	2.292	2.526	16.39	10	0.0810	CDF	Non-Significant Effect
		GH_FR1	-2.369	2.526	16.39	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	3.217	2.526	16.39	10	0.0102	CDF	Significant Effect
		EV_MC2	9.535	2.526	16.39	10	<0.0001	CDF	Significant Effect
		EV_HC1	15.31	2.526	16.39	10	<0.0001	CDF	Significant Effect
		CM_MC2	2.677	2.526	16.39	10	0.0360	CDF	Significant Effect
		LC_LCDSSLCC	8.841	2.526	16.39	10	<0.0001	CDF	Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.7195	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	43551.93	6221.705	7	55.4	<0.0001	Significant Effect
Error	3144.375	112.2991	28			
Total	46696.3		35			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.356	18.48	0.7380	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9644	0.9166	0.2918	Normal Distribution

**CETIS Analytical Report**

Report Date: 16 Mar-17 13:48 (p 2 of 2)

Test Code: 170123 | 11-4244-3211

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 06-0706-2608  
 Analyzed: 16 Mar-17 13:47

Endpoint: Cell Yield  
 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

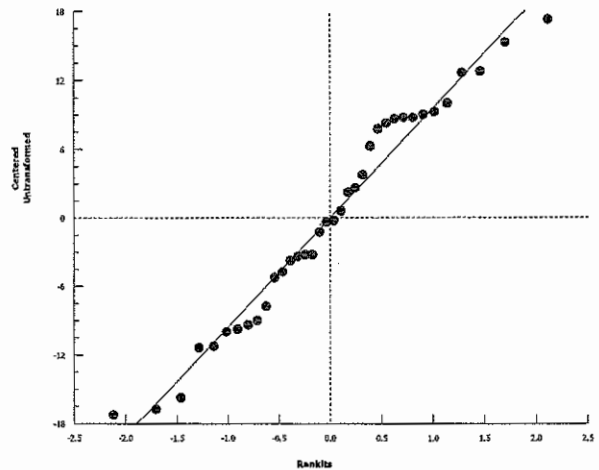
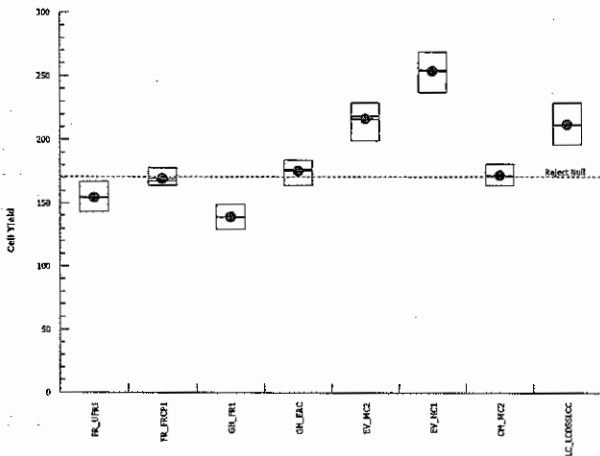
**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	154.4	147.5	161.2	154.5	143	167	2.897	5.31%	0.0%
FR_FRCP1	4	169.3	159.4	179.1	167.5	164	178	3.092	3.65%	-9.64%
GH_FR1	4	139	121.5	156.5	139	129	149	5.492	7.9%	9.96%
GH_ERC	4	175.3	161.7	188.8	176.5	164	184	4.27	4.87%	-13.52%
EV_MC2	4	216.3	195.1	237.4	218.5	199	229	6.651	6.15%	-40.08%
EV_HC1	4	253.8	231.7	275.8	254.5	237	269	6.921	5.46%	-64.37%
CM_MC2	4	171.8	160	183.5	171	164	181	3.705	4.32%	-11.26%
LC_LCDSSLCC	4	211.8	187.3	236.2	211	196	229	7.685	7.26%	-37.17%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	154	151	163	167	155	143	157	145
FR_FRCP1	169	164	178	166				
GH_FR1	148	149	129	130				
GH_ERC	164	174	184	179				
EV_MC2	199	224	213	229				
EV_HC1	249	269	260	237				
CM_MC2	168	174	181	164				
LC_LCDSSLCC	220	229	196	202				

**Graphics**



**APPENDIX C – *Hyaella azteca* Toxicity Test Data**

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## Hyalella azteca Test Summary Sheet

Client: Teck  
 Work Order No.: 170120

Start Date: 23-Feb-17  
 Set up by: JW

**Sample Information:**

Sample ID: Various - See below  
 Sample Date: February 21 & 28, March 7 & 14, 2017  
 Date Received: February 22, March 1, 8 & 15, 2017  
 Sample Volume: 1x 20L per refresh

**Test Organism Information:**

Species: Hyalella azteca  
 Supplier: Aquatic Research Organisms, NH  
 Date received: 23-Feb-17  
 Age or size (Day 0): 8-days

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: HA124  
 Stock Solution ID: n/a  
 Date Initiated: 23-Feb-17

96-h LC50 (95% CL): 6.4 (5.2 - 8.0)

96-h LC50 Reference Toxicant Mean and Range: 5.6 (5.0 - 6.4) CV (%): 7

**Test Results:**

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	96.0 ± 5.5	0.8586 ± 0.03
FR_UFR1	96.0 ± 5.5	0.73 ± 0.15
GH_FR1	100.0 ± 0.0	0.70 ± 0.18
FR_FRCP1	96.0 ± 5.5	0.48 ± 0.14 *†
CM_MC2	64.0 ± 41.6 *†	0.20 ± 0.03 *†

\* Samples that are significantly different from Control

† Samples that are significantly different from reference site FR\_UFR1

Reviewed by: 

Date reviewed: April 6, 2017

## Chronic *H. azteca* Toxicity Test Data Sheet

### Freshwater Water Quality

Client: Teck  
 WO #: 170120  
 Sample ID: See below

Start Date: Feb 23 / 17  
 Termination Date: Mar 23 / 17  
 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	22.0	22.5	23.0	22.5	22.5	23.0	23.0	22.5	23.0	23.0	22.5	23.5	23.0	23.0
FR_UFR1	22.0	22.0	22.5	23.0	22.5	22.5	23.0	23.0	22.5	23.0	23.0	22.5	23.5	23.0	23.0
GH_FR1	22.0	22.0	23.0	23.0	22.5	22.5	23.0	23.0	22.5	23.0	23.0	22.5	23.5	23.0	23.0
FR_FRCP1	22.0	22.0	23.0	23.0	22.5	22.5	23.0	23.0	22.5	23.0	23.0	22.5	23.5	23.0	23.0
CM_MC2	22.0	22.0	23.0	23.0	22.5	22.5	23.0	23.0	22.5	23.0	23.0	22.5	23.5	23.0	23.0
Technician Initials	JW	JW	A	A	K	K	K	K	K	A	A	K	K	K	JW

#### Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	426	436	461	445	441	435	439	439	439	436	451	442	442	449	440
FR_UFR1	418	423	433	444	444	434	432	436	436	438	445	446	445	444	432
GH_FR1	914	922	940	941	924	913	923	904	950	951	945	924	939	958	951
FR_FRCP1	1514	1481	1520	1514	1500	1488	1488	1489	1536	1524	1523	1488	1505	1543	1944
CM_MC2	1011	1008	1047	1047	1025	1015	1019	1090	1083	1096	1103	1076	1086	1104	1104
Technician Initials	JW	JW	A	A	K	K	K	K	K	A	A	K	K	K	JW

#### 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	7.4	7.2	7.0	7.3	7.4	7.3	7.2	7.1	6.5	6.3	6.3	6.3	6.2	6.8
FR_UFR1	8.7	7.4	7.3	6.9	7.4	7.4	7.3	7.2	7.2	6.7	6.2	6.8	6.3	6.2	6.8
GH_FR1	8.7	7.5	7.5	6.9	7.4	7.4	7.3	7.1	7.2	6.8	6.3	6.8	6.3	6.3	6.8
FR_FRCP1	8.7	7.5	7.5	6.9	7.3	7.4	7.3	7.1	7.3	6.7	6.5	6.8	6.4	6.3	6.8
CM_MC2	8.7	7.5	7.4	6.9	7.3	7.4	7.3	7.2	7.4	6.7	6.5	7.0	6.4	6.3	6.9
Technician Initials	JW	JW	A	A	K	K	K	K	K	A	A	K	K	K	JW

#### pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	7.6	7.5	7.7	7.7	7.4	7.2	7.1	7.2	7.1	7.4	7.5	7.2	7.3	7.2	7.1
FR_UFR1	7.6	7.9	8.2	8.3	7.9	7.8	7.6	7.6	7.4	7.7	7.7	7.7	7.8	7.8	7.6
GH_FR1	7.7	8.0	8.3	8.4	7.9	7.8	7.8	7.0	7.6	7.6	7.8	7.9	7.9	8.0	7.8
FR_FRCP1	7.8	8.1	8.3	8.4	7.9	7.8	7.8	7.7	7.7	7.8	7.9	8.0	8.0	8.0	7.9
CM_MC2	7.8	8.1	8.4	8.4	7.9	7.8	7.9	7.7	7.8	7.9	7.9	8.0	8.0	8.0	7.9
Technician Initials	JW	JW	A	A	K	K	K	K	K	A	A	K	K	K	JW


Comments:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Reviewed by:



Date Reviewed:

April 5, 2017

## Chronic *H. azteca* Toxicity Test Data Sheet

### Freshwater Water Quality

Client: Teck  
 WO #: 170120  
 Sample ID: See below

Start Date: Feb 23/17  
 Termination Date: Mar 23/17  
 Test Organism: *H. azteca*

#### Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	23.0	23.5	23.5	23.0	23.5	23.0	23.5	23.5	23.5	23.5	23.0	23.5	23.0	22.5
FR_UFR1	23.0	23.5	23.5	23.0	23.5	23.0	23.5	23.5	23.5	23.5	23.0	23.5	23.0	22.5
GH_FR1	23.0	23.5	23.5	23.0	23.80	23.0	23.5	23.5	23.5	23.5	23.0	23.5	23.0	22.5
FR_FRCP1	23.0	23.5	23.5	23.0	23.80	23.0	23.5	23.5	23.5	23.5	23.0	23.5	23.0	22.5
CM_MC2	23.0	23.5	23.5	23.0	23.80	23.0	23.5	23.5	23.5	23.5	23.0	23.5	23.0	22.5
Technician Initials	JW	A	A	K	K	K	K	K	K	A	A	K	K	K

#### Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	451	459	453	482	455	459	469	464	471	487	484	483	480	487
FR_UFR1	438	438	439	455	446	436	430	421	425	430	440	442	443	445
GH_FR1	975	974	975	959	937	956	930	909	907	902	890	907	924	915
FR_FRCP1	2150	2140	2140	2160	2140	2270	1853	1855	1548	1592	1522	1465	1560	1548
CM_MC2	1117	1114	1112	1115	1098	1092	1081	1075	1077	1085	1071	1083	1096	1088
Technician Initials	JW	A	A	K	K	K	K	K	A	A	K	K	K	K

01557

#### Dissolved oxygen (mg/L)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	6.8	7.1	6.9	6.3	6.0	6.1	5.6	5.1	5.7	6.2	5.3	5.3	5.5	5.4
FR_UFR1	6.7	7.0	7.1	6.2	6.2	6.1	5.8	5.1	5.9	6.3	5.7	5.3	5.6	5.3
GH_FR1	6.8	7.1	6.9	6.2	6.2	6.2	5.9	5.2	6.0	6.1	5.7	5.6	5.8	5.4
FR_FRCP1	6.8	7.0	6.9	6.3	6.4	6.4	5.9	5.3	5.9	6.0	5.7	5.6	5.8	5.4
CM_MC2	6.7	6.9	7.0	6.5	6.4	6.6	6.0	5.2	5.8	6.0	5.6	5.6	5.9	5.6
Technician Initials	JW	A	A	K	K	K	K	K	A	A	K	K	K	K

#### pH

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	7.1	7.4	7.6	7.4	7.3	7.3	7.2	7.1	7.4	7.2	7.1	7.1	7.2	7.0
FR_UFR1	7.6	7.7	7.8	7.9	7.9	7.9	7.7	7.5	7.8	7.6	7.6	7.7	7.7	7.6
GH_FR1	7.7	7.9	7.9	8.0	7.9	8.0	7.8	7.7	7.9	7.8	7.7	7.8	7.9	7.8
FR_FRCP1	7.9	7.9	8.0	8.2	8.1	8.1	8.0	7.9	8.0	7.9	7.8	7.9	8.0	8.0
CM_MC2	8.0	8.0	8.0	8.1	8.0	8.1	8.0	7.9	8.0	7.9	7.7	7.9	8.0	7.9
Technician Initials	JW	A	A	K	K	K	K	K	A	A	K	K	K	K

Comments:

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Reviewed by: 

Date Reviewed: April 5, 2017

*127*  
**H. azteca Sediment Toxicity Test Data Sheet**  
Freshwater Sediment Survival and Weight

Client: Teck  
Work Order No: 170120  
Sample ID: See below

Start Date: FEB 23/17  
Termination Date: MAR 23/17  
Test Organism: Hyalella azteca

Sample ID	Pan No. <i>T17</i> <i>blue</i>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control	1	A	9	0	1	u	1015.71	1023.19	9	u/u
	2	B	9	0	1		1023.41	1031.03	9	
	3	C	10	0	0		992.00	1000.43	10	
	4	D	10	0	0		1006.16	1014.71	10	
	5	E	10	0	0	u	1034.69	1043.73	10	
FR_UFR1	6	A	10	0	0	u	1008.00	1014.19	10	
	7	B	9	0	1		1003.04	1008.04	9	
	8	C	10	0	0		1021.08	1028.13	u 10 10	
	9	D	9	0	1		1023.39	1031.48	9	
	10	E	10	0	0	↓	1002.62	1011.10	10	
GH_FR1	11	A	10	0	0	u	1026.06	1030.17	10	
	12	B	10	0	0		1007.18	1014.04	10	
	13	C	10	0	0		1024.19	1032.37	10	
	14	D	10	0	0		1040.59	1049.46	10	
	15	E	10	0	0	↓	1009.25	1016.28	10	
FR_FRCP1	16	A	9	0	1	u	1005.27	1011.14	9	
	17	B	10	0	0		1004.45	1009.97	10	
	18	C	10	0	0		1020.36	1023.78	10	
	19	D	<del>10</del> 9	0	<del>1</del> 0		1017.61	1020.58	9	
	20	E	10	0	0	↓	1012.42	1017.60	10	↓

Comments: 10% re-weigh: #1: 1023.09mg, #10: 1011.01mg, u

Reviewed by: 

Date Reviewed: April 5, 2017

## H. azteca Toxicity Test Data Sheet

### Survival and Weight

Client: Teck  
 Work Order No: 170120  
 Sample ID: see below

Start Date: Feb 23/17  
 Termination Date: Mar 23/17  
 Test Organism: Hyalella azteca

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
② CM_MC2	21	A	5	0	5	KL	1016.08	1017.09	5	KL/KL
	22	B	6 <sup>①</sup>	0	0	↓	1007.68	1009.09	8 <sup>①</sup>	↓
	23	C	0	9 <sup>KL</sup>	9	↓	1014.28	-	0	↓
	24	D	7	0	3	↓	1025.69	1027.00	7	↓
	25	E	10	10 <sup>KL</sup>	0	↓	1009.85	1012.24	10	↓
		A								
		B								
		C								
		D								
		E								
		A								
		B								
		C								
		D								
		E								
		A								
		B								
		C								
		D								
		E								

Comments: ① 2 lost in transfer 10% re-weigh 25: 1012.21mg - ② Organisms look ok, other than just smaller in size compared to other samples

Reviewed by: 

Date Reviewed: April 5, 2017



Client: Teck  
 W.O.#: 17010

H. Azteca  
**Hardness and Alkalinity Datasheet**

Day 0

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
FR_UFP1	Feb 23/17	Feb 23/17	50	7.7	7.9	150	100	2.4	240	K
AH_FP1	↓	↓	↓	10.0	10.3	194	↓	6.0	600	↓
FR-FRCP1	↓	↓	↓	12.8	13.0	252	↓	9.2	920	↓
CM-MC2	↓	↓	↓	10.3	10.5	202	↓	6.8	680	↓
MHW	↓	↓	↓	2.8	3.0	52	50	6.8	136	↓
FR_UFP1	Feb 28/17	Mar 2/17	50	7.9	8.1	154	100	2.1	210	K
AH_FP1	↓	↓	↓	11.2	11.4	220	↓	4.9	490	↓
FR-FRCP1	↓	↓	↓	11.9	12.1	234	↓	8.5	850	↓
CM-MC2	↓	↓	↓	11.0	11.1	218	↓	5.8	580	↓
FR_UFP1	Mar 7/17	Mar 8/17	50	7.7	7.8	152	100	2.9	290	K
AH_FP1	↓	↓	↓	11.2	11.4	220	↓	5.0	500	↓
FR-FRCP1	↓	↓	↓	15.0	15.2	296	↓	14.6 <sup>②</sup>	1460	↓
CM-MC2	↓	↓	↓	10.9	11.2	212	↓	5.9	590	K
FR_UFP1	Mar 14/17	Mar 15/17	50	7.6	7.7	150	100	2.1	210	K
AH_FP1	↓	↓	↓	10.3	10.5	202	↓	5.2	520	↓
FR-FRCP1	↓	↓	↓	13.1	13.3	258	↓	9.5	950	↓
CM-MC2	↓	↓	↓	10.5	10.7	206	↓	5.9	590	↓

Notes: ① Sample diluted w/ DI water up to 100ml ② Tied twice and gave same result

Reviewed by: [Signature] Date Reviewed: April 5, 2017

Client: Teck

H. AZTECA


W.O.#: 170120

### Hardness and Alkalinity Datasheet

Day 28

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
Control MHW	Mar 23/17	Mar 23/17	50	3.8	4.0	72	50	7.5	150	KL
PR UFPI	↓	↓	↓	8.9	9.0	176	100	1.8	180	↓
OH-PR1	↓	↓	↓	10.5	10.7	206	↓	4.9	490	↓
PR FPCPI	↓	↓	↓	11.8	12.0	232	↓	9.0	900	↓
OM MCL	↓	↓	↓	10.6	10.8	208	↓	5.9	590	↓

Notes: ① Sample diluted w/ DI water up to 100mL

Reviewed by: 

Date Reviewed: April 5, 2017

**CETIS Summary Report**

Report Date: 03 Apr-17 11:53 (p 1 of 1)  
 Test Code: 170120 | 06-9788-2749

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Batch ID: 19-4590-3851      Test Type: Survival-Growth      Analyst: Kania Lywe  
 Start Date: 23 Feb-17      Protocol: EPA/600/R-99/064 (2000)      Diluent: Mod-Hard Synthetic Water  
 Ending Date: 23 Mar-17      Species: Hyalella azteca      Brine:  
 Duration: 28d 0h      Source: Aquatic Research Organisms, NH      Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-7315-6147	23 Feb-17	23 Feb-17	NA	Teck Coal	
① FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

**Test Acceptability**

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
03-4676-7007	Survival Rate	Control Resp	0.96	0.8 - NL	Yes	Passes Acceptability Criteria

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	0.0%
① FR_UFR1	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	0.0%
GH_FR1	5	1	1	1	1	1	0	0	0.0%	-4.17%
FR_FRCP1	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	0.0%
CM_MC2	5	0.64	0.1236	1	0	1	0.186	0.4159	64.99%	33.33%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.9	0.9	1	1	1
① FR_UFR1	1	0.9	1	0.9	1
GH_FR1	1	1	1	1	1
FR_FRCP1	0.9	1	1	0.9	1
CM_MC2	0.5	1	0	0.7	1

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	9/10	9/10	10/10	10/10	10/10
① FR_UFR1	10/10	9/10	10/10	9/10	10/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
FR_FRCP1	9/10	10/10	10/10	9/10	10/10
CM_MC2	5/10	10/10	0/10	7/10	10/10

① FR\_UFR1 is site control (Reference sediment)

*KL*  
 April 5/17

**CETIS Analytical Report**

Report Date: 03 Apr-17 11:26 (p 1 of 2)  
 Test Code: 170120 | 06-9788-2749

**Hyaella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

<b>Analysis ID:</b> 03-4676-7007	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 03 Apr-17 11:07	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 19-4590-3851	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Mod-Hard Synthetic Water
<b>Ending Date:</b> 23 Mar-17	<b>Species:</b> Hyaella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-7315-6147	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °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_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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	0.6913	1.0000	Exact	Non-Significant Effect
Control	GH_FR1	1	1.0000	Exact	Non-Significant Effect
Control	FR_FRCP1	0.6913	1.0000	Exact	Non-Significant Effect
Control	CM_MC2	4.419E-05	0.0002	Exact	Significant Effect

**Test Acceptability Criteria**

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.96	0.8 - NL	Yes	Passes Acceptability Criteria

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control	48	2	50	0.96	0.04	0.0%
FR_UFR1	48	2	50	0.96	0.04	0.0%
GH_FR1	50	0	50	1	0	-4.17%
FR_FRCP1	48	2	50	0.96	0.04	0.0%
CM_MC2	32	18	50	0.64	0.36	33.33%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.9	0.9	1	1	1
FR_UFR1	1	0.9	1	0.9	1
GH_FR1	1	1	1	1	1
FR_FRCP1	0.9	1	1	0.9	1
CM_MC2	0.5	1	0	0.7	1

FR\_UFR1 is site control (reference sediment)

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	9/10	9/10	10/10	10/10	10/10
FR_UFR1	10/10	9/10	10/10	9/10	10/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
FR_FRCP1	9/10	10/10	10/10	9/10	10/10
CM_MC2	5/10	10/10	0/10	7/10	10/10

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 April 5/17

# CETIS Analytical Report

Report Date: 03 Apr-17 11:26 (p 2 of 2)  
Test Code: 170120 | 06-9788-2749

## Hyalella 28-d Survival and Growth Sediment Test

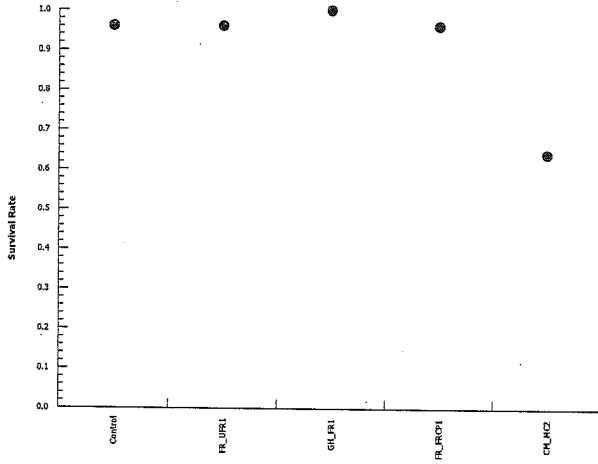
Nautilus Environmental

Analysis ID: 03-4676-7007  
Analyzed: 03 Apr-17 11:07

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



*EW*  
*April 17/17*

**CETIS Analytical Report**

Report Date: 03 Apr-17 11:26 (p 1 of 2)

Test Code: 170120 | 06-9788-2749

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

<b>Analysis ID:</b> 02-5337-9541	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 03 Apr-17 11:23	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 19-4590-3851	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Mod-Hard Synthetic Water
<b>Ending Date:</b> 23 Mar-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.6913	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	4.419E-05	0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	Reference Sed	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	Reference Sed	48	2	50	0.96	0.04	0.0%
GH_FR1		50	0	50	1	0	-4.17%
FR_FRCP1		48	2	50	0.96	0.04	0.0%
CM_MC2		32	18	50	0.64	0.36	33.33%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
① FR_UFR1	1	0.9	1	0.9	1
GH_FR1	1	1	1	1	1
FR_FRCP1	0.9	1	1	0.9	1
CM_MC2	0.5	1	0	0.7	1

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
① FR_UFR1	10/10	9/10	10/10	9/10	10/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
FR_FRCP1	9/10	10/10	10/10	9/10	10/10
CM_MC2	5/10	10/10	0/10	7/10	10/10

① FR\_UFR1 is the control (reference sediment)

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# CETIS Analytical Report

Report Date: 03 Apr-17 11:26 (p 2 of 2)

Test Code: 170120 | 06-9788-2749

## Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 02-5337-9541

Endpoint: Survival Rate

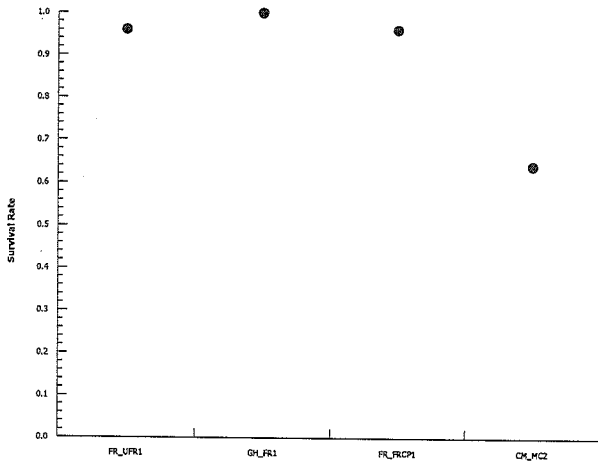
CETIS Version: CETISv1.8.7

Analyzed: 03 Apr-17 11:23

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

### Graphics



*EW*  
April 5/17

**CETIS Summary Report**

Report Date: 03 Apr-17 12:10 (p 1 of 1)  
 Test Code: 170120 | 06-9788-2749

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Batch ID: 19-4590-3851      Test Type: Survival-Growth      Analyst: Kania Lywe  
 Start Date: 23 Feb-17      Protocol: EPA/600/R-99/064 (2000)      Diluent: Mod-Hard Synthetic Water  
 Ending Date: 23 Mar-17      Species: Hyalella azteca      Brine:  
 Duration: 28d 0h      Source: Aquatic Research Organisms, NH      Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-7315-6147	23 Feb-17	23 Feb-17	NA	Teck Coal	
① FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.856	0.8209	0.891	0.8311	0.904	0.01261	0.0282	3.3%	0.0%
① FR_UFR1	5	0.7253	0.5435	0.907	0.5556	0.8989	0.06546	0.1464	20.18%	15.27%
GH_FR1	5	0.701	0.4749	0.9271	0.411	0.887	0.08143	0.1821	25.97%	18.1%
FR_FRCP1	5	0.4788	0.3057	0.652	0.33	0.6522	0.06238	0.1395	29.13%	44.06%
CM_MC2	4	0.2011	0.1575	0.2447	0.1763	0.239	0.01369	0.02738	13.62%	76.51%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.8311	0.8467	0.843	0.855	0.904
① FR_UFR1	0.619	0.5556	0.705	0.8989	0.848
GH_FR1	0.411	0.686	0.818	0.887	0.703
FR_FRCP1	0.6522	0.552	0.342	0.33	0.518
CM_MC2	0.202	0.1763		0.1872	0.239

① FR\_UFR1 is site control (reference sediment)

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 April 6/17



**CETIS Analytical Report**

Report Date: 03 Apr-17 11:26 (p 1 of 2)

Test Code: 170120 | 06-9788-2749

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

<b>Analysis ID:</b> 04-0909-5952	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 03 Apr-17 11:20	<b>Analysis:</b> Nonparametric-Multiple Comparison	<b>Official Results:</b> Yes
<b>Batch ID:</b> 19-4590-3851	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Mod-Hard Synthetic Water
<b>Ending Date:</b> 23 Mar-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-7315-6147	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °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_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	24.0%	

**Wilcoxon/Bonferroni Adj Test**

Sample Code vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Control	FR_UFR1	22	NA	0	8	0.6190	Exact	Non-Significant Effect
	GH_FR1	19	NA	0	8	0.1905	Exact	Non-Significant Effect
	FR_FRCP1	15	NA	0	8	0.0159	Exact	Significant Effect
	CM_MC2	10	NA	0	7	0.0317	Exact	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.165099	0.2912746	4	18.35	<0.0001	Significant Effect
Error	0.3015804	0.01587265	19			
Total	1.466679		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.61	13.28	0.0056	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.945	0.884	0.2110	Normal Distribution

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	0.856	0.8209	0.891	0.8467	0.8311	0.904	0.01261	3.3%	0.0%
FR_UFR1	5	0.7253	0.5435	0.907	0.705	0.5556	0.8989	0.06546	20.18%	15.27%
GH_FR1	5	0.701	0.4749	0.9271	0.703	0.411	0.887	0.08143	25.97%	18.1%
FR_FRCP1	5	0.4788	0.3057	0.652	0.518	0.33	0.6522	0.06238	29.13%	44.06%
CM_MC2	4	0.2011	0.1575	0.2447	0.1946	0.1763	0.239	0.01369	13.62%	76.51%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.8311	0.8467	0.843	0.855	0.904
FR_UFR1	0.619	0.5556	0.705	0.8989	0.848
GH_FR1	0.411	0.686	0.818	0.887	0.703
FR_FRCP1	0.6522	0.552	0.342	0.33	0.518
CM_MC2	0.202	0.1763	0.1872	0.239	

FR\_UFR1 is ok control (Reference Sediment)

*[Signature]*  
April 6/17

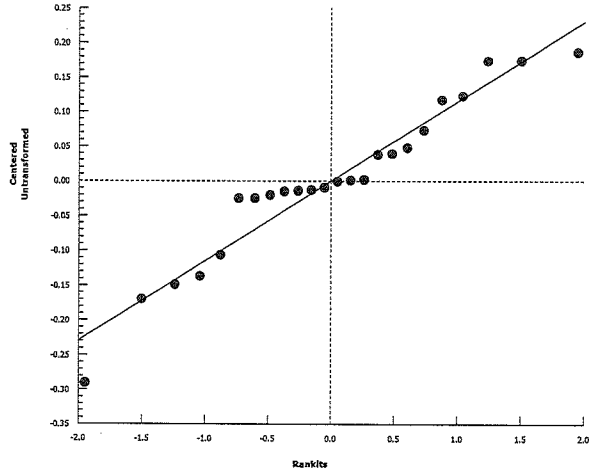
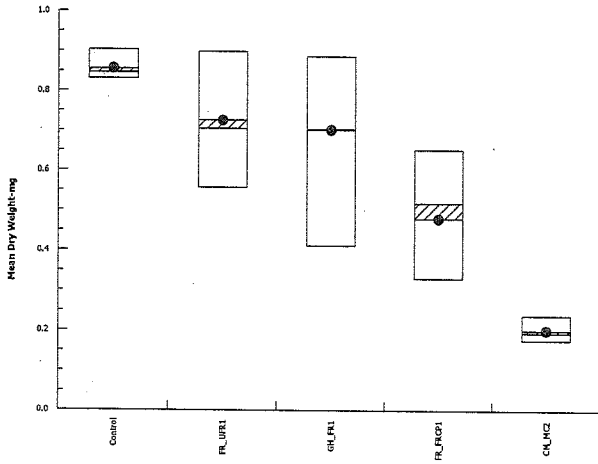
Hyalrella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 04-0909-5952      Endpoint: Mean Dry Weight-mg  
Analyzed: 03 Apr-17 11:20      Analysis: Nonparametric-Multiple Comparison

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



*EW*  
April 6/17

**CETIS Analytical Report**

Report Date: 03 Apr-17 11:36 (p 1 of 2)  
 Test Code: 170120 | 06-9788-2749

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 13-7049-3156	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 03 Apr-17 11:36	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 19-4590-3851	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Mod-Hard Synthetic Water
<b>Ending Date:</b> 23 Mar-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	29.3%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
① FR_UFR1		GH_FR1	0.2723	2.244	0.200	8	0.6489	CDF	Non-Significant Effect
		FR_FRCP1	2.763	2.244	0.200	8	0.0188	CDF	Significant Effect
		CM_MC2	5.54	2.244	0.212	7	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.779112	0.259704	3	13.05	0.0002	Significant Effect
Error	0.2983994	0.0198933	15			
Total	1.077511		18			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.814	11.34	0.0781	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9558	0.8605	0.4936	Normal Distribution

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
① FR_UFR1	5	0.7253	0.5435	0.907	0.705	0.5556	0.8989	0.06546	20.18%	0.0%
GH_FR1	5	0.701	0.4749	0.9271	0.703	0.411	0.887	0.08143	25.97%	3.35%
FR_FRCP1	5	0.4788	0.3057	0.652	0.518	0.33	0.6522	0.06238	29.13%	33.98%
CM_MC2	4	0.2011	0.1575	0.2447	0.1946	0.1763	0.239	0.01369	13.62%	72.27%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
① FR_UFR1	0.619	0.5556	0.705	0.8989	0.848
GH_FR1	0.411	0.686	0.818	0.887	0.703
FR_FRCP1	0.6522	0.552	0.342	0.33	0.518
CM_MC2	0.202	0.1763	0.1872	0.239	

① FR\_UFR1 is site control (Reference Sediment)

*[Handwritten Signature]*  
 April 6/17

Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 13-7049-3156

Endpoint: Mean Dry Weight-mg

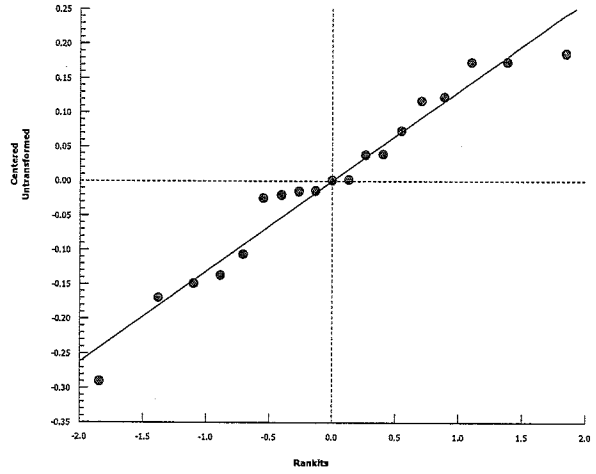
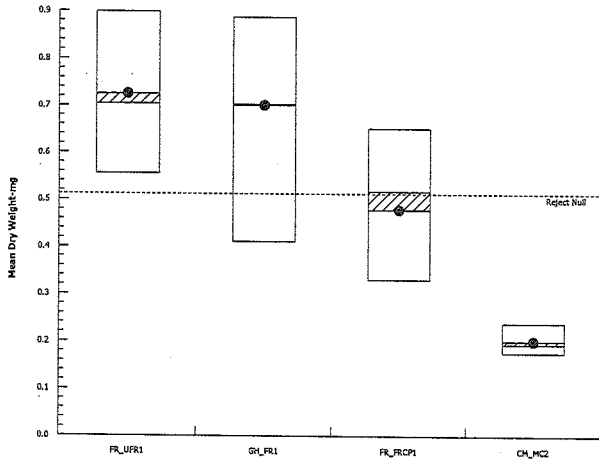
CETIS Version: CETISv1.8.7

Analyzed: 03 Apr-17 11:36

Analysis: Parametric-Control vs Treatments

Official Results: Yes

Graphics



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April 6/17

**APPENDIX D – *Pimephales promelas* Toxicity Test Data**

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Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/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-UNT		CTL- Cu		1617-0683		1617-0684		1617-0685		1617-0686	
	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	14	1	15	0	14	1	14	1	15	0	15	0
c	<del>14</del> 15	<del>10</del> 0	14	1	15	0	15	0	14	1	15	0
d	15	0	14	1	15	0	15	0	15	0	14	1
e	29	1	28	2	29	1	30	0	30	0	29	1
f	30	0	29	1	30	0	29	1	29	1	30	0

Comments/Observations:

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT			CTL- Cu			1617-0683			1617-0684		
	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	15	0	15	14	1	15
b	14	0	15	15	0	15	13	1	15	13	1	15
c	11	3	15	14	0	15	15	0	15	15	0	15
d	13	2	15	14	0	15	14	1	15	15	0	15
e	27	<del>2</del> 2	15	26	2	15	<del>29</del> 29	0	15	29	1	15
f	28	2	15	27	2	15	29	1	15	29	0	15

replicate	1617-0685			1617-0686		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	15	0	15	14	1	15
b	14	1	15	14	1	15
c	13	1	15	15	0	15
d	15	0	15	13	1	15
e	30	0	15	29	0	15
f	28	1	15	30	0	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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT		CTL- Cu		1617-0683		1617-0684		1617-0685		1617-0686	
	Day 3		Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	13	2	14	1	6	9	12	3	13	2	9	6
b	13	2	13	2	10	5	10	5	13	2	9	6
c	12	3	12	3	11	4	12	2	11	4	10	4
d	15	0	15	0	2	13	9	6	12	3	13	2

Comments/Observations:

replicate	CTL-UNT		CTL- Cu		1617-0683		1617-0684		1617-0685		1617-0686	
	Day 4		Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	-	15(1)	1	14	-	15	0	14	1	14	1	14
b	1	14	1	14(1)	-	15	-	15	-	15	-	15
c	1	14	1	14	-	15	-	13	-	15	-	14
d	1	14	1	15	-	15	1	13(1)	1	14	-	15

1617-0684(c) - Two dead unhatched.  
(a) couldn't find any other embryos

Comments/Observations:

replicate	CTL-UNT		CTL- Cu		1617-0683		1617-0684		1617-0685		1617-0686	
	Day 5		Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15	(1)	15		15		14		15		14	
b	15		15	(1)	15		15		15		15	
c	14		14		15		13		15		14	
d	15		15		14		15		15		14	

0686 A - 1 dead E.

Comments/Observations: CTL Cu c - 1 dead E  
CTL UNT - c - 1 dead E

replicate	CTL-UNT		CTL- Cu		1617-0683		1617-0684		1617-0685		1617-0686	
	Day 6		Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	14	(1)	15		15		14		15		14	
b	15	(1)	14	(1)	15	(1)	15		15		15	
c	14	(1)	14		15	(1)	13		15		14	
d	15		13		14		15		14		14	

0686 (A) - One bank fail  
0686 (D) - " " "

Comments/Observations:

unt CTLA - can't see dead one  
Cu CTLB - " "

Method FMD 32 Day ELS Client NAU104 Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 7	Day 7	Day 7	Day 7	Day 7	Day 7
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	14	15	14	15	14(1)
b	15	14(1)	15	15	15	15(1)
c	14(1)	14	15(1)	14 13 down	15	13
d	15	15	14	13(1)	14	14

Comments/Observations:

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 8	Day 8	Day 8	Day 8	Day 8	Day 8
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	14	15	14	15	14(1)
b	15	14(1)	15	15	15	15
c	14(1)	14	15(1)	13	15	13
d	15	15	7*	13(1)	14	14

\*\* Feeding adjusted for 1617-0683(d) to 0.25mls

Comments/Observations: \*microbial growth

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 9	Day 9	Day 9	Day 9	Day 9	Day 9
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	14	15	14	15	14(1)
b	15	14(1)	15	15	15	15
c	14(1)	14	15(1)	13	15	13
d	15	15	1*	13(1)	14	14

\*\*

Comments/Observations:

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 10	Day 10	Day 10	Day 10	Day 10	Day 10
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	14(1)	14	15	14	15	14(1)
b	15	14(1)	15	15	15	15
c	14(1)	14	15(1)	13	15	13
d	15	15	1	13(1)	14	14

Comments/Observations:



Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

		Number of Alive Embryos and Hatched Organisms					
		CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
		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		12	13	14	14	15	14(1)
b		15	13(1)	15	14	13.5	15(1)
c		14(1)	14(1)	15(1)	11	13	13
d		15	15	1	13(1)	13	14

Comments/Observations: CTL-UNT A - 2 dead no microb growth

		CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
		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		12	13	12	14	15	14(1)
b		14(2)	13(1)	15	14	14	15(1)
c		14(1)	14(1)	14	11	13	12
d		15	15	1	13	13	14

Comments/Observations: 1617-0683(c) Two dead no microb. growth  
 1617-0685(b) - One dead no microb. growth ON

		CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
		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		12	13	12	14	15	13
b		<del>12</del> 12	13(1)	15	14	14	15(1)
c		14	14(1)	14	11	13	12
d		15	15	1	13	13	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
		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		12	12	<del>15</del> 12	14	15	13
b		12	12(1)	15	14	14	15(1)
c		14	13	14/5(4) HS	8*	13	12
d		15	15	1	13	13	14

Comments/Observations: \* microbial growth

Method FMD 32 Day ELS Client NAU104 Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

Number of Alive Embryos and Hatched Organisms						
	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	11	12	14	15	13
b	12	12(1)	15	14	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations: Control Cu (a) - No microbial

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	11	12	14	15	13
b	12	12(1)	14	14	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	10	12	14	15	13
b	12	12(1)	14	14	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	10	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	10(1)	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	9	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	9	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

replicate	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	9	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	12	14	15	13
b	12	12(1)	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:  
*Cu(b) and 0683(a) - one dead, no microbial growth.*

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	1	13	13	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	4	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

Number of Alive Embryos and Hatched Organisms						
	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13(1)	14

Comments/Observations:

*06-25(d) - (no. gross (1))*

	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
	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	12	9	11	14	15	13
b	12	11	14	13	14	15
c	14	13	14	8	13	12
d	15	15	0	13	13	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

New Solutions						
Conc. (%)	CTL-UNT	CTL-Cu	1617-0683	1617-0684	1617-0685	1617-0686
Day						
	pH (units)					
0	8.3	8.3	8.1	8.2	8.0	8.1
1	8.3	8.4	8.2	8.3	8.1	8.1
2	8.0	8.1	7.9	8.1	7.9	7.9
3	8.0	8.1	8.0	8.3	8.1	8.1
4	7.8	7.9	7.9	8.0	7.9	8.0
5	7.9	8.0	7.9	8.0	8.0	8.0
6	7.9	8.0	7.9	8.1	8.0	8.1
7	8.0	8.0	8.0	8.1	8.1	8.1
8	8.0	8.0	8.0	8.1	8.0	8.1

Old Solutions					
CTL-UNT	CTL-Cu	1617-0683	1617-0684	1617-0685	1617-0686
	pH (units)				
0					
1	8.2	8.1	8.0	8.1	8.1
2	8.0	8.0	7.7	8.0	7.8
3	7.9	8.1	7.9	8.2	7.9
4	7.8	7.9	7.7	8.0	7.8
5	7.8	8.0	7.8	8.1	7.9
6	7.9	7.9	7.7	8.0	7.8
7	8.0	8.0	7.5	8.2	7.8
8	7.6	7.7	7.6	8.0	7.8

Conductance (µS/cm)						
0	430	427	1239	305	707	712
1	427	407	1206	305	727	809
2	369	375	1147	307	728	811
3	348	362	1258	302	722	792
4	345	350	1183	304	693	789
5	352	348	1217	301	710	808
6	365	356	1225	296	709	794
7	380	346	1218	314	766	819
8	364	348	1224	318	736	862

Conductance (µS/cm)					
0					
1	443	457	1203	367	725
2	430	410	1193	313	700
3	398	394	1185	310	705
4	388	371	1169	310	703
5	359	363	1190	309	701
6	363	361	1191	313	706
7	356	355	1196	315	702
8	428	359	1200	318	714

Dissolved Oxygen (mg/L) (40-100% saturation)						
0	7.2	7.2	7.1	7.1	7.2	7.2
1	7.3	7.3	7.3	7.2	7.3	7.2
2	7.2	7.2	7.2	7.2	7.2	7.2
3	7.2	7.2	7.2	7.2	7.2	7.2
4	7.3	7.2	7.1	7.1	7.1	7.1
5	7.3	7.3	7.2	7.1	7.2	7.2
6	7.3	7.3	7.2	7.3	7.2	7.2
7	7.3	7.3	7.2	7.3	7.3	7.3
8	7.2	7.2	7.2	7.1	7.1	7.1

Dissolved Oxygen (mg/L) (40-100% saturation)					
0					
1	6.5	6.3	6.7	6.7	6.7
2	6.8	6.8	6.9	6.9	6.9
3	7.0	6.9	7.0	7.1	7.0
4	6.9	6.9	6.9	7.0	6.9
5	6.9	6.8	6.8	6.9	6.8
6	7.0	6.8	6.8	6.8	6.7
7	6.7	6.8	6.9	6.8	7.0
8	6.7	6.7	6.8	6.7	6.9

Temperature (°C)						
0	25.0	25.0	25.4	25.6	25.1	25.2
1	24.0	24.0	24.4	24.7	24.3	24.8
2	25.0	24.9	24.1	25.2	24.9	25.2
3	24.2	24.7	25.1	25.3	25.2	25.2
4	23.9	25.1	25.6	25.7	25.7	25.6
5	23.5	24.4	25.4	25.7	25.2	25.3
6	23.9	23.9	24.7	25.0	24.8	24.9
7	24.0	24.2	25.3	24.2	24.4	24.4
8	24.6	25.0	25.6	25.6	25.7	25.6

Temperature (°C)					
0					
1	24.3	24.0	24.3	24.1	23.9
2	24.0	23.9	24.2	24.3	24.3
3	24.0	24.0	24.3	23.9	24.1
4	24.0	24.0	24.0	24.0	24.0
5	24.0	24.2	24.6	24.5	24.5
6	23.9	24.4	24.8	24.8	25.0
7	23.7	23.8	24.7	24.5	24.9
8	23.8	23.7	24.6	24.5	24.6

**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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

New Solutions						
Conc. (%)	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
Day						
	pH (units)					
9	8.0	8.0	8.0	8.1	8.1	8.1
10	8.1	8.2	8.2	8.2	8.2	8.2
11	7.9	7.8	7.9	7.9	7.9	8.0
12	7.6	7.7	7.6	7.7	7.7	7.7
13	7.9	7.9	7.9	8.0	7.9	8.0
14	7.8	7.9	8.0	8.0	8.0	8.1
15	7.9	8.0	8.1	8.2	8.0	8.1
16	8.0	8.1	8.2	8.2	8.1	8.1
17	8.0	8.0	8.1	8.2	8.1	8.2
	Conductance (µS/cm)					
9	353	337	1222	306	746	868
10	362	345	1215	305	745	862
11	347	344	1266	299	752	876
12	345	345	1247	324	727	871
13	401	411	1479	382	874	1035
14	394	423	2330	377	925	1055
15	386	405	2622	372	865	1027
16	384	403	2210	345	909	1032
17	400	404	2050	352	928	1054
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.1	7.2	7.1	7.1	7.1	7.2
10	7.1	7.1	7.1	7.1	7.1	7.1
11	7.2	7.2	7.2	7.2	7.1	7.2
12	7.2	7.2	7.1	7.2	7.2	7.2
13	7.2	7.2	7.2	7.1	7.2	7.2
14	7.2	7.2	7.2	7.2	7.2	7.2
15	7.2	7.2	7.2	7.2	7.1	7.2
16	7.2	7.2	7.2	7.2	7.1	7.1
17	7.2	7.2	7.2	7.2	7.2	7.2
	Temperature (°C)					
9	25.6	25.0	25.5	25.7	25.6	25.3
10	25.8	25.7	25.7	25.8	25.7	25.6
11	24.9	25.0	25.4	25.4	25.6	25.4
12	24.6	24.8	25.7	25.4	25.4	25.3
13	24.7	24.6	25.7	26.2	25.4	26.0
14	24.3	24.7	25.1	25.4	25.3	24.9
15	25.0	25.4	25.7	25.8	25.6	25.3
16	24.4	25.0	25.2	25.6	25.7	25.6
17	24.5	24.8	25.0	25.1	25.3	25.4

Old Solutions						
CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686	
	pH (units)					
9	7.8	7.8	7.8	8.0	7.7	7.7
10	7.6	7.8	7.8	8.1	7.9	7.9
11	7.5	7.6	7.5	7.8	7.5	7.4
12	7.4	7.4	7.4	7.6	7.4	7.4
13	7.7	7.6	7.6	7.9	7.6	7.6
14	7.7	7.7	7.8	7.9	7.8	7.8
15	7.7	7.6	7.6	7.8	7.6	7.6
16	7.6	7.6	7.6	7.8	7.7	7.7
17	7.6	7.7	7.7	7.8	7.7	7.7
	Conductance (µS/cm)					
9	399	369	1214	320	713	840
10	369	362	1228	331	714	845
11	355	350	1200	325	714	842
12	452	355	1212	320	713	854
13	501	410	1439	373	850	992
14	433	427	1456	385	890	1041
15	401	432	1291	320	820	1040
16	435	437	1494	387	921	1030
17	414	421	2160	394	899	1047
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	6.4	6.4	6.4	6.4	6.4	6.5
10	6.2	6.2	6.3	6.5	6.5	6.6
11	7.1	7.1	6.5	6.7	6.6	6.6
12	7.2	7.2	7.2	6.9	6.9	6.8
13	6.9	7.3	7.0	7.1	7.1	7.1
14	6.8	6.8	6.4	6.9	6.5	6.4
15	6.8	6.7	6.6	6.9	7.0	6.6
16	6.8	6.7	6.5	6.6	6.7	6.5
17	6.8	6.5	6.3	6.5	6.7	6.3
	Temperature (°C)					
9	24.1	24.1	24.0	24.1	24.0	24.2
10	24.1	24.1	24.0	24.0	24.0	24.0
11	23.5	23.5	24.9	24.1	24.7	24.8
12	23.5	23.5	23.5	23.5	23.5	23.5
13	23.8	23.8	23.8	23.7	23.8	23.8
14	24.0	24.1	24.3	24.1	24.0	24.5
15	23.7	23.7	24.3	23.8	23.6	24.4
16	23.9	23.9	23.9	23.9	23.8	23.8
17	23.3	23.7	23.6	23.7	23.5	23.7

**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:**



Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
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Day	pH (units)					
18	7.6	7.7	7.6	7.9	7.6	7.7
19	7.6	8.0	8.0	8.0	8.0	8.0
20	7.8	8.0	8.1	8.2	8.0	8.0
21	7.8	8.0	8.0	8.1	8.0	8.0
22	7.6	8.0	8.1	8.2	8.0	8.0
23	7.8	8.0	8.1	8.2	8.0	8.1
24	8.2	8.2	8.2	8.3	8.2	8.2
25	7.8	7.9	8.0	8.1	8.0	8.0
26	8.1	8.1	8.2	8.1	8.1	8.1

**Conductance (µS/cm)**

18	403	415	2160	399	876	1053
19	418	402	2160	368	882	990
20	398	385	2060	347	868	999
21	396	382	1453	359	918	976
22	414	392	1395	390	795	971
23	392	406	1437	364	807	956
24	395	392	1463	360	807	986
25	388	400	1459	369	821	991
26	381	403	1402	343	798	922

**Dissolved Oxygen (mg/L) (40-100% saturation)**

18	6.5	6.6	6.2	6.5	6.5	6.4
19	7.1	7.3	7.1	7.1	7.1	7.1
20	7.2	7.3	7.2	7.2	7.2	7.2
21	7.2	7.2	7.2	7.2	7.2	7.2
22	7.2	7.2	7.2	7.2	7.2	7.1
23	7.2	7.1	7.1	7.1	7.1	7.1
24	7.0	7.0	7.2	7.2	7.2	7.0
25	7.2	7.2	7.1	7.1	7.2	7.1
26	7.2	7.2	7.2	7.2	7.2	7.2

**Temperature (°C)**

18	23.6	23.9	24.0	23.9	23.9	24.0
19	23.9	24.4	25.7	26.2	26.1	25.8
20	24.2	24.3	24.8	25.1	25.2	25.1
21	25.3	24.8	25.3	25.4	25.3	25.2
22	25.0	24.5	25.4	25.6	25.6	25.5
23	25.3	25.4	25.4	25.3	25.4	25.4
24	25.1	24.7	25.8	25.8	25.4	25.6
25	25.1	24.7	25.8	25.8	25.4	25.6
26	25.2	24.9	25.3	25.4	25.4	25.4

**Old Solutions**

CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
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Day	pH (units)					
18	7.9	7.9	7.9	8.1	8.0	8.0
19	7.7	7.7	7.7	7.9	7.7	7.7
20	7.5	7.6	7.6	7.8	7.7	7.7
21	7.5	7.6	7.6	7.8	7.7	7.7
22	7.3	7.5	7.6	7.6	7.7	7.7
23	7.3	7.5	7.6	7.7	7.7	7.7
24	7.5	7.6	7.7	7.7	7.8	7.8
25	7.7	7.7	7.9	8.0	7.9	7.8
26	7.7	7.6	7.8	7.8	7.8	7.8

**Conductance (µS/cm)**

18	402	403	2260	383	1058	942
19	421	443	2180	394	964	973
20	378	418	1998	382	878	980
21	441	409	1979	378	865	984
22	398	400	1595	371	826	984
23	494	405	1403	387	816	1023
24	426	425	1426	369	769	799
25	402	413	1321	369	731	935
26	397	410	1350	373	761	934

**Dissolved Oxygen (mg/L) (40-100% saturation)**

18	7.2	7.2	7.1	7.1	7.2	7.1
19	6.7	6.9	6.8	6.6	6.5	6.3
20	6.8	6.6	6.4	6.6	6.6	6.4
21	6.2	6.2	6.1	6.2	6.3	6.1
22	6.5	6.1	5.8	6.0	5.9	5.4
23	5.5	5.5	5.6	5.7	5.7	5.6
24	7.1	7.0	7.0	7.1	7.1	7.1
25	7.2	7.2	7.1	7.1	7.1	7.1
26	7.0	7.0	7.0	6.9	6.9	6.9

**Temperature (°C)**

18	24.9	25.0	26.1	26.1	25.4	25.9
19	23.5	23.5	24.2	24.4	24.3	24.6
20	24.2	24.7	24.8	24.7	24.8	24.8
21	24.0	24.2	24.0	24.7	25.0	25.2
22	24.2	24.6	25.1	24.9	25.1	25.2
23	24.1	24.0	24.3	24.2	24.1	24.1
24	23.9	24.0	24.1	24.1	24.2	24.0
25	24.1	24.1	24.2	24.3	24.3	24.1
26	23.7	23.9	24.2	24.0	24.2	24.3

**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:**

\* 7.1, 7.1

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/L)

New Solutions						
Conc. (%)	CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686
Day						
	7.9 <del>mm</del> pH (units)					
27	7.7	8.1	8.1	8.2	8.0	8.1
28	8.0	8.1	8.1	8.1	8.1	8.1
29	7.8	7.9	7.9	8.0	8.0	8.1
30	7.7	7.9	8.0	7.9	7.9	8.0
31	7.9	7.8	7.9	8.0	7.9	8.0
32						
	352 <del>mm</del> Conductance (µS/cm)					
27	376	385	1399	338	767	927
28	394	390	1037	326	813	821
29	388	498	1018	317	786	715
30	372	480	984	333	790	720
31	370	394	1025	322	821	603
32						
	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	7.1	7.1	6.8	7.0	7.0	7.0
28	7.2	7.1	7.1	7.1	7.1	7.1
29	7.2	7.2	7.1	7.1	7.1	7.1
30	7.3	7.3	7.2	7.1	7.1	7.1
31	7.2	7.2	7.2	7.2	7.1	7.2
32						
	24.1 Temperature (°C)					
27	23.8	24.5	25.9	26.1	26.1	26.0
28	25.3	25.3	26.1	25.7	26.1	26.1
29	25.0	25.2	25.9	26.1	26.1	26.2
30	24.3	24.3	25.3	25.6	25.6	25.6
31	24.9	25.0	25.1	24.9	25.6	25.3
32						

Old Solutions						
CTL-UNT	CTL- Cu	1617-0683	1617-0684	1617-0685	1617-0686	
Day						
	pH (units)					
27	7.7	7.8	7.6	8.1	8.0	7.9
28	7.6	7.5	7.7	7.9	7.9	7.8
29	7.6	7.6	7.6	7.9	7.9	7.7
30	7.6	7.7	7.8	7.9	7.9	7.9
31	7.8	7.8	7.8	7.8	7.8	8.0
32	7.7	7.8	7.9	7.9	7.8	7.9
	Conductance (µS/cm)					
27	376	394	1247	346	697	856
28	402	400	1315	349	702	817
29	391	394	1020	343	743	722
30	407	470	990	345	752	912
31	372	479	970	365	721	652
32	392	464	928	336	707	609
	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	6.4	6.7	6.0	6.7	7.0	6.9
28	7.2	7.2	6.2	6.7	6.7	6.9
29	7.1	7.2	7.0	7.1	7.1	7.1
30	6.9	6.8	6.8	6.8	6.7	6.8
31	7.3	7.1	6.8	7.0	6.9	6.9
32	7.0	6.9	6.9	6.9	7.0	6.9
	Temperature (°C)					
27	23.8	24.3	24.4	24.6	24.6	24.6
28	23.7	24.0	24.4	24.1	24.3	24.1
29	23.5	23.6	23.9	23.7	23.8	24.1
30	23.6	23.6	23.9	23.9	23.6	23.8
31	23.5	23.5	24.2	24.3	24.3	24.1
32	23.7	23.8	24.2	24.6	24.1	24.1

**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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/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	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	8	N	1	5	N	1	7	N
	2	9	↓	2	7	↓	2	8	↓	2	8	↓
	3	9	↓	3	11	↓	3	7	↓	3	8	↓
	4	9	↓	4	9	↓	4	9	↓	4	7	↓
	5	10	↓	5	12	↓	5	7	↓	5	9	↓
	6	8	↓	6	9	↓	6	10	↓	6	9	↓
	7	10	↓	7	8	↓	7	11	↓	7	9	↓
	8	9	↓	8	10	↓	8	7	↓	8	8	↓
	9	8	↓	9	9	↓	9	9	↓	9	9	↓
	10	9	↓	10	8	↓	10	8	↓	10	10	↓
	11	8	↓	11	7	↓	11	10	↓	11	8	↓
	12	10	↓	12	6	↓	12	9	↓	12	11	↓
	13	—	—	13	—	—	13	9	↓	13	7	↓
	14	—	—	14	—	—	14	9	↓	14	7	↓
	15	—	—	15	—	—	15	—	—	15	9	↓

Comments

CTL- Cu	Replicate # <u>A</u>			Replicate # <u>B</u>			Replicate # <u>C</u>			Replicate # <u>O</u>		
	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal	Fish	Length (mm)	Normal/Abnormal
	1	9	N	1	11	N	1	6	N	1	5	N
	2	9	↓	2	12	↓	2	8	↓	2	8	↓
	3	11	↓	3	8	↓	3	11	↓	3	9	↓
	4	9	↓	4	7	↓	4	7	↓	4	9	↓
	5	8	↓	5	7	↓	5	12	↓	5	7	↓
	6	10	↓	6	11	↓	6	9	↓	6	9	↓
	7	8	↓	7	9	↓	7	9	↓	7	10	↓
	8	8	↓	8	7	↓	8	7	↓	8	11	↓
	9	10	↓	9	10	↓	9	8	↓	9	9	↓
	10	—	—	10	9	↓	10	11	↓	10	9	↓
	11	—	—	11	8	↓	11	10	↓	11	7	↓
	12	—	—	12	—	—	12	9	↓	12	10	↓
	13	—	—	13	—	—	13	6	↓	13	10	↓
	14	—	—	14	—	—	14	—	—	14	7	↓
	15	—	—	15	—	—	15	—	—	15	9	↓

Comments

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/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.

1617-0683	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	9	N	1	9	N	1	-	-
	2	14		2	10		2	9		2	-	-
	3	12		3	10		3	10		3	-	-
	4	13		4	7		4	13		4	-	-
	5	11		5	11		5	9		5	-	-
	6	10		6	11		6	9		6	-	-
	7	10		7	9		7	8		7	-	-
	8	11		8	9		8	10		8	-	-
	9	12		9	10		9	11		9	-	-
	10	11		10	12		10	7		10	-	-
	11	11		11	9		11	10		11	-	-
	12	-	-	12	9		12	10		12	-	-
	13	-	-	13	10		13	9		13	-	-
	14	-	-	14	10		14	9		14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

1617-0684	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	9	N	1	9	N	1	13	N	1	8	N
	2	7		2	10		2	9		2	9	
	3	11		3	10		3	10		3	8	
	4	10		4	10		4	10		4	10	
	5	10		5	6		5	12		5	9	
	6	7		6	9		6	11		6	9	
	7	10		7	10		7	9		7	10	
	8	10		8	10		8	10		8	10	
	9	10		9	11		9	-	-	9	10	
	10	10		10	11		10	-	-	10	11	
	11	10		11	11		11	-	-	11	8	
	12	10		12	10		12	-	-	12	9	
	13	9		13	10		13	-	-	13	8	
	14	9		14	11		14	-	-	14	11	
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0683, 1617-0684, 1617-0685, 1617-0686 Copper (10 µg/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.

1617-0685	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	9	7	N	1	7	N	1	9	N	1	9	N
2	7	8		2	8		2	9		2	11	
3	8	8		3	8		3	10		3	7	
4	8	8		4	8		4	9		4	9	
5	7	8		5	9		5	9		5	12	
6	9	8		6	7		6	8		6	8	
7	10	8		7	9		7	9		7	8	
8	10	8		8	9		8	11		8	10	
9	10	8		9	10		9	9		9	7	
10	7	8		10	9		10	8		10	7	
11	8	8		11	7		11	9		11	8	
12	9	8		12	9		12	9		12	9	
13	9	8		13	10		13	9		13	7	
14	8	8		14	9		14	11		14	7	
15	10	8		15	11		15	11		15	7	

Comments

1617-0686	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	6	8	N	1	7	N	1	7	N	1	7	N
2	8	8		2	8		2	7		2	8	
3	8	8		3	10		3	9		3	10	
4	7	8		4	9		4	8		4	9	
5	8	8		5	6		5	9		5	7	
6	9	8		6	8		6	7		6	8	
7	10	8		7	9		7	12		7	8	
8	7	8		8	11		8	10		8	9	
9	8	8		9	8		9	9		9	6	
10	10	8		10	8		10	7		10	9	
11	10	8		11	7		11	8		11	8	
12	10	8		12	8		12	10		12	6	
13	8	8		13	6		13	11		13	10	
14	8	8		14	10		14	11		14	9	
15	10	8		15	10		15	11		15	7	

Comments

# Organism Weights Bench Sheet

Client NAU104 Sample 1617-0683 Organism FM 32 Day  
1617-0684  
1617-0685  
1617-0686

Initial Weight (mg) (dried pan)

Date: 2017/03/25 Initials: LC Balance\*: Mettler #1

Conc.	CTL-UNT	CTL-Cu	1617-0683	1617-0684	1617-0685	1617-0686		
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Replicate								
a	1023.69	1009.67	1030.49	1025.22	964.64	967.06		
b	1018.84	1010.18	970.40	992.96	970.43	975.51		
c	1018.22	998.24	1004.52	938.54	977.26	976.43		
d	983.99	964.63	1018.97	948.63	1015.14	1024.25		
e								

Final Weight (mg) (dried pan+organisms)

Date: 2017/03/30 Initials: JW Balance\*: Mettler #1

Conc.	CTL-UNT	CTL-Cu	0683	0684	0685	0686		
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Replicate								
a	1039.87	1024.30	1047.93	1039.99	983.80	984.39 PW		
b	1031.66	1027.85	987.20	1009.73	988.80	993.14		
c	1033.75	1016.69	1020.32	952.91	995.30	993.57		
d	1000.56	982.74	-	965.65	1032.94	1043.48		
e								

Test Validity Met: **Yes/No/NA**

Results are Logical\*\*: **Yes/No**

\*\*no negative numbers, consistent values across replicates

\*Same balance must be used for initial and final weights

\*For FM/HA/CT must use scale with 0.01 mg accuracy

Balance Calibration Check:

Initial	Final
first pan weighed: <span style="border: 1px solid black; padding: 2px;">CTL-UNT</span>	first pan+org weighed: <span style="border: 1px solid black; padding: 2px;">CTL-Cu</span>
weight of first pan: <span style="border: 1px solid black; padding: 2px;">983.99</span>	weight of first pan + org: <span style="border: 1px solid black; padding: 2px;">1024.30</span>
re-weigh of first pan after	re-weigh of first pan + org
all weights measured: <span style="border: 1px solid black; padding: 2px;">983.86</span>	after all weights measured: <span style="border: 1px solid black; padding: 2px;">1024.35</span>
% difference <5%: <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Yes/No</span>	% difference <5%: <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Yes/No</span>

Calculation: % difference = [initial weight-reweight/((initial weight+reweight)/2)]x100

If "no" is circled for any parameter, notify Lab Supervisor/QA Group to determine appropriate action

**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: 20170223FM

**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): 8.1  
conductance (µS/cm): 417  
dissolved oxygen (mg/L): 7.2  
NH<sub>4</sub><sup>+</sup> (mg/L): <0.1  
hardness (mg CaCO<sub>3</sub>/L): 228  
alkalinity (mg CaCO<sub>3</sub>/L): 132  
total residual chlorine (mg/L): <0.01

**Comments:**

The test data and results are authorized and verified correct.



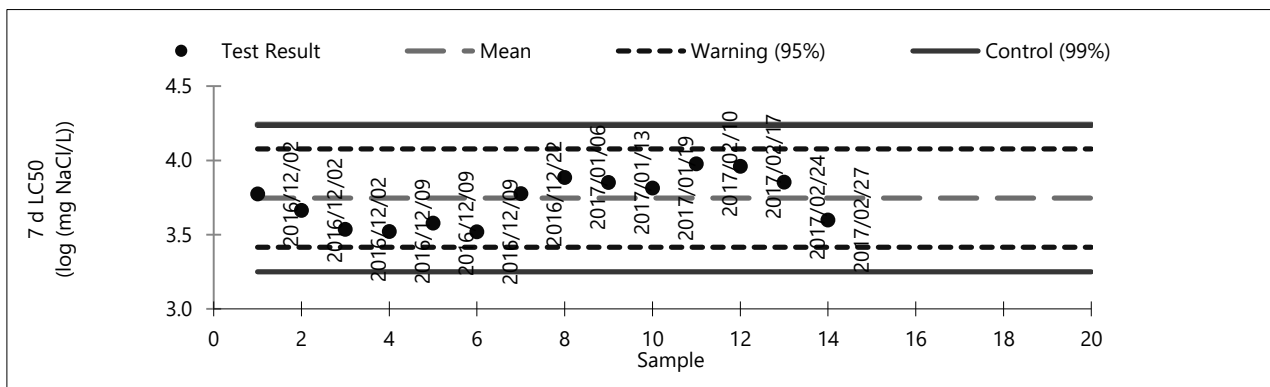
Senior Verifier

## Mortality Current Test

toxicant	Sodium Chloride (NaCl)			
started on	2017/02/27	ended on	2017/03/06	
Result (7 d LC50):	3.60	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.54	upper	3.66

## Historical Values

mean	3.75	sd	0.17	cv(%)	25.5
	lower	upper			
warning limits ( $\pm 2$ sd)	3.41	4.08	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.25	4.24	(99% confidence limits)		

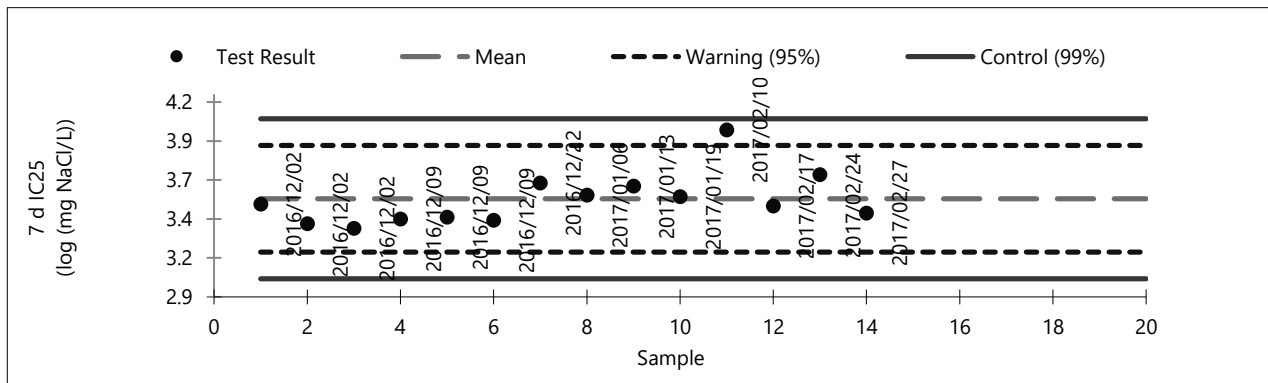


## Biomass

started on	2017/02/27	ended on	2017/03/06	
Result (7 d IC25):	3.44	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.26	upper	3.52

## Historical Values

mean	3.53	sd	0.17	cv(%)	26.4
	lower	upper			
warning limits ( $\pm 2$ sd)	3.19	3.87	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.02	4.04	(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

Report Date: 18 Apr-17 16:49 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Batch ID: 09-9403-8836      Test Type: Survival-Development-Growth      Analyst: Krysta Percy  
 Start Date: 23 Feb-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 27 Mar-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-1097-8725	23 Feb-17	23 Feb-17	NA	Teck Coal	
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA		
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Copper Control	Copper Control	Copper Control	Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

### 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%
Copper Control	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
FR_UFR1	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
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	0.9667	0.9054	1	0.9333	1	0.01925	0.03849	3.98%	1.7%

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	8.698	8.247	9.149	8.4	9.083	0.1417	0.2834	3.26%	0.0%
Copper Control	4	8.901	8.599	9.202	8.692	9.111	0.09477	0.1895	2.13%	-2.33%
FR_UFR1	4	9.51	8.43	10.59	9	10.5	0.3394	0.6789	7.14%	-9.33%
FR_FRCP1	3	10.22	7.559	12.89	9.5	11.45	0.6191	1.072	10.49%	-17.53%
GH_FR1	4	8.77	8.361	9.179	8.615	9.154	0.1285	0.257	2.93%	-0.82%
CM_MC2	4	8.43	8.115	8.745	8.143	8.583	0.09892	0.1978	2.35%	3.08%

### Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	1.018	0.8388	1.198	0.8547	1.105	0.0564	0.1128	11.08%	0.0%
Copper Control	4	1.148	0.9617	1.334	0.9753	1.23	0.05842	0.1168	10.18%	-12.7%
FR_UFR1	4	1.049	0.905	1.193	0.958	1.135	0.0452	0.09041	8.62%	-3.0%
FR_FRCP1	4	0.834	-0.05361	1.722	0	1.163	0.2789	0.5578	66.88%	18.1%
GH_FR1	4	1.223	1.16	1.286	1.187	1.277	0.01977	0.03953	3.23%	-20.08%
CM_MC2	4	1.189	1.088	1.29	1.143	1.282	0.03177	0.06355	5.35%	-16.74%

### Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.8833	0.7242	1	0.8	1	0.05	0.1	11.32%	0.0%
Copper Control	4	0.8	0.5261	1	0.6	1	0.08607	0.1721	21.52%	9.43%
FR_UFR1	4	0.8	0.5127	1	0.5333	0.9333	0.09027	0.1805	22.57%	9.43%
FR_FRCP1	4	0.65	0	1	0	0.9333	0.2217	0.4435	68.23%	26.42%
GH_FR1	4	0.9167	0.8151	1	0.8667	1	0.03191	0.06383	6.96%	-3.77%
CM_MC2	4	0.9	0.763	1	0.8	1	0.04303	0.08607	9.56%	-1.89%

**CETIS Summary Report**

Report Date: 18 Apr-17 16:49 (p 2 of 2)  
 Test Code: 170121 | 03-7310-5425

**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	0.9333	1
Copper Control	1	1	0.9333	1
FR_UFR1	0.9333	1	0.8667	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	0.9333	1	0.9333	1

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	9.083	8.667	8.643	8.4
Copper Control	9.111	9	8.692	8.8
FR_UFR1	9	9.385	10.5	9.154
FR_FRCP1	11.45	9.714	9.5	
GH_FR1	8.667	8.643	9.154	8.615
CM_MC2	8.462	8.533	8.583	8.143

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1.079	0.8547	1.035	1.105
Copper Control	0.9753	1.178	1.23	1.207
FR_UFR1	0.9847	1.118	0.958	1.135
FR_FRCP1	1.163	1.12	1.053	0
GH_FR1	1.277	1.225	1.203	1.187
CM_MC2	1.155	1.175	1.143	1.282

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8	0.8	0.9333	1
Copper Control	0.6	0.7333	0.8667	1
FR_UFR1	0.9333	0.8667	0.5333	0.8667
FR_FRCP1	0.7333	0.9333	0.9333	0
GH_FR1	1	0.9333	0.8667	0.8667
CM_MC2	0.8667	1	0.8	0.9333

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	15/15	14/15	15/15
Copper Control	15/15	15/15	14/15	15/15
FR_UFR1	14/15	15/15	13/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	14/15	15/15	14/15	15/15

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	12/15	14/15	15/15
Copper Control	9/15	11/15	13/15	15/15
FR_UFR1	14/15	13/15	8/15	13/15
FR_FRCP1	11/15	14/15	14/15	0/15
GH_FR1	15/15	14/15	13/15	13/15
CM_MC2	13/15	15/15	12/15	14/15

**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 20-0417-5570	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:02	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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%)
Copper Control		FR_UFR1	0.3093	1.0000	Exact	Non-Significant Effect
Copper Control		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Copper Control		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Copper Control		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Copper Control Negative Contr	59	1	60	0.9833	0.01667	0.0%
FR_UFR1	57	3	60	0.95	0.05	3.39%
FR_FRCP1	60	0	60	1	0	-1.7%
GH_FR1	60	0	60	1	0	-1.7%
CM_MC2	58	2	60	0.9667	0.03333	1.7%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	1	1	0.9333	1
FR_UFR1	0.9333	1	0.8667	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	0.9333	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	15/15	15/15	14/15	15/15
FR_UFR1	14/15	15/15	13/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	14/15	15/15	14/15	15/15

# CETIS Analytical Report

Report Date: 18 Apr-17 16:48 (p 2 of 2)  
Test Code: 170121 | 03-7310-5425

Fathead Minnow 32-d Survival and Growth Test

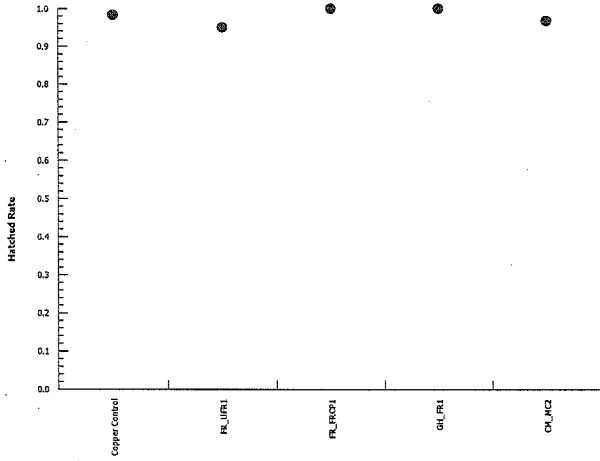
Nautilus Environmental

Analysis ID: 20-0417-5570  
Analyzed: 18 Apr-17 16:02

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 20-8897-5351	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:37	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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		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**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	57	3	60	0.95	0.05	0.0%
FR_FRCP1	60	0	60	1	0	-5.26%
GH_FR1	60	0	60	1	0	-5.26%
CM_MC2	58	2	60	0.9667	0.03333	-1.75%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	1	0.8667	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	0.9333	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	14/15	15/15	13/15	15/15
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	14/15	15/15	14/15	15/15

# CETIS Analytical Report

Report Date: 18 Apr-17 16:48 (p 2 of 2)  
Test Code: 170121 | 03-7310-5425

Fathead Minnow 32-d Survival and Growth Test

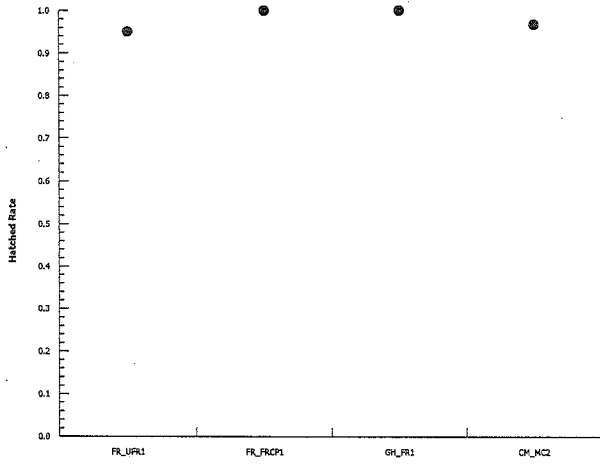
Nautilus Environmental

Analysis ID: 20-8897-5351  
Analyzed: 18 Apr-17 16:37

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 1)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 04-4653-8496	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:46	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-1097-8725	23 Feb-17	23 Feb-17	NA	Teck Coal	
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Copper Control	Copper Control	Copper Control	Copper Control		

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%)
Lab Control		Copper Control	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%
Copper Control Negative Contr	59	1	60	0.9833	0.01667	0.0%

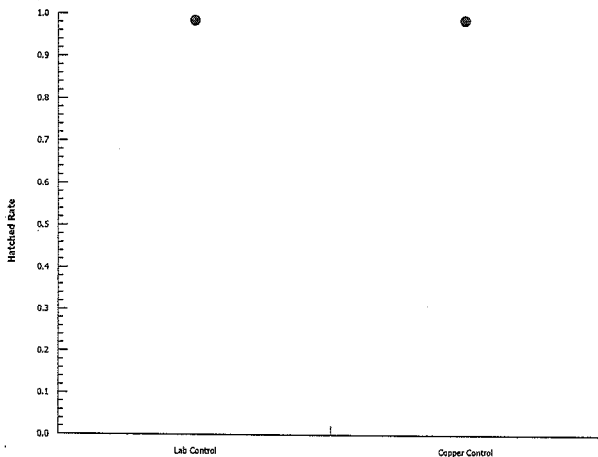
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	0.9333	1
Copper Control	1	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	15/15	14/15	15/15
Copper Control	15/15	15/15	14/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:49 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 12-8794-6469	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:02	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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%)
Copper Control		FR_UFR1	0.5901	1.0000	Exact	Non-Significant Effect
Copper Control		FR_FRCP1	0.05057	0.2023	Exact	Non-Significant Effect
Copper Control		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Copper Control		CM_MC2	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Copper Control	48	12	60	0.8	0.2	0.0%
FR_UFR1	48	12	60	0.8	0.2	0.0%
FR_FRCP1	39	21	60	0.65	0.35	18.75%
GH_FR1	55	5	60	0.9167	0.08333	-14.58%
CM_MC2	54	6	60	0.9	0.1	-12.5%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	0.6	0.7333	0.8667	1
FR_UFR1	0.9333	0.8667	0.5333	0.8667
FR_FRCP1	0.7333	0.9333	0.9333	0
GH_FR1	1	0.9333	0.8667	0.8667
CM_MC2	0.8667	1	0.8	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	9/15	11/15	13/15	15/15
FR_UFR1	14/15	13/15	8/15	13/15
FR_FRCP1	11/15	14/15	14/15	0/15
GH_FR1	15/15	14/15	13/15	13/15
CM_MC2	13/15	15/15	12/15	14/15



Fathead Minnow 32-d Survival and Growth Test

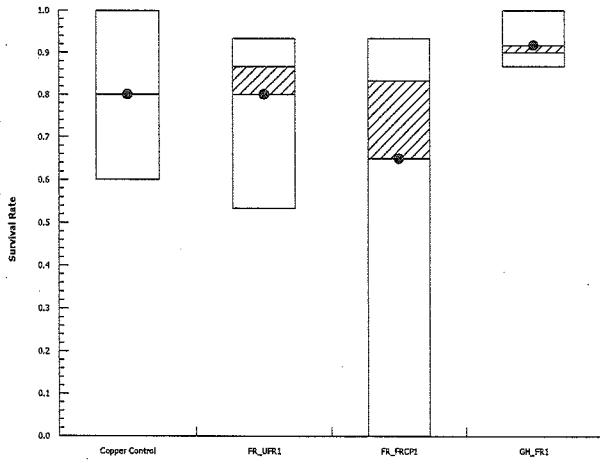
Nautilus Environmental

Analysis ID: 12-8794-6469  
Analyzed: 18 Apr-17 16:02

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:49 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 14-0651-2000	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:38	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_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		FR_FRCP1	0.05057	0.1517	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**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	48	12	60	0.8	0.2	0.0%
FR_FRCP1	39	21	60	0.65	0.35	18.75%
GH_FR1	55	5	60	0.9167	0.08333	-14.58%
CM_MC2	54	6	60	0.9	0.1	-12.5%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.8667	0.5333	0.8667
FR_FRCP1	0.7333	0.9333	0.9333	0
GH_FR1	1	0.9333	0.8667	0.8667
CM_MC2	0.8667	1	0.8	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	14/15	13/15	8/15	13/15
FR_FRCP1	11/15	14/15	14/15	0/15
GH_FR1	15/15	14/15	13/15	13/15
CM_MC2	13/15	15/15	12/15	14/15

Fathead Minnow 32-d Survival and Growth Test

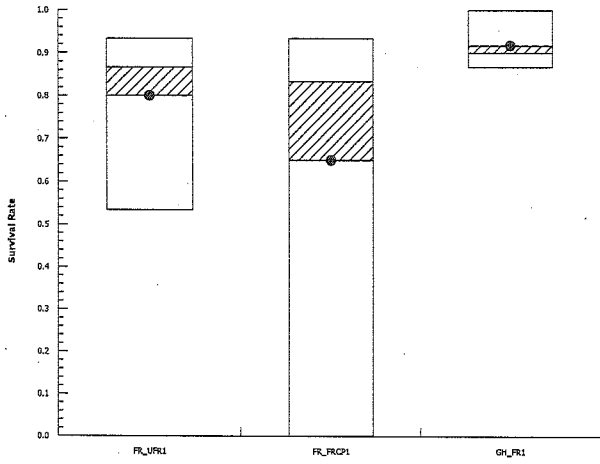
Nautilus Environmental

Analysis ID: 14-0651-2000  
Analyzed: 18 Apr-17 16:38

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:57 (p 1 of 1)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 21-2166-6864	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:57	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_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%)
Copper Control		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Copper Control	48	12	60	0.8	0.2	0.0%
FR_FRCP1	39	6	45	0.8667	0.1333	-8.33%

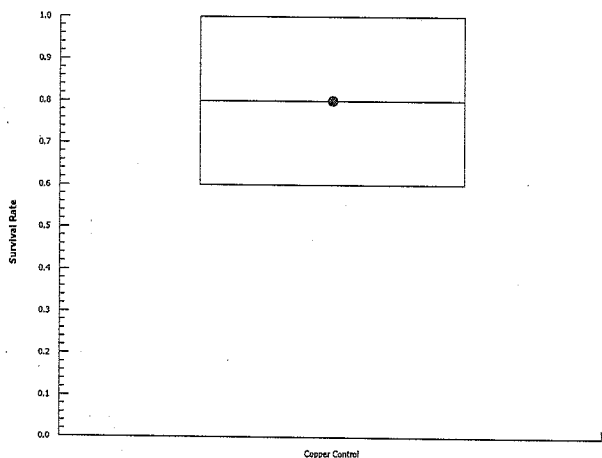
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	0.6	0.7333	0.8667	1
FR_FRCP1	0.7333	0.9333	0.9333	

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	9/15	11/15	13/15	15/15
FR_FRCP1	11/15	14/15	14/15	

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:58 (p 1 of 1)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 02-0643-9308	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:53	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_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%)
FR_UFR1		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	48	12	60	0.8	0.2	0.0%
FR_FRCP1	39	6	45	0.8667	0.1333	-8.33%

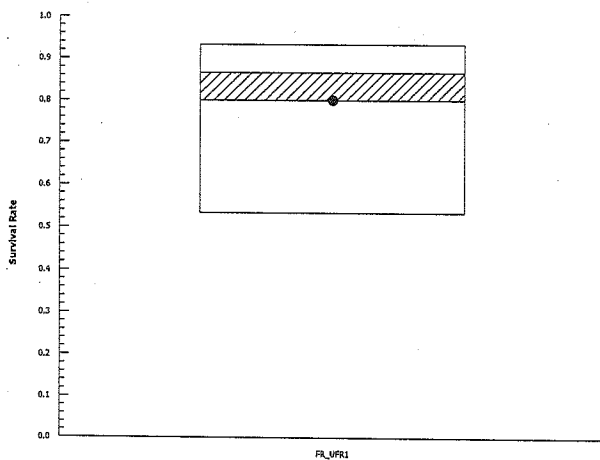
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9333	0.8667	0.5333	0.8667
FR_FRCP1	0.7333	0.9333	0.9333	

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	14/15	13/15	8/15	13/15
FR_FRCP1	11/15	14/15	14/15	

**Graphics**



# CETIS Analytical Report

Report Date: 18 Apr-17 16:49 (p 1 of 1)  
 Test Code: 170121 | 03-7310-5425

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

<b>Analysis ID:</b> 07-8735-7377	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:46	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Percy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-1097-8725	23 Feb-17	23 Feb-17	NA	Teck Coal	
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Copper Control	Copper Control	Copper Control	Copper Control		

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%)
Lab Control		Copper Control	0.2247	0.2247	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%
Copper Control Negative Contr	48	12	60	0.8	0.2	9.43%

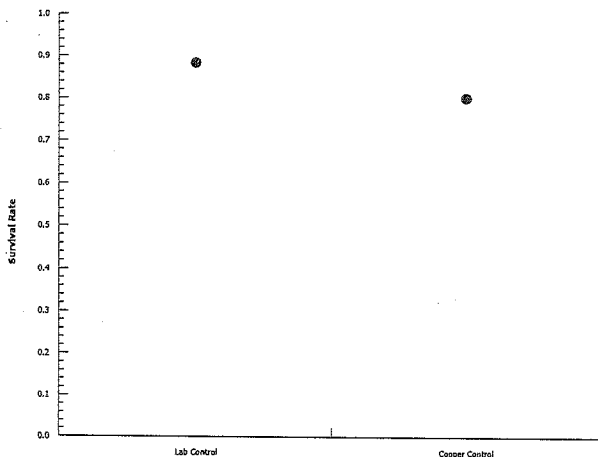
### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8	0.8	0.9333	1
Copper Control	0.6	0.7333	0.8667	1

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	12/15	14/15	15/15
Copper Control	9/15	11/15	13/15	15/15

### Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 06-2789-8431      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Apr-17 16:03      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes  
 Batch ID: 09-9403-8836      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 23 Feb-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 27 Mar-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	37.8%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Copper Control		FR_UFR1	13	10	0	6	0.2026	Asymp	Non-Significant Effect
		FR_FRCP1	13	10	0	6	0.2026	Asymp	Non-Significant Effect
		GH_FR1	21	10	0	6	0.9690	Asymp	Non-Significant Effect
		CM_MC2	17	10	0	6	0.6926	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3918234	0.09795586	4	1.447	0.2673	Non-Significant Effect
Error	1.015762	0.06771749	15			
Total	1.407586		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.24	13.28	0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.7407	0.866	0.0001	Non-normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Copper Control	4	1.148	0.9617	1.334	1.193	0.9753	1.23	0.05842	10.18%	0.0%
FR_UFR1	4	1.049	0.905	1.193	1.051	0.958	1.135	0.0452	8.62%	8.61%
FR_FRCP1	4	0.834	-0.05361	1.722	1.087	0	1.163	0.2789	66.88%	27.33%
GH_FR1	4	1.223	1.16	1.286	1.214	1.187	1.277	0.01977	3.23%	-6.55%
CM_MC2	4	1.189	1.088	1.29	1.165	1.143	1.282	0.03177	5.35%	-3.59%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	0.9753	1.178	1.23	1.207
FR_UFR1	0.9847	1.118	0.958	1.135
FR_FRCP1	1.163	1.12	1.053	0
GH_FR1	1.277	1.225	1.203	1.187
CM_MC2	1.155	1.175	1.143	1.282

Fathead Minnow 32-d Survival and Growth Test

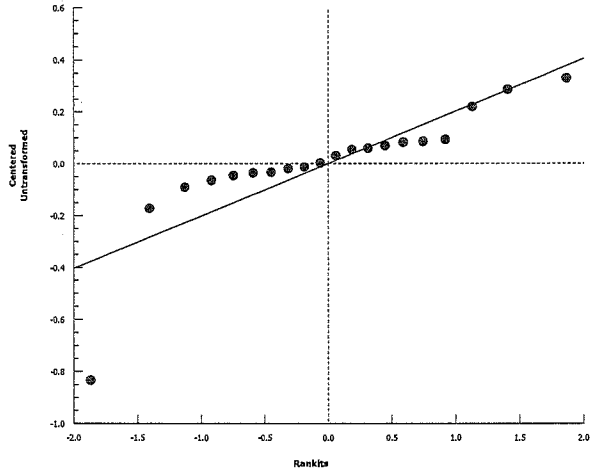
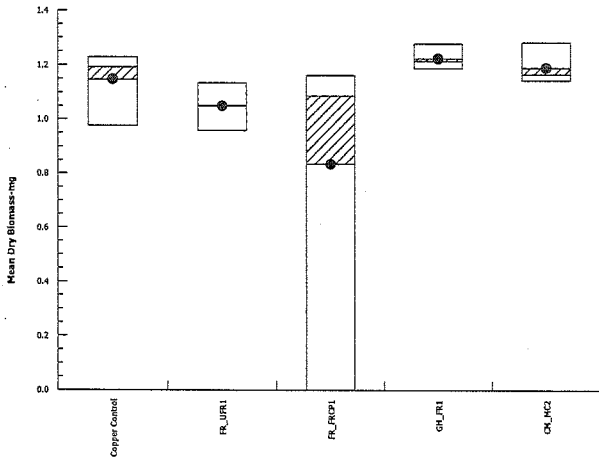
Nautilus Environmental

Analysis ID: 06-2789-8431  
Analyzed: 18 Apr-17 16:03

Endpoint: Mean Dry Biomass-mg  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 18-5876-7418	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:38	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	44.0%	

**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		FR_FRCP1	19	10	0	6	0.8427	Asymp	Non-Significant Effect
		GH_FR1	26	10	0	6	0.9996	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	0.37428	0.12476	3	1.536	0.2559	Non-Significant Effect
Error	0.9748061	0.08123384	12			
Total	1.349086		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	20.83	11.34	0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.729	0.8408	0.0004	Non-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	1.049	0.905	1.193	1.051	0.958	1.135	0.0452	8.62%	0.0%
FR_FRCP1	4	0.834	-0.05361	1.722	1.087	0	1.163	0.2789	66.88%	20.48%
GH_FR1	4	1.223	1.16	1.286	1.214	1.187	1.277	0.01977	3.23%	-16.59%
CM_MC2	4	1.189	1.088	1.29	1.165	1.143	1.282	0.03177	5.35%	-13.35%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9847	1.118	0.958	1.135
FR_FRCP1	1.163	1.12	1.053	0
GH_FR1	1.277	1.225	1.203	1.187
CM_MC2	1.155	1.175	1.143	1.282

Fathead Minnow 32-d Survival and Growth Test

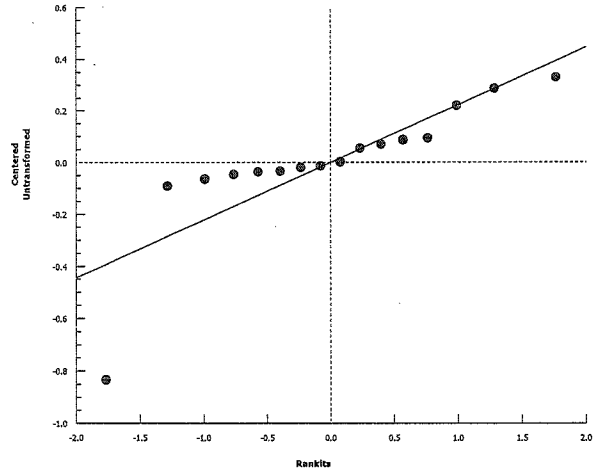
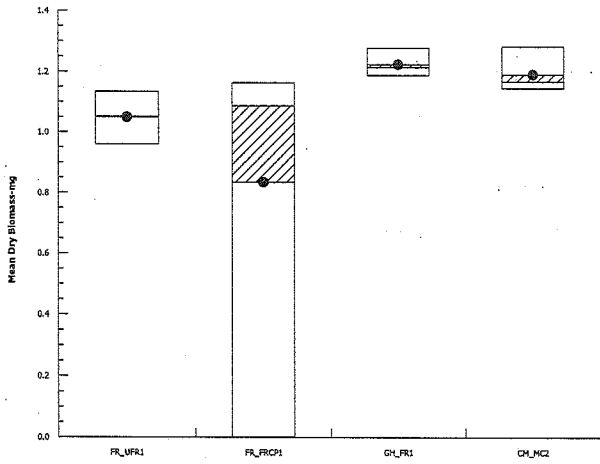
Nautilus Environmental

Analysis ID: 18-5876-7418  
Analyzed: 18 Apr-17 16:38

Endpoint: Mean Dry Biomass-mg  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:59 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 20-4437-9752	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:57	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	13.0%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Copper Control		FR_FRCP1	0.4815	2.015	0.149	5	0.3252	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002180754	0.002180754	1	0.2318	0.6505	Non-Significant Effect
Error	0.04702961	0.009405921	5			
Total	0.04921036		6			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.496	199.2	0.3746	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8553	0.5629	0.1374	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Copper Control	4	1.148	0.9617	1.334	1.193	0.9753	1.23	0.05842	10.18%	0.0%
FR_FRCP1	3	1.112	0.9751	1.249	1.12	1.053	1.163	0.03182	4.96%	3.11%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	0.9753	1.178	1.23	1.207
FR_FRCP1	1.163	1.12	1.053	

# CETIS Analytical Report

Report Date: 18 Apr-17 16:59 (p 2 of 2)  
Test Code: 170121 | 03-7310-5425

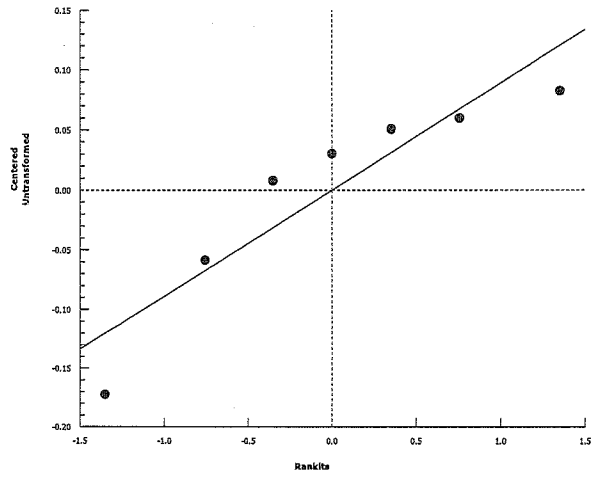
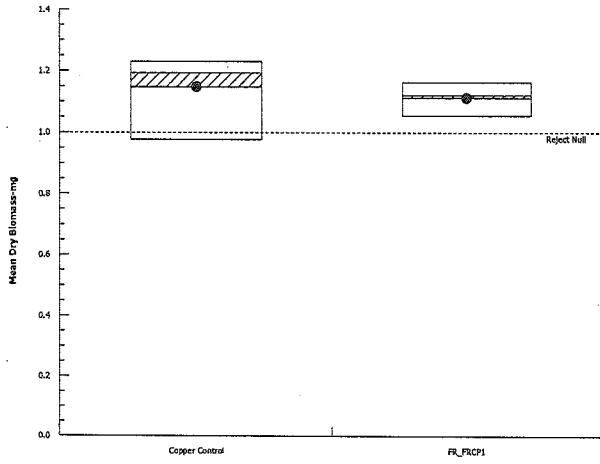
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-4437-9752      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Apr-17 16:57      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:59 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 01-1183-4854	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:53	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.5%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		FR_FRCP1	-1.057	2.015	0.120	5	0.8306	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.006840259	0.006840259	1	1.118	0.3387	Non-Significant Effect
Error	0.03059258	0.006118517	5			
Total	0.03743284		6			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.691	199.2	0.5650	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8998	0.5629	0.3299	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	1.049	0.905	1.193	1.051	0.958	1.135	0.0452	8.62%	0.0%
FR_FRCP1	3	1.112	0.9751	1.249	1.12	1.053	1.163	0.03182	4.96%	-6.02%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9847	1.118	0.958	1.135
FR_FRCP1	1.163	1.12	1.053	

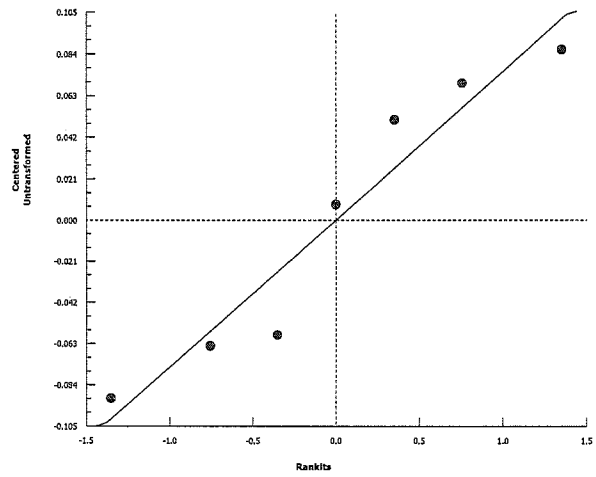
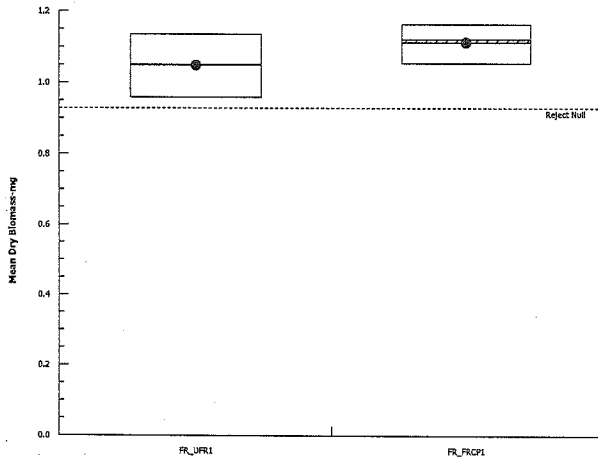
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-1183-4854      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Apr-17 16:53      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Apr-17 16:49 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-7106-2478	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:46	<b>Analysis:</b> Nonparametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-1097-8725	23 Feb-17	23 Feb-17	NA	Teck Coal	
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Copper Control	Copper Control	Copper Control	Copper Control		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C <> T	NA	NA	19.5%	

**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		Copper Control	13	NA	0	6	0.2000	Exact	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.03345431	0.03345431	1	2.537	0.1623	Non-Significant Effect
Error	0.0791255	0.01318758	6			
Total	0.1125798		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.073	47.47	0.9552	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7497	0.6451	0.0081	Non-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	1.018	0.8388	1.198	1.057	0.8547	1.105	0.0564	11.08%	0.0%
Copper Control	4	1.148	0.9617	1.334	1.193	0.9753	1.23	0.05842	10.18%	-12.7%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1.079	0.8547	1.035	1.105
Copper Control	0.9753	1.178	1.23	1.207

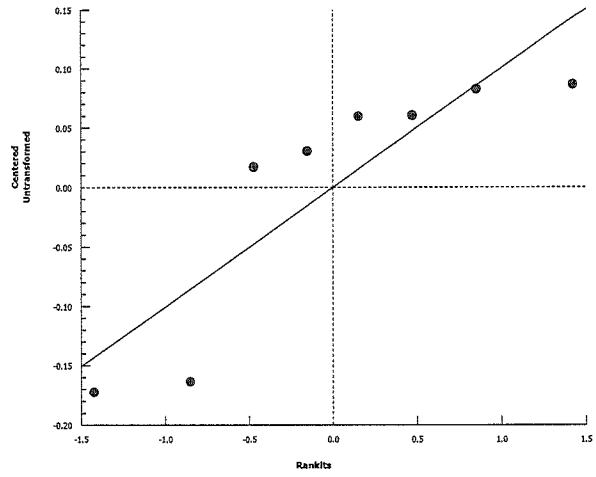
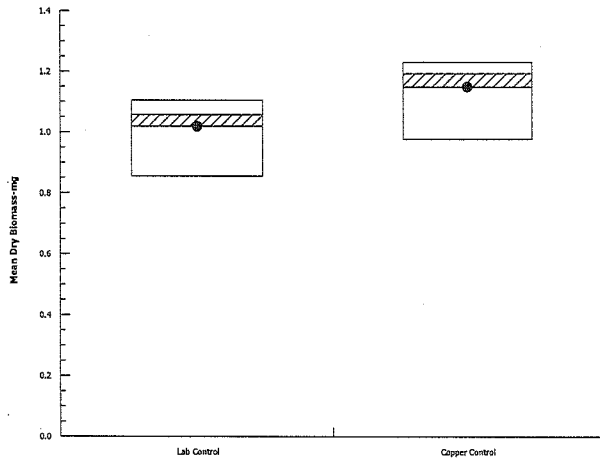
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 11-7106-2478      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Apr-17 16:46      Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-9098-1348	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:03	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA	Teck Coal	
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)		
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Copper Control	Copper Control	Copper Control	Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.2%	

**Dunnett Multiple Comparison Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Copper Control	FR_UFR1	-1.59	2.378	0.911	6	0.9951	CDF	Non-Significant Effect
	FR_FRCP1	-3.197	2.378	0.984	5	0.9999	CDF	Non-Significant Effect
	GH_FR1	0.3421	2.378	0.911	6	0.6790	CDF	Non-Significant Effect
	CM_MC2	1.229	2.378	0.911	6	0.2978	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	6.841947	1.710487	4	5.833	0.0056	Significant Effect
Error	4.105608	0.2932577	14			
Total	10.94755		18			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	11.09	13.28	0.0255	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8942	0.8605	0.0383	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Copper Control	4	8.901	8.599	9.202	8.9	8.692	9.111	0.09477	2.13%	0.0%
FR_UFR1	4	9.51	8.43	10.59	9.27	9	10.5	0.3394	7.14%	-6.84%
FR_FRCP1	3	10.22	7.559	12.89	9.714	9.5	11.45	0.6191	10.49%	-14.86%
GH_FR1	4	8.77	8.361	9.179	8.655	8.615	9.154	0.1285	2.93%	1.47%
CM_MC2	4	8.43	8.115	8.745	8.497	8.143	8.583	0.09892	2.35%	5.29%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Copper Control	9.111	9	8.692	8.8
FR_UFR1	9	9.385	10.5	9.154
FR_FRCP1	11.45	9.714	9.5	
GH_FR1	8.667	8.643	9.154	8.615
CM_MC2	8.462	8.533	8.583	8.143

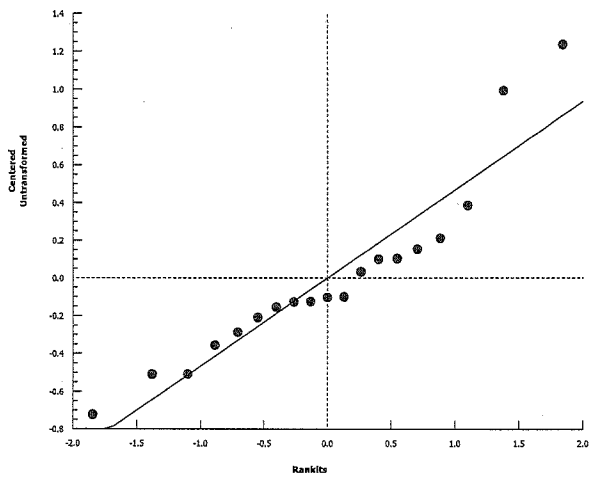
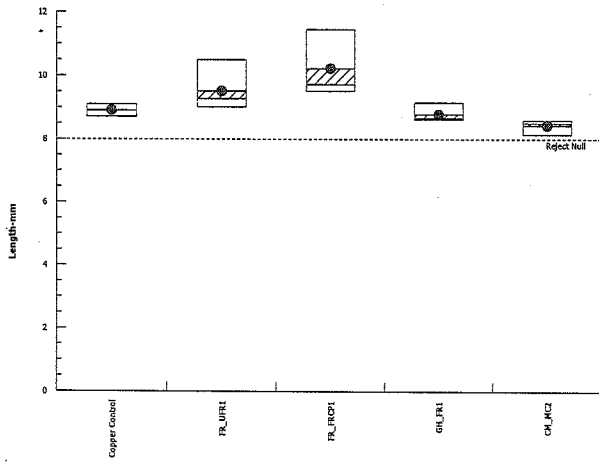
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-9098-1348      Endpoint: Length-mm  
Analyzed: 18 Apr-17 16:03      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



# CETIS Analytical Report

Report Date: 18 Apr-17 16:48 (p 1 of 2)  
 Test Code: 170121 | 03-7310-5425

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-2440-7392      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Apr-17 16:38      Analysis: Parametric-Control vs Treatments      Official Results: Yes  
 Batch ID: 09-9403-8836      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 23 Feb-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 27 Mar-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	20-4104-2710	21 Feb-17 10:30	22 Feb-17 10:30	38h (2.8 °C)	Teck Coal	
FR_FRCP1	20-6353-5284	21 Feb-17 08:55	22 Feb-17 10:30	39h (1.3 °C)		
GH_FR1	07-2968-3934	21 Feb-17 12:45	22 Feb-17 10:30	35h (1.5 °C)		
CM_MC2	11-1745-6464	21 Feb-17 11:40	22 Feb-17 10:30	36h (1.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_02012017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_02012017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-02-21_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170221_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.4%	

### 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	-1.549	2.318	1.067	5	0.9895	CDF	Non-Significant Effect
		GH_FR1	1.736	2.318	0.988	6	0.1270	CDF	Non-Significant Effect
		CM_MC2	2.532	2.318	0.988	6	0.0348	CDF	Significant Effect

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	6.617751	2.205917	3	6.07	0.0108	Significant Effect
Error	3.997825	0.3634386	11			
Total	10.61558		14			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.595	11.34	0.0552	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8948	0.8328	0.0794	Normal Distribution

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	9.51	8.43	10.59	9.27	9	10.5	0.3394	7.14%	0.0%
FR_FRCP1	3	10.22	7.559	12.89	9.714	9.5	11.45	0.6191	10.49%	-7.5%
GH_FR1	4	8.77	8.361	9.179	8.655	8.615	9.154	0.1285	2.93%	7.78%
CM_MC2	4	8.43	8.115	8.745	8.497	8.143	8.583	0.09892	2.35%	11.35%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	9	9.385	10.5	9.154
FR_FRCP1	11.45	9.714	9.5	
GH_FR1	8.667	8.643	9.154	8.615
CM_MC2	8.462	8.533	8.583	8.143

# CETIS Analytical Report

Report Date: 18 Apr-17 16:48 (p 2 of 2)

Test Code: 170121 | 03-7310-5425

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-2440-7392

Endpoint: Length-mm

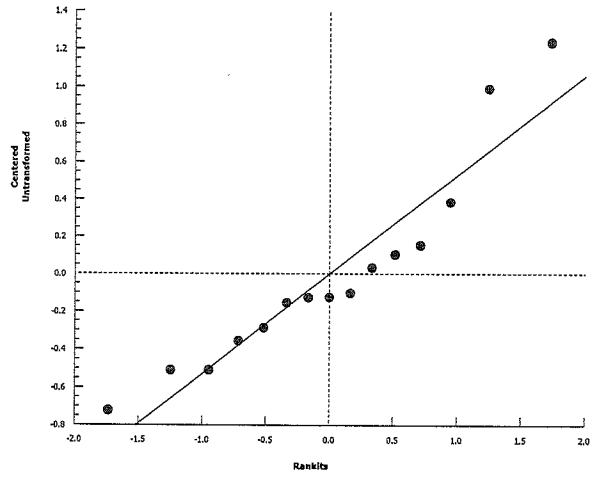
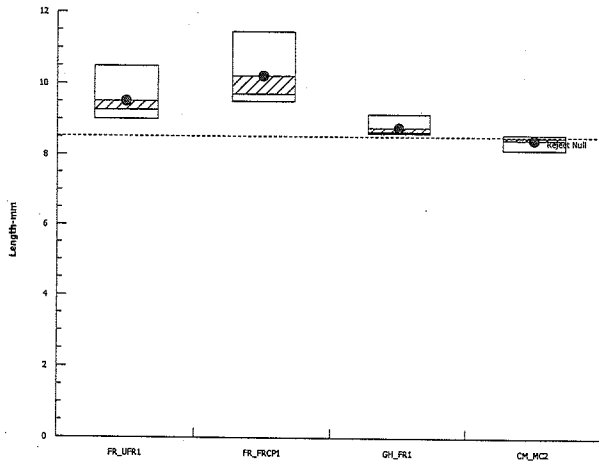
CETIS Version: CETISv1.8.7

Analyzed: 18 Apr-17 16:38

Analysis: Parametric-Control vs Treatments

Official Results: Yes

### Graphics



# CETIS Analytical Report

Report Date: 18 Apr-17 16:48 (p 1 of 2)

Test Code: 170121 | 03-7310-5425

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

<b>Analysis ID:</b> 02-0722-8502	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Apr-17 16:46	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 09-9403-8836	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 23 Feb-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 27 Mar-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-1097-8725	23 Feb-17	23 Feb-17	NA	Teck Coal	
Copper Control	20-6487-6838	23 Feb-17	23 Feb-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Copper Control	Copper Control	Copper Control	Copper Control		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C <> T	NA	NA	4.8%	

### Equal Variance t Two-Sample Test

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control	Copper Control	1.188	2.447	0.417	6	0.2798	CDF	Non-Significant Effect

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.08201278	0.08201278	1	1.411	0.2798	Non-Significant Effect
Error	0.3487977	0.05813296	6			
Total	0.4308105		7			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.236	47.47	0.5258	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9717	0.6451	0.9108	Normal Distribution

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	8.698	8.247	9.149	8.655	8.4	9.083	0.1417	3.26%	0.0%
Copper Control	4	8.901	8.599	9.202	8.9	8.692	9.111	0.09477	2.13%	-2.33%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	9.083	8.667	8.643	8.4
Copper Control	9.111	9	8.692	8.8

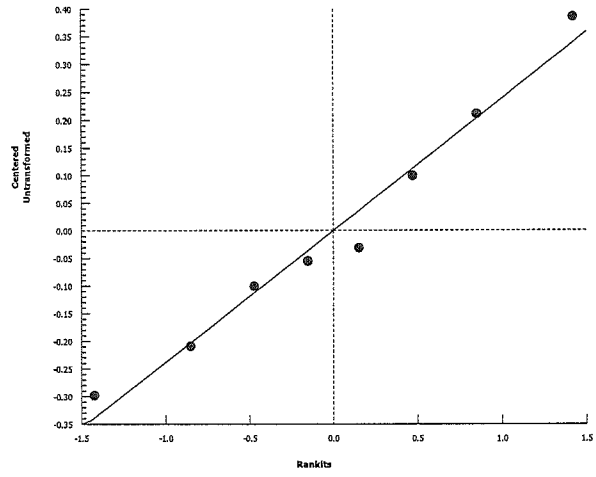
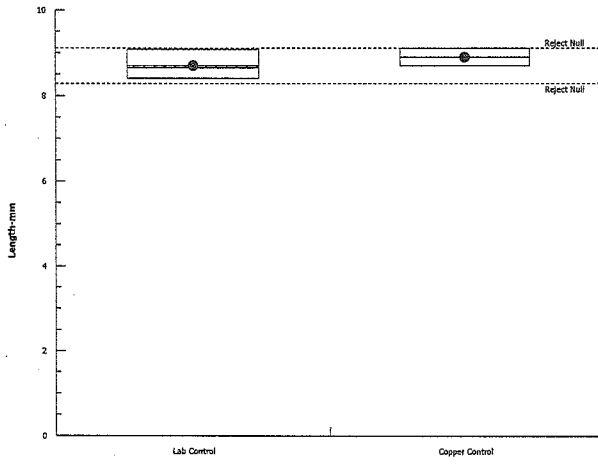
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-0722-8502      Endpoint: Length-mm  
Analyzed: 18 Apr-17 16:46      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**APPENDIX E – Chain-of-Custody Forms**

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COC ID: 20170221-1302 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	Lee Wilm			Lab Contact				Email 1:	Lee.Wilm@teck.com	x	x	x
Email				Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5289			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED					Filtered - P: 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 Day H. azteca Pass/Fail	7 D C. Dubia Pass/Fail	72 hr P. subcapitata Pass/Fail	32d FHM PF 30-Day Rainbow trout embryo atv-in Pass/Fail						Temp °C
FR_FRCPI_Q_02012017_N	FR_FRCPI	WS		2017/02/21	08:55	G	1	1	1	1	x						1.3
FR_UFR1_Q_02012017_N	FR_UFR1	WS		2017/02/21	10:30	G	1	1	1	1	x						2.8
								170120	170122	170123	170121						

WOC #

Conducted in Calgary

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Begin	2/21	Nautilus - Burnaby NY - Nain Yamamoto	Feb 22/17 @ 10:30

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Dylan Begin	250 865 5273
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
	<i>Dylan Begin</i>	Feb 21/17



COC ID: Q1 Chronic Tox TURNAROUND TIME: regular RUSH:

Table with 3 main sections: PROJECT/CLIENT INFO, LABORATORY, and OTHER INFO. Includes fields for Facility Name (Greenhills Operations), Lab Name (Nautilus Environmental), Project Manager (Leigh Stickney), Lab Contact (Krysta Pearcy), and various contact and address details.

SAMPLE DETAILS ANALYSIS REQUESTED

Main data table with columns for Sample ID, Location, Matrix, Hazardous Material, Date, Time, G/Grab, # Of Cont., and various analysis types (Rainbow trout, daphnia, C. dubia, etc.). Includes handwritten entries for sample dates and results.

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS and RELINQUISHED BY/AFFILIATION. Includes handwritten notes: 'J. Enns (Nautilus)', 'Nautilus - Burnaby', and 'NY - Nain Yamando'.

SERVICE REQUEST (rush - subject to availability) and Sampler information. Includes checkboxes for Regular (default) X, Priority (50% surcharge), and Emergency (100% surcharge). Sampler Name: Jeremy Enns, Mobile #: 250-919-4387, Date/Time: 21-Feb-17.

1x20  
1.5  
1.5  
1x20

Temp °C

wo# 170122  
170123  
170121  
170120

30

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Carla Romero  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7350  
 Email EDD To: Rick.Magliocco@teck.com  
 Don.Sacino@teck.com  
 Carla.Romero@teck.com  
 Bob.Werner@teck.com

Lab Name: Nautilus Environmental  
 Contact Name: Krysta Pearcy  
 Address: 8664 commerce Court  
 City: Burnaby State: BC  
 Postal Code: V5A 4N7 Country: Canada  
 Phone Number: 604-420-8773  
 Email Address: krysta@nautilusenvironmental.ca  
 PO Number:

Send Invoice To:  
 Address:  
 City:  
 Postal Code:  
 Task Code:  
 Shipping Company:  
 Tracking Number:  
 CC Hardcopy To:  
 CC Hardcopy To:

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS	ANALYSIS REQUESTED							Temp °C	Additional Information		
								72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalella P/F	72-h P. subcapitata (pass/fail)	28-d H. azteca (pass/fail)	32d FHM P/F	30-d rainbow trout early life stage P/F			Conducted in Calgary	
CM_MC2_WS_20170221_N	WS	Feb 21 2017	11:40	G	1			X	X	X							1.3	1x20L Week 1
							wo#	170123	170122	170120								

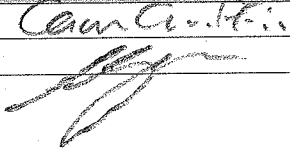
Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions			
				Nautilus - Burnaby	Feb 22/17	10:30	Y/N	Y/N	Y/N	
				NY - Naui Yamamoto			Y/N	Y/N	Y/N	
							Y/N	Y/N	Y/N	
	Sampler's Name	Don Sacino / Bob Werner		Mobile #			Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
	Sampler's Signature			Date/Time	2/21/2017 2:00PM					

# Teck

<b>COC ID:</b> 20170221 NJ		<b>TURNAROUND TIME:</b>		<b>RUSH:</b>						
<b>PROJECT/CLIENT INFO</b>			<b>LABORATORY</b>		<b>OTHER INFO</b>					
Facility Name / Job#	Elkview Operations		Lab Name	Nautilus Environmental		Report Format / Distribution	Excel	PDF	EDD	
Job Description	Chronic Toxicity Sampling		Lab Contact	Krysta Peracy		Email 1:	Jeff.Williams@teck.com	X	X	X
Project Manager	Jeff Williams		Email	krysta@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			X
Email	Jeff.Williams@teck.com		Address	8664 Commerce Court		Email 3:	James.Bold@teck.com	X	X	X
Address	RR#1 HWY# 3			Imperial Square, Lake City		Email 4:	Cameron.Griffin@teck.com	X	X	X
						Email 5:	Teck.Lab.Results@sharepoint.teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	475474	
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada			
Phone Number	1-250-865-5289		Phone Number							

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_2017-02-21_N	EV_HC1	WS	N	2017/02/21	12:15	G	1			x	x										Temp °C	
EV_MC2_WS_2017-02-21_N	EV_MC2	WS	N	2017/02/21	8:05	G	1			x	x										2.0	
							Total														4.5	
									600#	170123	170122											1x20L

<b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b> 72h P.subcapitata P/F 30d rainbow trout early life stage P/F 96 hr Rainbow Trout P/F 48 hr Daphnia P/F 7d C.dupia P/F	<b>RELINQUISHED BY/AFFILIATION</b>		<b>DATE/TIME</b>	<b>ACCEPTED BY/AFFILIATION</b>		<b>DATE/TIME</b>
				Nautilus - Burnaby		Feb 22/17 @ 10:30
				NY - Nari Yamamoto		

<input checked="" type="checkbox"/> Regular (default) <input type="checkbox"/> Priority (2-3 business days) - 50% surcharge <input type="checkbox"/> Emergency (1 Business Day) - 100% surcharge <input type="checkbox"/> For Emergency <1 Day, ASAP or Weekend - Contact ALS	<b>Sampler's Name</b> Cameron Griffin	<b>Mobile #</b> 21 FEB -17
	<b>Sampler's Signature</b> 	<b>Date/Time</b> 21 FEB -17

COC ID: 20170221-0720

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Krysta Pearcy			Email 1:	jay.jones@teck.com	x	x
Email	jay.jones@teck.com			Email	Krysta@NautilusEnvironmental.ca			Email 2:	tim.chala@teck.com	x	x
Address	Box 2003			Address	8664 commerce Court			Email 3:	teckcoal@equisonline.com	x	x
	15km North Hwy 43							Email 4:	cait.good@teck.com		
City	Sparwood	Province	BC	City	Burnaby	Province	BC				
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	432106		
Phone Number	250-425-6111			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.	72h P. subcapitata P/F	7d C. dubia P/F	30 d rainbow trout early life stage P/F	7 d Cdubia dilution series	72hr Psubcapitata dilution series	7d L minor plant grown dilution series	7 d O mykis development dilution series	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None	Excel	PDF	EDD	Temp °C	
LC_LCDSSLCC_WS_2017-02-21_N	LC_LCDSSLCC	WS	N	2017/02/21	8:15	G	1	X	X										1x20L	2.0

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	T Phillips/ NUPQU	February 21, 2017	Nautilus - Burnaby NY - Nain Yamamoto	Feb 22/17 @ 10:30

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default)	X	Tyler Phillips	(250) 919-0965
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
			February 21, 2017

# Teck

COC ID: 20170221-1250

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fouding River Operation			Lab Name	Hydroqual			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Lee Wilim			Lab Contact	Jacklyn Pool			Email 1:	Lee.Wilim@teck.com	x	x	x
Email				Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	#4 6125-12th Street S.E.			Email 3:	teckcoal@equisonline.com			x
City	Elkford		Province	BC		City	Calgary		Province	AB		PO number
Postal Code	VOB 1H0		Country	Canada		Postal Code	T2H 2K1		Country	CANAD		
Phone Number	1-250-865-5289			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.	30 Day Fathead Minnow				
FR_FRCPI_Q_02012017_N 1617-0683	FR_FRCPI	WS		2017/02/21	08:55	G	2	2				
FR_UFRI_Q_02012017_N 1617-0684	FR_UFRI	WS		2017/02/21	10:30	G	2	2				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Beggs	2/21		

NO OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile#	Sampler's Signature	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	Dylan Beggs	250 865 5273	<i>[Signature]</i>	Feb 21/17

2017/02/20 FP  
1000  
2 x 20L carboys  
No ILS  
good condition  
1.70C  
Dropoff Bearspaw RW

Teck

1617-0685

COC ID:		Q1 Chronic Tox		TURNAROUND TIME:		regular		RUSH:			
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name: Greenhills Operations				Lab Name: Hydroqual Laboratories Ltd				EOD delivery:			
Project Manager: Leigh Stickney				Lab Contact: Jacklyn Pool				Site: leigh.stickney@teck.com		EQHS: 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: sean.beswick@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_FRI_WS_2017-02-21_N	GH_FRI	WS	N	21-Feb-17	12:45	G	2	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d Culex NG3/504	39 d rainbow trout early life stage NG3/504	72 hr P Subcapitata	30 day rainbow trout early life stage P/F	28 day H azteca	28 Day Hyalella PF	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow S04	
1617-0685	WEEK 1																		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		Date	Time	Accepted By/Affiliation		Date	Time
				Irene (Nugra)		21-Feb-17	13:30				

SERVICE REQUEST (rush - subject to availability)				Sampler's Name		Mobile #	Date/Time	
Regular (default) X		Priority (2-3 business days) - 50% surcharge		Jeremy EMS		750-919-4387	21-Feb-17	
Emergency (1 Business Day) - 100% surcharge		For Emergency <1 Day, ASAP or Weekend - Contact ALS		[Signature]				

2017/02/22 EP 2L 20L carbons  
 1000  
 No I/S  
 good condition  
 1.70C  
 50700 EP  
 Bears paw

1617-0686

Chain Of Custody Record						COC ID: 20160823-0823				Page: 1 of 1											
PROJECT/CLIENT INFO						LABORATORY						OTHER INFO									
Facility Name: Coal Mountain Operation						Lab Name: Hydroqual Laboratories						Send Invoice To:									
Contact Name: Carla Romero						Contact Name: Jacklyn Pool						Address:									
Address: 2261 Corbin Rd.						Address: #4, 6125-12th Street S.E.															
City: Sparwood		Prov.: BC				City: Calgary		State: AB				City:		State:							
Postal Code: V0B 2G0		Country: Canada				Postal Code: T2H 2K1		Country: Canada				Postal Code:		Country:							
Phone Number: 250 425 7350						Phone Number: 403-251-7121						Task Code:									
Email EDD To: Rick.Magliocco@teck.com						Phone Number:						Shipping Company:									
Don.Sacino@teck.com						Email Address:						Tracking Number:									
Carla.Romero@teck.com						PO Number:						CC Hardcopy To:									
Bob.Werner@teck.com												CC Hardcopy To:									
SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION									
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV	ANALYSIS	30 day early life stage inthead minnow P/F													
CM_MC2_WS_20170221_M	WS	Feb 21, 2017	11:40	G	2				X												
1617-0686 WEEK 1																					
Additional Comments/Special Instructions						Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions							
2017/02/22 EP 1000 No I/s good condition for 2017 corbins 1.70C Jordan Georgiou															Y/N	Y/N	Y/N				
																		Y/N	Y/N	Y/N	
																			Y/N	Y/N	Y/N
																			Y/N	Y/N	Y/N
Sampler's Name		Don Sacino / Bob Werner				Mobile #						Temp in °C	Samples on ice	Sample intact?	Trip Blank?						
Sampler's Signature						Date/Time		2/21/2017 2:00PM													

COC ID: 20170228-1057

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	Lee Wilm			Lab Contact				Email 1:	Lee.Wilm@teck.com	x	x	x
Email				Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5289			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.	28 Day H. azteca Pass/Fail	32d FHM P/F	Conducted in Calgary	Temp °C	
FR_FRCPI_QR_09012017_N	FR_FRCPI	WS		2017/02/28	09:05	G	1	1	x		0.0	
FR_UFRI_QR_09012017_N	FR_UFRI	WS		2017/02/28	10:12	G	1	1	x		0.0	
								WO# 170120	170121			
= refresh samples = samples arrived plushy												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Beglin	2/28	Nautilus - Burnaby NY - Nari Yamamoto	Mar 01/17 @ 09:10
<b>NB OF BOTTLES RETURNED/DESCRIPTION</b>	<b>Sampler's Name</b>	<b>Sampler's Signature</b>	<b>Mobile #</b>	<b>Date/Time</b>
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 Beglin		250 865 5273	Feb 22/17





# Chain Of Custody Record

COC ID: 20160823-0823

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Nautilus Environmental			Send Invoice To			
Contact Name	Carla Romero			Contact Name	Krysta Pearcy			Address			
Address	2261 Corbin Rd.			Address	8664 commerce Court						
City	Sparwood	Prov.	BC	City	Burnaby	State	BC	City		State	
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	Postal Code		Country	
Phone Number	250 425 7350			Phone Number	604-420-8773			Task Code			
Email EDD To	Rick.Magliocco@teck.com			Email Address	krysta@nautilusenvironmental.ca			Shipping Company			
	Don.Sacino@teck.com			PO Number				Tracking Number			
	Carla.Romero@teck.com							CC Hardcopy To			
	Bob.Werner@teck.com							CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED							ADDITIONAL INFORMATION			
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS									
CM_MC2_WS_20170228_N	WS	Feb 28 2017		G	1		72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallella P/F	72-h P. subcapitata (pass/fail)	28-d H. azteca (pass/fail)	30 d rainbow trout early life stage P/F	32d FHM P/F conducted in Calgary			
									X				X			Week 2
																= refresh sample =
																sample arrived fresh

Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions			
						Nautilus - Burnaby		Mar 01/17	09:10	03	Y/N	Y/N	Y/N
						NY - Nari Yamamoto					Y/N	Y/N	Y/N
											Y/N	Y/N	Y/N
											Y/N	Y/N	Y/N
Sampler's Name		Don Sacino/Bob Werner			Mobile #				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?	
Sampler's Signature					Date/Time		2/28/2017 2:00PM						

# Teck

COC ID: 20170228-1138

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job/	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Lee Wilm			Lab Contact	Claudio Quinteros			Email 1:	lee.wilm@teck.com	x	x	x
Email				Email	claudio@nautihsenvironmental.ca			Email 2:	Nell.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	#4 6125- 12th st. S.E.			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Calgary	Province	AB	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	CANAD					
Phone Number	1-250-865-5289			Phone Number	403-253-7121							

SAMPLE DETAILS								ANALYSIS REQUESTED				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	C-Grab C-Comp	# Of Cont.	30 Day Exceed Minnow				
FR_FRCP1_QR_09012017_N 1617-0863	FR_FRCP1	WS		2017/02/28	09:05	G	2	1				
FR_UFRI_QR_09012017_N 1617-0684	FR_UFRI	WS		2017/02/28	10:12	G	2	2				
Week 2												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Begon	2/28	Jessica Wang Bentley Consulting No S/I good condition	2017/03/01 10:40 3.6°C 2x 20L carboy + 2x 20L carboy

NOTE: BOTTLES RETURNED/DESCRIPTION	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 Begon	250 865 5273
	Sampler's Signature	Date/Time
	<i>[Signature]</i>	Feb 28 / 17

# Teck

COC ID:	<b>Q1 Chronic Tox</b>	TURNAROUND TIME:	<small>regular</small>	RUSH:	
PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Greenthills Operations	Lab Name	Hydroqual Laboratories Ltd	EDD delivery:	
Project Manager	Leigh Stickney	Lab Contact	Jacklyn Pool	Site:	leigh.stickney@teck.com
Email	leigh.stickney@teck.com	Email		Report Format / Distribution	
Address	PO Box 5000	Address	#4, 6125 - 12th Street S.E.	Yes	PDF
City	Elkford	City	Calgary	Yes	Excel
Postal Code	V0B 1H0	Postal Code	T2H 2K1	Email 1: leigh.stickney@teck.com	
Phone Number	250 865 3274	Phone Number	403.253.7121	Email 2: sean.beswick@teck.com	
				Email 3: jevin.wolchuk@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	#N/A	#N/A		
GH FR1 WS 2017-02-28_N	GH FR1	WS	N	28-Feb-17	11:45	G	2	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d Ceratbia N03/S04	39 d rainbow trout early life stage N03/S04	72 hr P Subcapitata	30 day rainbow trout early life stage P/F	28 day H azteca	28 Day Hyalella P/F	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow S04					
41617-0685 week 2																	X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	<i>Jevin Wolchuk</i>	Feb. 28/17	11:45	Jessica Wang Bearspaw contracting No S/T good condition	2017/03/01	1040

SERVICE REQUEST (rush - subject to availability)	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	Sampler's Signature	Mobile #	Date/Time
	<input checked="" type="checkbox"/>					<i>[Signature]</i>	250-425-5310	Feb. 28/17 11:45

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO					LABORATORY					OTHER INFO					
Facility Name: Coal Mountain Operation					Lab Name: HydroQual Laboratories					Send Invoice To:					
Contact Name: Carla Romero					Contact Name: Jacklyn Pool					Address:					
Address: 2261 Corbin Rd.					Address: #4, 6125-12th Street S.E.					City:					
City: Sparwood			Prov: BC		City: Calgary			State: AB		Postal Code:			Country:		State:
Postal Code: V0B 2G0			Country: Canada		Postal Code: T2H 2K1			Country: Canada		Task Code:			Shipping Company:		Tracking Number:
Phone Number: 250-424-7350					Phone Number: 403-253-7121					CC Hardcopy To:					
Email EDD To: Rick Magliocco@teck.com					Email Address:					CC Hardcopy To:					
Don.Sacino@teck.com					PO Number:										
Carla.Romero@teck.com															
Bob.Werner@teck.com															

SAMPLE DETAILS							ANALYSIS REQUESTED										ADDITIONAL INFORMATION					
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESEV.	ANALYSIS															
CM_MC2_WS_20170228_H	WS	Feb 28, 2017	13:10	G	2																	
30 day envly life stage instead minnow P/R																						
Week 2																						
1617-0686 WEEK 2																						

Additional Comments/Special Instructions			Relinquished By/Affiliation			Date	Time	Accepted By/Affiliation				Date	Time	Sample Receipt Conditions								
								Puska Wang Beavpaw consulting No S/I and conditions				2017/03/01	10:40					Y/N	Y/N	Y/N	Y/N	Y/N
																		Y/N	Y/N	Y/N	Y/N	Y/N
																		Y/N	Y/N	Y/N	Y/N	Y/N
																		Y/N	Y/N	Y/N	Y/N	Y/N
Sampler's Name		Don Sacino/ Bob Werner					Mobile #						Temp in °C	Samples on Ice	Sample Intact?	Trip Blank?						
Sampler's Signature							Date/Time		2/28/2017 2:00PM													

COC ID: 20170307-1238

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	Lee Wilm			Lab Contact				Email 1:	Lee.Wilm@teck.com	x	x	x
Email				Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	VOB 1H0		Country	Canada	Postal Code	V5A 4N7		Country	Canada			
Phone Number	1-250-865-5289			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.	REL	PRESERV.	ANALYSIS	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None										
FR_FRCPI_QR_16012017_N	FR_FRCPI	WS		2017/03/07	10:16	G	1			28 Day H. azteca Pass/Fail											
FR_UFRI_QR_16012017_N	FR_UFRI	WS		2017/03/07	09:07	G	1			32 d FHM P/F conducted in Calgary											
										WO# 170120											
										170121											
											refresh sample										
											Temp °C										
											IX20L 0.8										
											IX20L 0.8°C										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
		Dylan Begin	3/7	Nautilus - Burnaby NY - Nain Yamamoto	Mar 08/17 @ 09:35
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) X		Dylan Begin	250 865 5273		March 7, 2017
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

① sample FR-UFRI arrived slightly frozen

COC ID:		<b>Q1 Chronic Tox</b>			TURNAROUND TIME: regular			RUSH:	
PROJECT/CLIENT INFO					LABORATORY			OTHER INFO	
Facility Name		Greenhills Operations			Lab Name		Nautilus Environmental		
Project Manager		Leigh Stickney			Lab Contact		Krysta Pearcy		Site:
Email		leigh.stickney@teck.com			Email		leigh.stickney@teck.com	EQUIS:	GHO
Address		PO Box 5000			Address		8664 Commence Court		Report Format / Distribution
City		Elkford			City		Imperial Square Lake City		Yes PDF
Postal Code		V0B 1H0			Postal Code		V5A 4N7		Yes Excel
Phone Number		250 865 3274			Phone Number		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
GH_FR1_WS_2017-03-07_N	GH_FR1	WS	N	7-Mar-17	9:40	G	1	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C. dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyalotella P/F	32d FHM P/F conducted in Calgary	0.8

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns (Nautilus)	7-March-17	10:30	Nautilus - Burnaby	Mar 08/17	09:35
				NY - Nautilus		

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	Jeremy Enns	Mobile #	250-919-4387
Sampler's Signature	<i>[Signature]</i>	Date/Time	7-March-17

IX 20  
refresh  
sample

wo # 170/20  
170/21

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Nautilus Environmental			Send Invoice To			
Contact Name	Carla Romero			Contact Name	Krysta Peary			Address			
Address				Address							
City	Sparwood	Prov.	BC					City			
Postal Code	V0B 2G0	Country	Canada	City	Burnaby	State	BC	Postal Code			
Phone Number	250 425 7350			Postal Code	V5A 4N7	Country	Canada	Task Code			
Email EDD To	Rick.Maglio@teck.com			Phone Number	604-420-8773			Shipping Company			
	Don.Sacino@teck.com			Email Address	krysta@nautilusenvironmental.ca			Tracking Number			
	<del>Carla.Romero@teck.com</del>			PO Number				CC Hardcopy To			
	Bob.Werner@teck.com							CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION			
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalella P/F	72-h P. subcapitata (pass/fail)	28-d H. azteca (pass/fail)	30 d rainbow trout early life stage P/F	32d AFM P/F conducted in Calgary		
CM_MC2_WS_20170307_N	WS	Mar 7, 2017	12:26	G	1								X	1x20L Week 3 - refuse sample arrived slightly frozen	
													X	wo# 170120	

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions						
							Y / N	Y / N	Y / N				
				Nautilus - Burnaby	Mar 08/17	09:35	0.8	Y	N	Y	N	Y	N
				NY - Nari Yamamoto				Y	N	Y	N	Y	N
								Y	N	Y	N	Y	N
								Y	N	Y	N	Y	N

Sampler's Name	Don Sacino/Bob Werner	Mobile #		Temp in °C		Samples on ice?		Sample intact?		Trip Blank?	
Sampler's Signature		Date/Time	3/07/2017 2:00PM								



COC ID: 20170307-1231		TURNAROUND TIME:			RUSH:												
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO										
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual		Report Format / Distribution		Excel	PDF	EDD						
Project Manager	Lee Wilm			Lab Contact	Claudio Quinteros		Email 1:	lee.wilm@teck.com	x	x	x						
Email				Email	cclaudio@nautilusenvironmental.ca		Email 2:	Neil.Macdonald@teck.com	x	x	x						
Address	PO Box 100			Address	#4 6125- 12th st. S.E.		Email 3:	teckcoal@egulsonline.com			x						
City	Elkford	Province	BC	City	Calgary	Province	AB	PO number									
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	CANAD										
Phone Number	1-250-865-5289			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.	30 Day Fathead Minnow									
FR_FRCPI_QR_16012017_N 1617-0683	FR_FRCPI	WS		2017/03/07	10:16	G	2	2									
FR_UFRI_QR_16012017_N 1617-0684	FR_UFRI	WS		2017/03/07	09:07	G	2	2									
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME							
				Dylan Begun		3/7											
NB OF BOTTLES RETURNED/DESCRIPTION				Sampler's Name		Mobile #		Date/Time									
Regular (default) X				Dylan Begun		250 865 5273		March 7, 2017									
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																	

2017/03/08 NOSE  
 NW 1030 good conditio.  
 3.4PC 2 X 20L can boy  
 4 BPCANSRAW



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To			
Contact Name	Carla Romero			Contact Name	Jacklyn Pool			Address			
Address	2261 Corbin Rd.			Address	#4, 6125-12th Street S.E.						
City	Sparwood	Prov.	BC	City	Calgary	State	AB	City		State	
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Postal Code		Country	
Phone Number	250 425 7350			Phone Number	403-253-7121			Task Code			
Email EDD To	Rick.Magliocco@teck.com			Phone Number				Shipping Company			
	Don.Sacino@teck.com			Email Address				Tracking Number			
	Carla.Romero@teck.com			PO Number				CC Hardcopy To			
	Bob.Werner@teck.com							CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION		
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PREP								
1617-0686 CM_MC2_WS_20170307_N	WS	Mar 7, 2017	12:26	G	2									Week 3

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions			
							Y / N	Y / N	Y / N	
2017103104 1030 NW 2 x 20L carbonyl 3.9°C NDS-I good condition							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
Sampler's Name	Don Sacino/Bob Werner			Mobile #			Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
Sampler's Signature				Date/Time	3/07/2017 2:00PM					

COC ID:

20170314-1245

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO

LABORATORY

OTHER INFO

Facility Name / Job#	Fording River Operation				Lab Name	Nautilus Environmental				Report Format / Distribution			Excel	PDF	EDI
Project Manager	Lee Wilm				Lab Contact					Email 1:	lee.wilm@teck.com	x	x	x	
Email					Email					Email 2:	Neil.Macdonald@teck.com	x	x	x	
Address	PO Box 100				Address	8664 Commerce Court				Email 3:	teckcoal@equisonline.com				x
City	Elkford	Province	BC		City	Burnaby	Province	BC		PO number					
Postal Code	V0B 1H0		Country	Canada		Postal Code	V5A 4N7		Country	Canada					
Phone Number	1-250-865-5289				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	PRESERV	REL	Temp °C
FR_CCI_Q_02012017_N	FR_CCI	WS		2017/03/14	10:05	G	1	48 hr Depnia Single Conc. Pass/Fail			k20L 2.3
FR_LP1-WS-201703141030	FR_LP1	WS		2017/03/14	10:30	G	1	96 Hr Rainbow Trout Single Conc. Pass/Fail			↓
FR_FRCPI_QR_23012017_N	FR_FRCPI	WS		2017/03/14	11:56	G	1	28 Day H. azteca Pass/Fail			↓
FR_UFRI_QR_23012017_N	FR_UFRI	WS		2017/03/14	09:05	G	1	32d FHM P/F Conducted in Calgary			↓

① refresh sample

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
② Clear, Colorless, No particulates, No odour	Dylan Begin	3/14	Nautilus	Mar 15/17 @ 09:05
③ Clear, Colorless, No particulates, No odour			NY - Nav Yamamoto	
NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) X	Dylan Begin	250 865 5273		March 17, 2017
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

COC ID: Q1 Chronic Tox 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		Krysta Pearcy		Site:		leigh.stickney@teck.com		EQuIS: GHO	
Email		leigh.stickney@teck.com		Email		8664 Commence Court		Report Format / Distribution					
Address		PO Box 5000		Address		Imperial Square Lake City		Yes		PDF		Yes Excel	
City		Elkford		Province		BC		City		Burnaby		Province BC	
Postal Code		VOB 1H0		Country		Canada		Postal Code		V5A 4N7		Country Can	
Phone Number		250 865 3274		Phone Number				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, Perserved 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_2017-03-14_N	GH_FR1	WS	N	14-Mar-17	9:15	G	1	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyalella P/F	32d FHM P/F	Temp °C	
																	X	2.8	

RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
J. Ennis (Nupur)	14-March-17	11:00	Nautilus	Mar 15/17	09:05
			NY - Nain Yamamoto		

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				250-919-9387	
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

32d FHM P/F conducted in Calgary

WO# 170120

170121

= refresh sample =

1x20

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

**Turnaround Time:**

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name: Coal Mountain Operation				Lab Name: Nautilus Environmental				Send Invoice To			
Contact Name: Bob Werner				Contact Name: Krysta Pearcy				Address			
Address: 2261 Corbin Rd.				Emma Marus							
City: Sparwood		Prov. BC		Address: 8664 commerce Court				City		State	
Postal Code: V0B 2G0		Country: Canada		City: Burnaby		State: BC		Postal Code		Country	
Phone Number: 250 425 7321				Postal Code: V5A 4N7				Country: Canada			
Email EDD To: Rick.Maglificio@teck.com				Phone Number: 604-420-8773				Shipping Company			
Don.Sacino@teck.com				Email Address: krysta@nautilusenvironmental.ca				Tracking Number			
Bob.Werner@teck.com				emma@nautilusenvironmental.ca				CC Hardcopy To			
				PO Number: CMO00478260				CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION		
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallella P/F	72-h P. subcapitata (pass/fail)	28-d H. azteca (pass/fail)	30 d rainbow trout early life stage P/F	32 d FHM P/F		
CM_MC2_WS_20170314_N	WS	Mar 14, 2017	12:05	G	1			X				X	Week 4 - 1x20L	
								wo# 170120				170121		

Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions		
						Nautilus - Burnaby		Mar 15/17	09:05	3.7		
						NY - Nain Yamamoto				Y/N	Y/N	Y/N
										Y/N	Y/N	Y/N
										Y/N	Y/N	Y/N
Sampler's Name		Don Sacino/ Bob Werner			Mobile #			Temp in °C		Samples on ice? Sample intact? Trip Blank?		
Sampler's Signature					Date/Time		3/14/2017 2:00PM					

COC ID: 20170314-1253

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Lee Wiln			Lab Contact	Elisabeth Henson			Email 1:	Lee.Wiln@teck.com	x	x	x
Email				Email	elisabeth_henson@golder.com			Email 2:	Neil.McDonald@teck.com	x	x	x
Address	PO Box 100			Address				Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City		Province		PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code		Country						
Phone Number	1-250-865-5289			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 Coni	30 Day Fathead Minimum															
FR_FRCPI_QR_23012017_N	FR_FRCPI	WS		2017/03/14	11:56	G	2	2	1617-0683														
FR_UFRI_QR_23012017_N	FR_UFRI	WS		2017/03/14	09:05	G	2	2	1617-0684														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Begun	3/17	2017/03/15 ORBO CO dug off 2x coolers, 4x 20L carboys 2.3°C No S/I good condition	

NO OF BOTTLES RETURNED/DESCRIPTION	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 Begun	250 865 5273

Sampler's Signature	Date/Time
<i>[Signature]</i>	March 14 / 17

**Teck**

<b>COCH:</b>	<b>Q1 Chronic Tox</b>	<b>TURNAROUND TIME:</b>	<b>TEST:</b>	<b>RUSH:</b>
<b>PROJECT CLIENT INFO</b>		<b>LABORATORY INFO</b>		<b>OTHER INFO</b>
Facility Name: <b>Gravel/Fill Operations</b>	Lab Name: <b>HydroQual Laboratories Ltd</b>	EQUIS: <b>GHG</b>		
Project Manager: <b>Leslie Stockey</b>	Lab Contact: <b>Andrina Post</b>	Report Format / Distribution:		
Contact: <b>leslie.stockey@teck.com</b>	Contact: <b></b>	Per PDF Per Email		
Address: <b>PO Box 3099</b>	Address: <b>64, 6435 - 12th Street S.E.</b>	Email 1: <b>teck.stockey@teck.com</b>		
City: <b>Edmonton</b>	City: <b>Calgary</b>	Email 2: <b>teck.andrina@teck.com</b>		
Postal Code: <b>T6B 1H9</b>	Postal Code: <b>T2H 3G4</b>	Email 3: <b>andrina.post@teck.com</b>		
Phone Number: <b>150 865 3294</b>	Phone Number: <b>403 293 9121</b>	PO number:		

**SAMPLE DETAILS**

**ANALYSIS REQUESTED:**

Sample ID	Sample Location	Field Matrix	X	Y	Date	Time (24hr)	G-Grab C-Cont	# of Cool	ANALYSIS REQUESTED											
									ANA	ANA	ANA	ANA	ANA	ANA	ANA	ANA	ANA	ANA	ANA	ANA
1617-0685	CHL FILL	SW	X		14-Mar-17	9:15	0	3	24 hr Katchere Direct (precooled)	48 hr dry storage (pass/fail)	48 hr dry storage (pass/fail) 30 deg C (pass/fail)	72 hr F Substrate	30 day minimum moist ready sub storage P/F	28 day F-culture	28 Day Mycotoxin P/F	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow SQ4			

ANALYST	DATE	TIME	ACCEPTED BY	DATE	TIME
T. Gross (Signature)	14-Mar-17	11:00	8017105115 0900 CA		
			dep. with Lr Codes 2x20L enterys		
			250L to 511		
			good conditions		

Regular Office Hours: 9:00 AM - 5:00 PM Extended Office Hours: 5:00 PM - 10:00 PM For Emergencies: 24 Hr, ASAP or Weekend - Contact A/B	Sample Name: <b>Joseph Gross</b> Sample Signature: <i>[Signature]</i>	Mobile: <b>250-919-4387</b> Date/Time: <b>14-March-17</b>
---	--	--



### Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO									
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To									
Contact Name	Bob Werner			Contact Name	Claudio Quinteros			Address									
Address	2261 Corbin Rd.			Address	#4, 6125-12th Street S.E.			City		State							
City	Sparwood	Prov.	BC	City	Calgary	State	AB	Postal Code		Country							
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Task Code									
Phone Number	250 425 7321			Phone Number	403-253-7121			Shipping Company									
Email EDD To	Don.Sacino@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number									
	Bob.Werner@teck.com			Email Address	jessica@nautilusenvironmental.ca			CC Hardcopy To									
				PO Number	CM000478075			CC Hardcopy To									
SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION					
1617-0686	Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERVE	ANALYSIS	30 day early life stage fathead minnow P/F								Week 4
Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions							
						2017/03/15 0900 Prop dt 1 Hx coolers 18x cartons (20L) 2-3° no S/I good condition				Y/N	Y/N	Y/N					
										Y/N	Y/N	Y/N					
										Y/N	Y/N	Y/N					
										Y/N	Y/N	Y/N					
Sampler's Name		Don Sacino/Bob Werner			Mobile #				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?					
Sampler's Signature					Date/Time	3/14/2017 2:00PM											

# Teck

COC ID: 20170321-1204

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Lee Wilm			Lab Contact	Elisabeth Henson			Email 1:	Lee.Wilm@teck.com	x	x	x
Email				Email	elisabeth_henson@golder.com			Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address				Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City		Province		PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code		Country						
Phone Number	1-250-865-5289			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.	30 Day	Fieldhead	Mimrow														
FR_FRCPI_QR_30012017_N	1617-0683 FR_FRCPI	WS		2017/03/21	10:20	G	2	2																
FR_UFRI_QR_30012017_N	1617-0684 FR_UFRI	WS		2017/03/21	09:40	G	2	2																
								2017/03/22 1015 RW BEAVSPAW 2*20 L canby, 2*20L canby 3PC NO SIS good conchmen																

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Begm	3/21		

NB OF BOTTLES RETURNED/DESCRIPTION	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 Begm	250 865 5273
	Sampler's Signature	Date/Time
		3/21/2017

Teck

COC ID:

Q1 Chronic Tox

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  
City Elkford  
Postal Code V0B 1H0  
Phone Number 250 865 3274

Lab Name Hydroqual Laboratories Ltd  
Lab Contact Jacklyn Pool  
Email  
Address #4, 6125 - 12th Street S.E.  
City Calgary  
Postal Code T2H 2K1  
Phone Number 403.253.7121

EDD delivery:  
Site: leigh.stickney@teck.com  
Report Format / Distribution: EQMS: GHO  
Yes PDF Yes Excel  
Email 1: leigh.stickney@teck.com  
Email 2: sean.beswick@teck.com  
Email 3:  
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					
GH_FRI_WS_2017-03-21_N  1617-0685	GH_FRI	WS	N	21-Mar-17	9:26	G	2	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	74 C. dubia NO3/SO4	99 d rainbow trout early life stage NO3/SO4	72 hr P Subcapitula	30 day rainbow trout early life stage P/E	28 day H. azteca	28 Day Hyalella P/F	30 d early life stage fathead minnow P/F	30 d early life stage, fathead minnow SO4					
								<p>2017/03/22 1015 RW Bouffon 2x 20L carboys 3°C No 5/11 good condition</p>															

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION

Date	Time	Accepted By/Affiliation	Date	Time
J. Carr	21-March-17 10:00			

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  
Sampler's Signature

Jeremy Evans  
*[Signature]*

Mobile #  
Date/Time

750-919-4387  
21-March-17

## Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO					LABORATORY					OTHER INFO				
Facility Name: Coal Mountain Operation					Lab Name: Hydroqual Laboratories					Send Invoice To:				
Contact Name: Bob Werner					Contact Name: Claudio Quinteros					Address:				
Address: 2261 Corbin Rd.					Address: Jessica Wang					City:				
City: Sparwood		Prov: BC		Address: #4, 6125-12th Street S.E.					City:		State:			
Postal Code: V0B 2G0		Country: Canada		City: Calgary		State: AB		Postal Code:		Country:				
Phone Number: 250 425 7321					Postal Code: T2H 2K1					Task Code:				
Email EDD To: Rick Magliocco@teck.com					Phone Number: 403-253-7121					Shipping Company:				
Don.Sacino@teck.com					Email Address: claudio@nautilusenvironmental.ca					Tracking Number:				
Bob.Werner@teck.com					jessica@nautilusenvironmental.ca					CC Hardcopy To:				
PO Number: CM000478075					PO Number: CM000478075					CC Hardcopy To:				

SAMPLE DETAILS							ANALYSIS REQUESTED							ADDITIONAL INFORMATION		
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.											
CM_MC2_WS_20170321_N	WS	Mar 21, 2017	10:15	G	2											Week 5
1617-0686	WEXS															

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions		
							Y/N	Y/N	Y/N

Sampler's Name	Don Sacino/Bob Werner	Mobile #	
Sampler's Signature	<i>Bob Werner</i>	Date/Time	3/21/2017 2:00PM

Temp in °C	Samples on ice?	Sample intact?	Trip Blank?

**END OF REPORT**

---

Appendix B-2  
Second Quarter 2017 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 2017 Results

Final Report

October 30, 2017

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 .....	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>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.....	14
Table 8.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	15
Table 9.	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 test.....	16
Table 12.	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 – *Hyaella azteca* Toxicity Test Data  
APPENDIX D – *Pimephales promelas* Toxicity Test Data  
APPENDIX E – *Oncorhynchus mykiss* (rainbow trout) Toxicity Test Data  
APPENDIX F – Chain-of-Custody Forms

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## SIGNATURE PAGE

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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 second quarter of 2017 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 and LC_LCDSSLCC*
Sample collection dates	April 24, May 2, 9, 16, 23 and 30 and June 6, 2017
Sample receipt dates	April 25, May 3, 10, 17, 24, and 31 and June 7, 2017
Sample receipt temperatures	Ranged from 3.0 to 12.0°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> survival and growth <i>Oncorhynchus mykiss</i> (rainbow trout) embryo-alevin development

\* Tested with *C. dubia*, *P. subcapitata* and *O. mykiss* only

† Tested with *C. dubia* and *P. subcapitata* only; sample collected on May 2, 2017

## Summary of Results

Endpoint	Mean ± SD				
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	FR_FRCP1	GH_FR1
<b><i>C. dubia</i></b>					
Survival (%)	100	100	90	100	100
Reproduction	20.8 ± 3.5	21.7 ± 4.1	17.3 ± 4.7 <sup>α</sup>	8.5 ± 2.5 <sup>* α β</sup>	17.6 ± 3.3 <sup>α</sup>
<b><i>P. subcapitata</i></b>					
Cell Yield (x 10 <sup>4</sup> cells/mL)	28.4 ± 1.8	141.4 ± 5.4	147.5 ± 9.7	145.0 ± 7.2	144.0 ± 5.0
<b><i>H. azteca</i></b>					
Survival (%)	86.0 ± 5.5	86.0 ± 11.4	94.0 ± 5.5	86.0 ± 11.4	86.0 ± 11.4
Dry weight (mg)	0.90 ± 0.06	0.91 ± 0.04	0.83 ± 0.04 <sup>* α</sup>	0.80 ± 0.10 <sup>α</sup>	0.89 ± 0.07

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**Summary of Results (continued)**

Endpoint	Mean ± SD				
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<b><i>C. dubia</i></b>					
Survival (%)	100	90	100	90	100
Reproduction	20.3 ± 2.5	16.7 ± 4.1* <sup>α</sup>	14.9 ± 3.1* <sup>α</sup>	10.5 ± 3.8* <sup>αβ</sup>	25.7 ± 2.4
<b><i>P. subcapitata</i></b>					
Cell Yield (x 10 <sup>4</sup> cells/mL)	141.3 ± 6.3	139.5 ± 9.3	144.3 ± 7.1	129.0 ± 7.4 <sup>αβ</sup>	134.0 ± 4.2 <sup>β</sup>
<b><i>H. azteca</i></b>					
Survival (%)	NT	NT	NT	50.0 ± 18.7* <sup>αβ</sup>	NT
Dry weight (mg)	NT	NT	NT	0.14 ± 0.02* <sup>αβ</sup>	NT

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**Summary of Results (continued)**

Endpoint	Mean ± SD				
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	FR_FRCP1	GH_FR1
<b><i>P. promelas</i></b>					
Hatch (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0
Survival (%)	96.7 ± 6.7	95.0 ± 6.4	95.0 ± 3.3	95.0 ± 6.4	61.7 ± 21.3* <sup>αβ</sup>
Biomass (mg)	0.76 ± 0.03	0.84 ± 0.08	0.80 ± 0.03	0.74 ± 0.05 <sup>α</sup>	0.64 ± 0.07* <sup>αβ</sup>
Length (mm)	8.4 ± 0.1	8.2 ± 0.3	8.4 ± 0.1	8.3 ± 0.2	8.9 ± 0.6
Normal development (%)	100 ± 0.0	100 ± 0.0	98.2 ± 3.6	98.2 ± 3.6	100 ± 0.0
<b><i>O. mykiss</i></b>					
Survival (%)	78.5 ± 10.4	62.2 ± 17.1* <sup>β</sup>	78.8 ± 12.0	63.8 ± 14.4* <sup>β</sup>	71.7 ± 10.9
Viability (%)	67.6 ± 10.1	58.9 ± 16.3	71.4 ± 13.2	58.8 ± 11.6	67.8 ± 12.6
Length (mm)	17.4 ± 0.5	19.2 ± 0.8	17.9 ± 0.4 <sup>α</sup>	18.8 ± 0.7	20.4 ± 0.8
Wet weight (mg)	72.1 ± 6.0	80.3 ± 6.7	78.0 ± 4.0	81.2 ± 7.1	91.7 ± 5.5

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**Summary of Results (continued)**

Endpoint	Mean ± SD				
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<b><i>P. promelas</i></b>					
Hatch (%)	NT	NT	NT	100 ± 0.0	NT
Survival (%)	NT	NT	NT	91.7 ± 3.3	NT
Biomass (mg)	NT	NT	NT	0.84 ± 0.05	NT
Length (mm)	NT	NT	NT	8.4 ± 0.2	NT
Normal development (%)	NT	NT	NT	100 ± 0.0	NT
<b><i>O. mykiss</i></b>					
Survival (%)	49.6 ± 23.3* <sup>β</sup>	79.8 ± 17.1	80.5 ± 8.3	76.2 ± 5.2	77.9 ± 6.5
Viability (%)	46.8 ± 23.3* <sup>β</sup>	73.1 ± 14.6	70.5 ± 10.2	62.9 ± 11.6	63.1 ± 12.5
Length (mm)	20.0 ± 0.8	19.1 ± 0.8	18.5 ± 0.9	18.5 ± 0.9	18.6 ± 1.0
Wet weight (mg)	88.7 ± 8.1	86.1 ± 7.2	82.8 ± 8.5	84.3 ± 7.0	90.5 ± 7.3

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**Summary of Results (continued)**

Endpoint	Mean ± SD		
	Laboratory Control	CM_MC1 (Site Control)	CM_MC2
<b><i>C. dubia</i></b>			
Survival (%)	100	100	100
Reproduction	18.9 ± 1.4	22.3 ± 1.9	14.3 ± 5.1*†
<b><i>P. subcapitata</i></b>			
Cell Yield (x 10 <sup>4</sup> cells/mL)	29.9 ± 1.6	170.0 ± 11.6	151.8 ± 11.0 <sup>†</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

† 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 Sustainability 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*). 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 3.0 to 12.0°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*, *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.

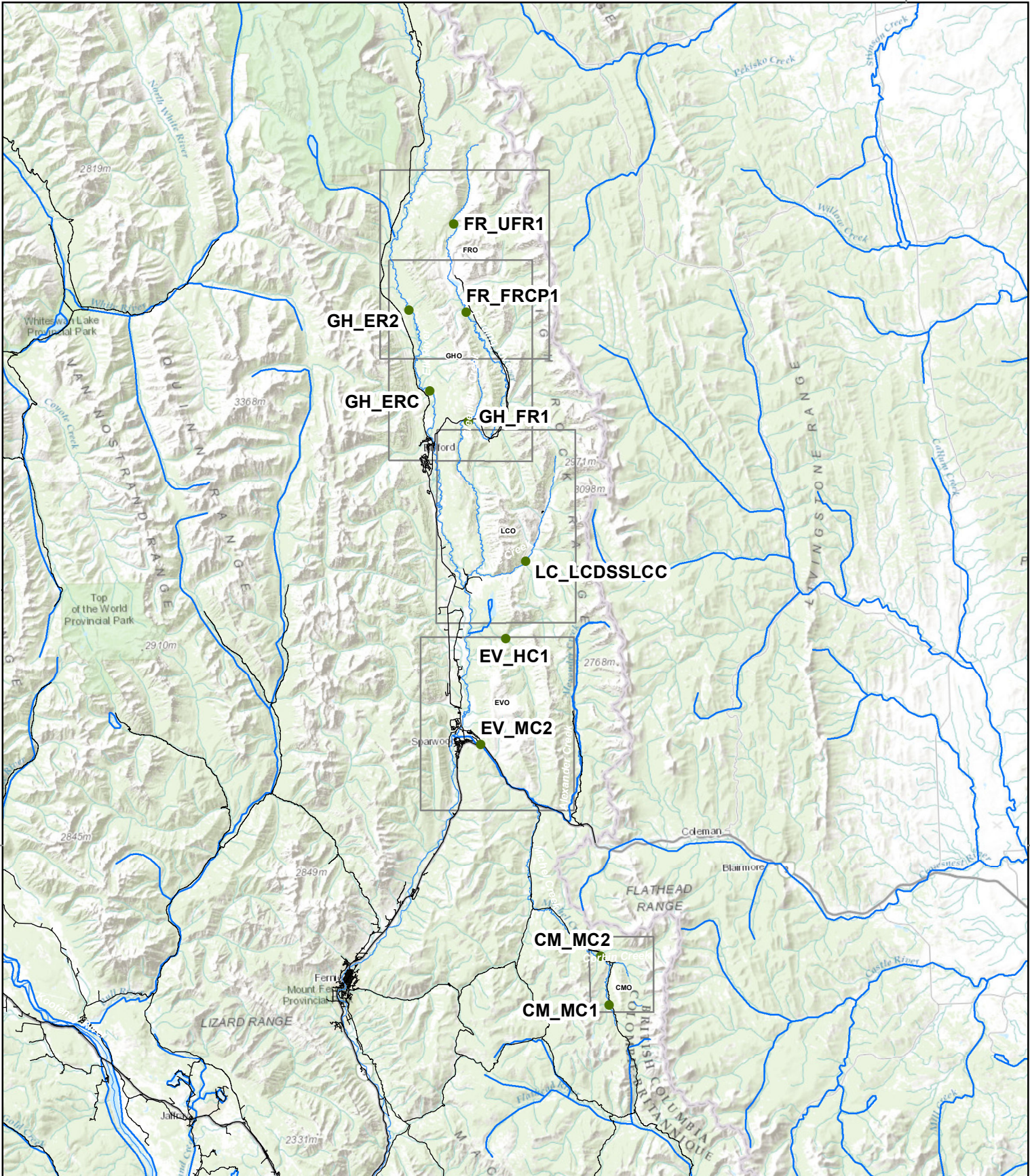
This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through E. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management 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> <sup>†</sup> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> <sup>†</sup> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
CM_MC1 *	E258175	<i>C. dubia</i> and <i>P. subcapitata</i>	May 2, 2017
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> <sup>†</sup> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> <sup>†</sup> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
GH_ERC	E300090	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
EV_MC2	E300091	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
EV_HC1	E102682	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> <sup>†</sup> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017
LC_LCDSSLCC	E297110	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	April 24, May 2, 9, 16, 23 and 30, and June 6, 2017

\* Site water controls

† *P. promelas* tests were conducted on copper-amended samples

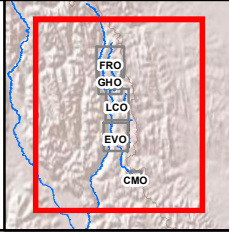


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**Chronic Toxicity Monitoring Locations**

- Roads
- Rivers
- Monitoring Locations

N

0 4,000 8,000 16,000 Meters

DATE: 8/29/2017	MINE OPERATION: Elk Valley
SCALE: 1:550,000	COORDINATE SYSTEM: NAD 1983 UTM Zone 11N

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## 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*; moderately hard 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 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; Ksoz et al., 2000; 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. A copper-amended control water treatment was 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/dilution 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/dilution 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 <sub>4</sub> )

**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/dilution water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples 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 µg/L Cu, plus laboratory control and control amended with 10 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control/dilution 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 ≥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 ± 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	≥65% normally developed hatched fish
Reference toxicant	Sodium dodecyl sulphate (SDS)

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## 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), Elk River (GH\_ER2) 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, Elk River and Michel Creek stations. Note that the upstream Michel Creek station (CM\_MC1) was tested subsequently to the remaining stations; sample from CM\_MC2 was tested a second time, concurrently with the test using sample from CM\_MC1, so that its performance could be compared with the site control from Michel Creek.

No adverse effect was observed on survival of *C. dubia*; survival ranged from 90 to 100% in the samples. A statistically significant reduction in *C. dubia* reproduction was observed in four samples (FR\_FRCP1, EV\_MC2, EV\_HC1 and CM\_MC2) compared to the laboratory control; percent reduction ranged from 20 to 59% in these samples. Relative to the Fording River site water control, a statistically significant reduction in reproduction was observed in all samples with the exception of GH\_ERC and LC\_LCDSSLCC; percent reduction in those samples ranged from 19 to 61%. A statistically significant reduction in reproduction was observed in samples FR\_FRCP1 (51% reduction) and CM\_MC2 (39% reduction) when compared to the Elk River site water control.

In the subsequent test using the Michel Creek site water control (CM\_MC1) and sample CM\_MC2, there were no adverse effects on survival; there was 100% survival in the laboratory water control, site water control and sample. A statistically significant reduction in reproduction was observed in CM\_MC2 when compared to the laboratory control (24% reduction) and Michel Creek site water control (36% reduction). The remaining samples were not compared statistically to the Michel Creek site water control because the tests were conducted at different times.

### 3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 8. In these tests, the Fording River, Elk River, and Michel Creek site water controls produced 4.0 to 4.7-fold greater growth than the laboratory water controls. 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. Note that the upstream Michel Creek station (CM\_MC1) was tested subsequently to the

remaining stations; sample from CM\_MC2 was tested a second time, concurrently with the test using sample from CM\_MC1, so that its performance could be compared with the site control from Michel Creek.

All of the samples exhibited a stimulation of cell growth relative to the laboratory water control; there was no adverse effect on cell growth compared to the laboratory water control. Only sample CM\_MC2 exhibited a statistically significant reduction (9%) in cell growth relative to the Fording River site water control. Compared to the Elk River site water control, a statistically significant reduction in cell yield was observed for CM\_MC2 (13% reduction) and LC\_LCDSSLCC (9% reduction).

In the subsequent test using the Michel Creek site water control (CM\_MC1) and sample CM\_MC2, stimulation of cell growth relative to the laboratory control was observed in both samples. Relative to the Michel Creek site water control, a statistically significant reduction in cell growth was observed in sample CM\_MC2; percent reduction was 11%.

### 3.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 9. Survival and dry weight in the Fording River site water control, and survival in the Elk River site water control, were similar to the laboratory water control for this species, indicating that there were no adverse effects associated with the upstream Fording River and Elk River stations for these endpoints. Dry weight for the Elk River site water control was statistically significantly reduced compared to the laboratory water control, although the percent reduction was only 8%.

A statistically significant reduction in survival was only observed in sample CM\_MC2; percent reduction relative to the laboratory control, Fording River site water control and Elk River site water control ranged from 42 to 47%. A statistically significant reduction in dry weight relative to the laboratory control was also observed for CM\_MC2; percent reduction was 85%. Relative to the Fording River site water control, a statistically significant reduction in dry weight was observed for FR\_FRCP1 (12% reduction) and CM\_MC2 (85% reduction). Compared to the Elk River site water control, only sample CM\_MC2 exhibited a statistically significant reduction in dry weight; percent reduction was 84%.

### 3.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 10. Hatch, survival, biomass, length and normal development (i.e., incidence of deformities) were similar in the Fording River

site water control, Elk River site water control and laboratory control, indicating that there were no adverse effects associated with the upstream Fording River and Elk River stations.

There were no statistically significant reductions in hatch, length and normal development (i.e., incidence of deformities) in the samples relative to the laboratory control, Fording River site water control and Elk River site water control. Survival and biomass were statistically significantly reduced in sample GH\_FR1 relative to the laboratory control, Fording River site water control and Elk River site water control; percent reduction for survival ranged from 35 to 36% and from 16 to 24% for biomass relative to the laboratory and site water controls. Biomass for sample FR\_FRCP1 was statistically significantly reduced relative to the Fording River site water control; percent reduction was 12%.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Ksoz et al., 1997; Downey et al. 2000). Amending the samples with 10 µg/L copper successfully curtailed fungal growth which has been observed in prior rounds of testing, with the exception of one replicate of GH\_FR1, in which fungal growth was noted to be present on some of the mortalities. The adverse response observed on survival in GH\_FR1 occurred primarily between Day 6 and 13 of exposure, which is consistent with the pattern of adverse responses that has previously been attributed to fungal or microbial growth. Thus, it appears that the concentration of copper added to this sample may not have been sufficient to entirely remove the adverse response. Results of the laboratory control and copper-treated laboratory control were similar, indicating that there was no adverse effect associated with the 10 µg/L copper addition.

### 3.5 *Oncorhynchus mykiss*

Results of the toxicity tests using *O. mykiss* are provided in Table 11. The Fording River site water control, Elk River site water control and laboratory water control performed similarly for this species, with the exception of survival in the Fording River site water control, indicating that there were no adverse effects associated with the upstream Fording River and Elk River stations for majority of the test endpoints. Survival in the Fording River site water control was statistically significantly reduced (21% reduction) compared to the laboratory control.

There were no adverse effects on length or wet weight in the samples compared to the laboratory water control, Fording River site water control and Elk River site water control. A statistically significant reduction in survival was observed in samples FR\_FRCP1 and GH\_ERC relative to the laboratory water control and Elk River site water control; percent reduction was 19% for FR\_FRCP1 and 37% for GH\_ERC relative to both the laboratory water control and Elk

River site water control. A statistically significant reduction in viability was only observed for sample GH\_ERC, compared to the laboratory water control (31% reduction) and the Elk River site water control (34% reduction).

There were no observations of unusual behaviour of *O. mykiss* in any of the test solutions, and the survival and viability endpoints were similar, indicating a low rate of deformities in all samples. 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)
<b>Tests initiated April 26, 2017</b>		
Laboratory Control	100	20.8 ± 3.5
FR_UFR1 (Site Control)	100	21.7 ± 4.1
GH_ER2 (Site Control)	90	17.3 ± 4.7 <sup>α</sup>
FR_FRCP1	100	8.5 ± 2.5 <sup>* α β</sup>
GH_FR1	100	17.6 ± 3.3 <sup>α</sup>
GH_ERC	100	20.3 ± 2.5
EV_MC2	90	16.7 ± 4.1 <sup>* α</sup>
EV_HC1	100	14.9 ± 3.1 <sup>* α</sup>
CM_MC2	90	10.5 ± 3.8 <sup>* α β</sup>
LC_LCDSSLCC	100	25.7 ± 2.4
<b>Tests initiated May 5, 2017</b>		
Laboratory Control	100	18.9 ± 1.4
CM_MC1 (Site Control)	100	22.3 ± 1.9
CM_MC2	100	14.3 ± 5.1 <sup>* †</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 8. Results: *Pseudokirchneriella subcapitata* growth inhibition test.**

Sample ID	Cell Yield (x 10 <sup>4</sup> cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
<b>Tests initiated April 25, 2017</b>		
Laboratory Control	28.4 ± 1.8	-
FR_UFR1 (Site Control)	141.4 ± 5.4	398.2
GH_ER2 (Site Control)	147.5 ± 9.7	419.8
FR_FRCP1	145.0 ± 7.2	411.0
GH_FR1	144.0 ± 5.0	407.5
GH_ERC	141.3 ± 6.3	397.8
EV_MC2	139.5 ± 9.3	391.6
EV_HC1	144.3 ± 7.1	408.4
CM_MC2	129.0 ± 7.4 <sup>αβ</sup>	354.6
LC_LCDSSLCC	134.0 ± 4.2 <sup>β</sup>	372.2
<b>Tests initiated May 5, 2017</b>		
Laboratory Control	29.9 ± 1.6	--
CM_MC1 (Site Control)	170.0 ± 11.6	469.0
CM_MC2	151.8 ± 11.0 <sup>†</sup>	407.9

SD = Standard Deviation

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 9. Results: *Hyaella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	86.0 ± 5.5	0.90 ± 0.06
FR_UFR1 (Site Control)	86.0 ± 11.4	0.91 ± 0.04
GH_ER2 (Site Control)	94.0 ± 5.5	0.83 ± 0.04 <sup>*α</sup>
FR_FRCP1	86.0 ± 11.4	0.80 ± 0.10 <sup>α</sup>
GH_FR1	86.0 ± 11.4	0.89 ± 0.07
CM_MC2	50.0 ± 18.7 <sup>*αβ</sup>	0.14 ± 0.02 <sup>*αβ</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**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	98.3 ± 3.3	0.73 ± 0.11	8.1 ± 0.3	100 ± 0.0
Laboratory Control [+Cu]	100 ± 0.0	96.7 ± 6.7	0.76 ± 0.03	8.4 ± 0.1	100 ± 0.0
FR_UFR1 (Site Control) [+Cu]	100 ± 0.0	95.0 ± 6.4	0.84 ± 0.08	8.2 ± 0.3	100 ± 0.0
GH_ER2 (Site Control) [+Cu]	100 ± 0.0	95.0 ± 3.3	0.80 ± 0.03	8.4 ± 0.1	98.2 ± 3.6
FR_FRCP1 [+Cu]	100 ± 0.0	95.0 ± 6.4	0.74 ± 0.05 <sup>α</sup>	8.3 ± 0.2	98.2 ± 3.6
GH_FR1 [+Cu]	100 ± 0.0	61.7 ± 21.3 <sup>*αβ</sup>	0.64 ± 0.07 <sup>*αβ</sup>	8.9 ± 0.6	100 ± 0.0
CM_MC2 [+Cu]	100 ± 0.0	91.7 ± 3.3	0.84 ± 0.05	8.4 ± 0.2	100 ± 0.0

SD = Standard Deviation

\* Result was significantly lower than the copper amended laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

**Table 11. Results: *Oncorhynchus mykiss* embryo-alevin test.**

Sample ID	(Mean ± SD)			
	Survival (%)	Viability (%)	Length (mm)	Wet weight (mg)
Laboratory Control	78.5 ± 10.4	67.6 ± 10.1	17.4 ± 0.5	72.1 ± 6.0
FR_UFR1 (Site Control)	62.2 ± 17.1 <sup>*β</sup>	58.9 ± 16.3	19.2 ± 0.8	80.3 ± 6.7
GH_ER2 (Site Control)	78.8 ± 12.0	71.4 ± 13.2	17.9 ± 0.4 <sup>α</sup>	78.0 ± 4.0
FR_FRCP1	63.8 ± 14.4 <sup>*β</sup>	58.8 ± 11.6	18.8 ± 0.7	81.2 ± 7.1
GH_FR1	71.7 ± 10.9	67.8 ± 12.6	20.4 ± 0.8	91.7 ± 5.5
GH_ERC	49.6 ± 23.7 <sup>*β</sup>	46.8 ± 23.3 <sup>*β</sup>	20.0 ± 0.8	88.7 ± 8.1
EV_MC2	79.8 ± 17.1	73.1 ± 14.6	19.1 ± 0.8	86.1 ± 7.2
EV_HC1	80.5 ± 8.3	70.5 ± 10.2	18.5 ± 0.9	82.8 ± 8.5
CM_MC2	76.2 ± 5.2	62.9 ± 11.6	18.5 ± 0.9	84.3 ± 7.0
LC_LCDSSLCC	77.9 ± 6.5	63.1 ± 12.5	18.6 ± 1.0	90.5 ± 7.3

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the 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. 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 – 2.2)	5	May 3, 2017
	Reproduction (IC50): 1.5 g/L NaCl	1.6 (1.1 – 2.1)	17	
<i>P. subcapitata</i>	Growth (IC50): 31.7 µg/L Zn	33.6 (25.5 – 44.3)	15	April 25, 2017
<i>H. azteca</i>	Survival (LC50): 6.0 g/L NaCl	5.7 (5.0 – 6.6)	7	April 26, 2017
<i>P. promelas</i>	Survival (LC50): 7.8 g/L NaCl	6.9 (4.5 – 10.7)	14	May 3, 2017
	Biomass (IC25): 3.6 g/L NaCl	4.5 (2.4 – 8.1)	20	
<i>O. mykiss</i>	Viability (EC50): 3.8 mg/L SDS	3.8 (2.4 – 6.0)	26	May 10, 2017

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, EC = Effect Concentration

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**APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data**

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### Ceriodaphnia dubia Summary Sheet

Client: Teck Coal  
 Work Order No.: 170358

Start Date/Time: Apr 26/17 @ 1500h  
 Set up by: EMM/JS

**Sample Information:**

Sample ID: various: see results table for  
 Sample Date: Apr 24/17 IDs  
 Date Received: Apr 25/17  
 Sample Volume: various

**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  $\geq 15$  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) =  $25 \pm 1$ ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

**Test Organism Information:**

Broodstock No.: 041917B  
 Age of young (Day 0): <24-h (within 12-h)  
 Avg No. young in first 3 broods of previous 7 d: 22  
 Mortality (%) in previous 7 d: 0  
 Individual female # used  $\geq 8$  young on test day: 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: Cd159  
 Stock Solution ID: 17NaCl  
 Date Initiated: May 3/17

7-d LC50 (95% CL): 2.1 (1.5-3.0) g/L NaCl  
 7-d IC50 (95% CL): 1.5 (0.6-1.9) 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: 1.6 (1.1-2.1) g/L NaCl CV (%): 17

**Test Results:**

	Survival (%)	Reproduction (Mean $\pm$ SD)	
Negative Control	100	20.8 $\pm$ 3.5	*reproduction significantly less than lab control
Site control PR_MFRI_Q_03042017_N	100	21.7 $\pm$ 4.1	
Site control GH_ER2_WS_2017-04-24_N	90	17.3 $\pm$ 4.7 <sup>b</sup>	a. reproduction significantly greater than lab control and site controls
PR_FRCP1_Q_03042017_N	100	8.5 $\pm$ 2.5 <sup>*bc</sup>	b. reproduction significantly less than site control PR_MFRI
GH_FR1_WS_2017-04-24_N	100	17.6 $\pm$ 3.3 <sup>b</sup>	
GH_ERC_WS_2017-04-24_N	100	20.3 $\pm$ 2.5	
EV_HCL_WS_2017-04-24_N	100	14.9 $\pm$ 3.1 <sup>*b</sup>	
EV_MC2_WS_2017-04-24_N	90	16.7 $\pm$ 4.1 <sup>*b</sup>	
CM_MC2_WS_2017-04-24_N	90	10.5 $\pm$ 3.8 <sup>*D.C.</sup>	
LC_LCDSS_LCC_WS_2017-04-24_N	100	25.7 $\pm$ 2.4 <sup>a</sup>	c. reproduction significantly less than site control GH_ER2

Reviewed by: [Signature]

Date reviewed: May 20, 2017

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: pass falls vanous  
 Work Order #: 70358

Start Date & Time: April 26/17 @ 1000h  
 Stop Date & Time: MAY 31/17 @ 1800h  
 Test Species: Ceriodaphnia dubia

% CVU) Concentration Control	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	25.0	24.0	25.0	24.0	25.0	24.0	25.0	25.0
DO (mg/L)	8.0	7.8	8.0	7.5	8.0	7.4	8.0	7.4	8.2	7.3	8.0	7.2	8.0	7.2	7.2
pH	8.0	7.8	7.9	7.8	8.0	7.2	7.5	7.2	7.7	7.8	7.9	7.6	7.9	7.6	7.6
Cond. (µS/cm)	216	218	214	215	215	215	215	215	215	216	215	215	215	218	218
Initials	EMM	JS	EMM	EL	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM

Concentration FR-UFR1	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	25.0	24.0	25.0	24.0	25.0	24.0	25.0	25.0
DO (mg/L)	8.0	7.8	8.1	7.3	8.2	7.6	8.1	7.6	8.1	7.4	8.0	7.1	8.1	7.1	7.1
pH	7.6	7.7	7.8	7.8	7.7	7.2	7.9	7.2	7.9	7.8	7.9	7.6	7.9	7.7	7.7
Cond. (µS/cm)	253	259	259	251	248	252	251	251	251	252	251	251	251	251	251
Initials	EMM	JS	EMM	EL	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM

GH-ER2 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
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	25.0
DO (mg/L)	8.1	7.9	8.1	7.2	8.2	7.6	8.1	7.6	8.1	7.4	8.1	7.1	8.1	7.1	7.1
pH	7.8	7.9	7.8	7.9	7.7	7.5	7.8	7.5	7.9	7.9	7.9	7.9	7.9	7.9	7.6
Cond. (µS/cm)	319	330	320	316	323	320	323	320	323	320	323	323	323	330	330
Initials	EMM	JS	EMM	EL	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM

FR-FRCPI 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
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	25.0
DO (mg/L)	8.1	7.9	8.2	7.3	8.2	7.7	8.1	7.5	8.1	7.4	7.9	7.1	7.9	7.1	7.1
pH	7.9	8.0	7.9	8.0	7.9	7.7	7.9	7.7	8.1	8.0	8.0	8.0	8.0	8.0	7.6
Cond. (µS/cm)	757	785	763	758	769	768	767	767	767	768	767	767	767	767	767
Initials	EMM	JS	EMM	EL	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM

Thermometer: 4 DO meter: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control	FR-UFR1	GH-ER2	FR-FRCPI
Hardness*	100	134	170	418
Alkalinity*	98	118	170	186

Analysts: AWD, JS, EMM  
 Reviewed by: EL  
 Date reviewed: May 30, 2017

\* mg/L as CaCO3

Sample Description: vanous; see coc for all sample descriptions

Comments: Broodboard Used: 091917B (31-35, 37-40)

### Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: Pass Falls Vanous  
 Work Order #: 170358

Start Date & Time: April 26/17 @ 1000 h  
 Stop Date & Time: MAY 3/17 @ 1800 h  
 Test Species: Ceriodaphnia dubia

% CIVV) Concentration <u>GH-FR1</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	25.0	24.0	25.0	24.0	25.0	24.0	25.0
DO (mg/L)	8.0	7.9	8.2	7.3	8.2	7.7	8.1	7.5	8.1	7.5	8.2	7.7	8.2	7.3
pH	7.8	7.9	7.9	7.8	7.8	7.8	7.9	7.8	8.1	7.9	8.1	7.8	8.1	8.0
Cond. (µS/cm)	693	723	700			697		703		697		690		698
Initials	EMM	JS	EMM			EL		JS		EMM		EMM		EMM

GH-ERC Concentration	Days <span style="float: right;">@ 25.0</span>													
	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)	8.0	7.8	8.2	7.3	8.2	7.9	8.1	7.5	8.1	7.5	8.0	7.3	8.2	7.3
pH	7.8	7.9	7.9	7.9	7.8	7.8	8.0	7.8	8.0	7.8	8.0	7.8	8.0	8.0
Cond. (µS/cm)	357	371	360			367		365		364		360		367
Initials	EMM	JS	EMM			EL		JS		EMM		EMM		EMM

EV-HCl 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)	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)	8.1	7.8	8.2	7.3	8.2	7.9	8.1	7.5	8.1	7.5	8.0	7.2	8.2	7.3
pH	7.9	7.9	8.0	7.9	7.9	7.8	8.0	7.8	8.1	7.9	8.1	7.8	8.1	7.9
Cond. (µS/cm)	659	687	679			657		645		650		657		660
Initials	EMM	JS	EMM			EL		JS		EMM		EMM		EMM

EV-MC2 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)	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)	8.1	8.0	8.2	7.2	8.2	7.9	8.1	7.5	8.1	7.5	7.9	7.3	8.1	7.7
pH	7.7	7.8	7.7	7.8	7.7	7.8	7.8	7.8	8.0	7.8	8.0	7.8	8.0	7.9
Cond. (µS/cm)	402	416	403			401		395		400		401		403
Initials	EMM	JS	EMM			EL		JS		EMM		EMM		EMM

Thermometer: 4 DO meter: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control	GH-FR1	GH-ERC	EV-HCl
Hardness*	100	490	180	358
Alkalinity*	98	210	174	224

EV-MC2 Analysts: AUD, JS, EMM  
EL

Reviewed by: [Signature]  
 Date reviewed: May 30, 2017

Sample Description: see page 1/3

Comments: Broodboard Used: 041917B (31-35 R7-740)

### Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: Pass Falls Vanadis  
 Work Order #: 170358

Start Date & Time: April 26/17 @ 1000h  
 Stop Date & Time: MAY 3/17 @ 1800h  
 Test Species: Ceriodaphnia dubia

Concentration <u>CM-MC2</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	25.0	24.0	25.0	24.0	25.0	24.0	25.0	
DO (mg/L)	8.1	7.8	8.2	7.9	8.2	7.9	8.1	7.6	8.1	7.8	8.1	7.9	8.1	7.7	
pH	8.0	8.1	8.0	8.0	8.0	7.7	8.1	7.7	8.0	8.0	8.0	7.9	7.9	7.9	
Cond. (µS/cm)	779	799	770	770	770	770	795	795	792	792	790	790	792	792	
Initials	EMM	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	

Concentration <u>LC-LC55LCC</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	25.0	24.0	25.0	24.0	25.0	24.0	25.0	
DO (mg/L)	8.1	7.8	8.2	7.8	8.2	7.9	8.1	7.6	8.1	7.6	8.1	7.9	8.1	7.7	
pH	8.0	8.1	8.0	8.1	8.0	7.7	8.0	7.7	8.0	8.1	8.0	8.0	7.9	8.0	
Cond. (µS/cm)	917	943	920	920	920	906	915	915	910	910	930	930	931	931	
Initials	EMM	JS	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	EMM	

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)	24.0														
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials	EMM														

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)	24.0														
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials	EMM														

Thermometer: 4 DO meter: 2/1 pH meter: 4 Conductivity meter: 2/1

	Control	CM-MC2	LC-LC55LCC
Hardness*	100	400	490
Alkalinity*	98	204	250

Analysts: AWD, JS, EMM  
EC  
 Reviewed by: EMM  
 Date reviewed: May 30, 2017

Sample Description: see page 1/3

Comments: Broodboard Used: 041917B(31-35, 37-40)



1/2

Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data

Client: Teck coal  
Sample ID: pass/fails  
Work Order: 170358

Start Date & Time: April 26/17 @ 1000h  
Stop Date & Time: May 3/17 @ 1800h  
Set up by: emm/js

100% CIV

Days	Concentration: <u>Control</u>											Concentration: <u>FR-UF21</u>											Concentration: <u>GHER2</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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL
4	✓	✓	✓	2	4	4	✓	2	4	✓	JS	3	4	2	2	4	4	3	3	4	3	JS	4	4	3	2	5	4	3	2	✓	4	JS
5	8	6	6	6	5	7	6	5	6	4	JS	4	✓	5	5	✓	✓	7	6	9	JS	✓	5	4	5	✓	5	X4	6	6	4	JS	
6	9	7	7	10	9	10	9	8	9	8	EMM	11	9	10	9	9	8	9	10	9	✓	EMM	8	10	9	9	7	✓	✓	9	10	EMM	
7	10	9	9	✓	✓	✓	6	✓	✓	13	EMM	✓	12	✓	✓	14	14	13	✓	✓	12	EMM	9	✓	✓	✓	13	7	✓	12	✓	✓	EMM
8																																	
Total	27	22	22	18	18	21	21	15	19	25	JW	18	25	17	16	27	26	25	20	19	24	JW	21	19	16	16	25	16	7X	20	15	18	JW

Days	Concentration: <u>FR-FCP1</u>											Concentration: <u>GH-FC1</u>											Concentration: <u>GH-FC2</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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	
3	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL	
4	4	✓	✓	✓	✓	✓	✓	✓	✓	4	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	3	3	✓	3	4	2	3	2	9	3	JS	
5	✓	2	4	3	2	3	3	3	4	✓	JS	4	3	4	3	4	4	2	4	2	5	JS	✓	5	2	5	✓	5	✓	✓	5	JS		
6	✓	✓	5	6	✓	✓	✓	✓	✓	6	EMM	6	6	4	8	6	7	7	✓	✓	6	EMM	7	9	6	9	8	✓	6	7	6	9	EMM	
7	6	4	✓	✓	6	5	✓	9	6	✓	EMM	9	8	10	9	10	9	8	9	9	10	EMM	13	14	12	✓	11	14	13	12	13	✓	EMM	
8																																		
Total	10	6	9	9	8	8	3	12	10	10	JW	19	17	18	20	20	20	17	13	11	21	JW	23	17	20	17	23	21	22	21	22	17	JW	

Days	Concentration: <u>EVHC1</u>											Concentration: <u>EVMC2</u>											Concentration: <u>CM-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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	
3	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL	/	/	/	/	/	/	/	/	/	/	EL	
4	3	3	3	3	3	2	5	4	✓	✓	JS	3	✓	✓	2	9	3	3	2	5	2	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	
5	5	3	5	✓	✓	5	✓	✓	2	2	JS	4	5	4	4	4	3	✓	4	✓	6	JS	5	2	5X	2	2	2	2	4	2	2	JS	
6	✓	8	✓	4	3	✓	3	6	4	✓	EMM	6	9	X	✓	✓	6	✓	6	✓	EMM	6	✓	✓	3	4	6	6	✓	✓	✓	EMM		
7	9	8	6	9	9	6	8	10	10	6	EMM	9	8	✓	9	9	6	12	9	11	10	EMM	✓	6	✓	7	8	✓	10	9	6	6	EMM	
8																																		
Total	17	14	14	16	15	13	16	20	16	8	JW	16	22	10X	15	16	12	21	15	22	18	JW	11	8	5X	12	14	8	18	13	8	8	JW	

Notes: X = mortality.

Sample Description: various; see CoC for all sample descriptions  
Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: [Signature]

Date reviewed: May 30, 2017

Chronic Freshwater Toxicity Test  
*C. dubia* Reproduction Data

2/2

Client: Teck  
 Sample ID: Pass/Fails  
 Work Order: 170358

Start Date & Time: April 26/17 @ 1500h  
 Stop Date & Time: May 3/17 @ 1800h  
 Set up by: EMM/JS

Days	Concentration: <u>LC LC055L</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	/	/	/	/	/	/	/	/	/	/	EMM																						
2	/	/	/	/	/	/	/	/	/	/	EMM																						
3	/	/	/	/	/	/	/	/	/	/	EL																						
4	2	✓	8	✓	✓	✓	✓	✓	2	4	5																						
5	✓	5	✓	6	6	6	4	5	✓	✓	5																						
6	6	8	6	8	8	9	9	10	9	10	EMM																						
7	13	16	13	12	12	13	12	11	13	14	EMM																						
8																																	
Total	21	29	24	26	26	28	25	26	24	28	JW																						

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																																									

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: various; see CoC for all sample descriptions  
 Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: EMM

Date reviewed: May 30, 2017

**CETIS Summary Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Batch ID: 05-6302-7034      Test Type: Reproduction-Survival (7d)      Analyst: Mimi Tran  
 Start Date: 26 Apr-17 10:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 03 May-17 18:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 7d 8h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-8096-0926	26 Apr-17	26 Apr-17	10h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5835	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

① Lab Control = 20% Perrier  
 FR\_UFR1 = site water  
 GH\_ER2 = site water

**7d Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
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%
GH_ER2	10	0.9	0.6738	1	0	1	0.1	0.3162	35.14%	10.0%
FR_FRCP1	10	1	1	1	1	1	0	0	0.0%	0.0%
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_HC1	10	1	1	1	1	1	0	0	0.0%	0.0%
EV_MC2	10	0.9	0.6738	1	0	1	0.1	0.3162	35.14%	10.0%
CM_MC2	10	0.9	0.6738	1	0	1	0.1	0.3162	35.14%	10.0%
LC LCDSSLCC	10	1	1	1	1	1	0	0	0.0%	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
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	1	1	1	1	0	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	1	0	1	1	1	1	1	1	1
CM_MC2	1	1	0	1	1	1	1	1	1	1
LC LCDSSLCC	1	1	1	1	1	1	1	1	1	1

*Handwritten signature*  
 May 30/17

**CETIS Summary Report**

Report Date: 23 May-17 13:58 (p 2 of 2)  
Test Code: 170358 | 07-1369-4595

**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	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	1/1	1/1	1/1	1/1	0/1	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	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	0/1	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

  
May 30/17  
QA: \_\_\_\_\_

**CETIS Summary Report**

Report Date: 25 May-17 09:29 (p 1 of 1)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Batch ID: 05-6302-7034      Test Type: Reproduction-Survival (7d)      Analyst: Mimi Tran  
 Start Date: 26 Apr-17 10:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 03 May-17 18:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 7d 8h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-8096-0926	26 Apr-17	26 Apr-17	10h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	10	20.8	18.28	23.32	15	27	1.114	3.521	16.93%	0.0%
FR_UFR1	10	21.7	18.76	24.64	16	27	1.3	4.111	18.94%	-4.33%
GH_ER2	10	17.3	13.93	20.67	7	25	1.491	4.715	27.26%	16.83%
FR_FRCP1	10	8.5	6.708	10.29	3	12	0.7923	2.506	29.48%	59.13%
GH_FR1	10	17.6	15.26	19.94	11	21	1.035	3.273	18.6%	15.38%
GH_ERC	10	20.3	18.55	22.05	17	23	0.7753	2.452	12.08%	2.4%
EV_HC1	10	14.9	12.68	17.12	8	20	0.9826	3.107	20.85%	28.37%
EV_MC2	10	16.7	13.78	19.62	10	22	1.291	4.084	24.45%	19.71%
CM_MC2	10	10.5	7.755	13.24	5	18	1.213	3.837	36.54%	49.52%
LC LCDSSLCC	10	25.7	24.01	27.39	21	29	0.7461	2.359	9.18%	-23.56%

**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	27	22	22	18	18	21	21	15	19	25
FR_UFR1	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

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**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-2948-5051	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 23 May-17 13:56	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-6302-7034	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 26 Apr-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 03 May-17 18:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-8096-0926	26 Apr-17	26 Apr-17	10h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 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	1	1.0000	Exact	Non-Significant Effect
Control		GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
Control		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Control		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Control		GH_ERC	1	1.0000	Exact	Non-Significant Effect
Control		EV_HC1	1	1.0000	Exact	Non-Significant Effect
Control		EV_MC2	0.5	1.0000	Exact	Non-Significant Effect
Control		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect
Control		LC LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
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%
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		9	1	10	0.9	0.1	10.0%
LC LCDSSLCC		10	0	10	1	0	0.0%

*Mimi Tran*  
 May 30/17

**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 2 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 08-2948-5051      Endpoint: 7d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 23 May-17 13:56      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

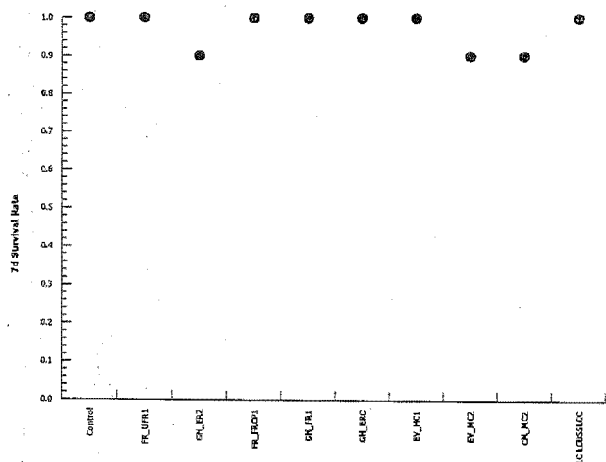
**7d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Control	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	1	1	1	1	0	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	1	0	1	1	1	1	1	1	1
CM_MC2	1	1	0	1	1	1	1	1	1	1
LC LCDSSLCC	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
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	1/1	1/1	1/1	1/1	0/1	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	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
CM_MC2	1/1	1/1	0/1	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

**Graphics**



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**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

Ceriodaphnia 7-d Survival and Reproduction Test			Nautilus Environmental		
Analysis ID: 18-7727-1069	Endpoint: Reproduction	CETIS Version: CETISv1.8.7			
Analyzed: 23 May-17 13:56	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 05-6302-7034	Test Type: Reproduction-Survival (7d)	Analyst: Mimi Tran			
Start Date: 26 Apr-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 03 May-17 18:00	Species: Ceriodaphnia dubia	Brine:			
Duration: 7d 8h	Source: In-House Culture	Age: <24h			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-8096-0926	26 Apr-17	26 Apr-17	10h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	18.4%	

Dunnnett Multiple Comparison Test									
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control		FR_UFR1	-0.5782	2.456	3.823	18	0.9771	CDF	Non-Significant Effect
		GH_ER2	2.248	2.456	3.823	18	0.0791	CDF	Non-Significant Effect
		FR_FRCP1	7.902	2.456	3.823	18	<0.0001	CDF	Significant Effect
		GH_FR1	2.056	2.456	3.823	18	0.1167	CDF	Non-Significant Effect
		GH_ERC	0.3212	2.456	3.823	18	0.8119	CDF	Non-Significant Effect
		EV_HC1	3.79	2.456	3.823	18	0.0011	CDF	Significant Effect
		EV_MC2	2.634	2.456	3.823	18	0.0327	CDF	Significant Effect
		CM_MC2	6.617	2.456	3.823	18	<0.0001	CDF	Significant Effect
		LC LCDSSLCC	-3.148	2.456	3.823	18	1.0000	CDF	Non-Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.6	267.7333	9	22.1	<0.0001	Significant Effect
Error	1090.4	12.11556	90			
Total	3500		99			

Distributional Tests					
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.722	21.67	0.4633	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9898	0.9654	0.6465	Normal Distribution



**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 2 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test** **Nautilus Environmental**

Analysis ID: 18-7727-1069      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 23 May-17 13:56      Analysis: Parametric-Control vs Treatments      Official Results: Yes

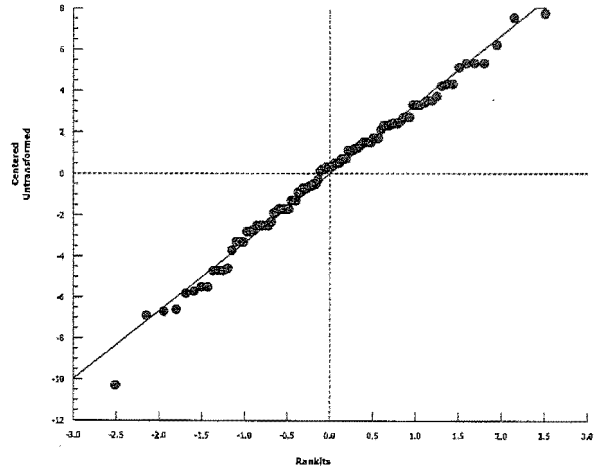
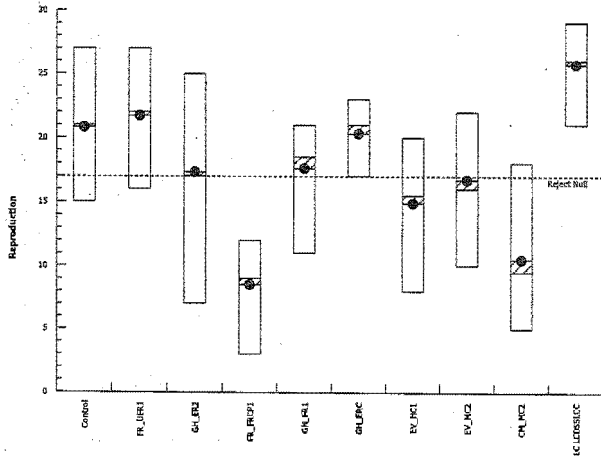
**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	10	20.8	18.28	23.32	21	15	27	1.114	16.93%	0.0%
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	-4.33%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	16.83%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	59.13%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	15.38%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	2.4%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	28.37%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	19.71%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	49.52%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-23.56%

**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	27	22	22	18	18	21	21	15	19	25
FR_UFR1	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

**Graphics**



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**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

<b>Ceriodaphnia 7-d Survival and Reproduction Test</b>			<b>Nautilus Environmental</b>
Analysis ID: 07-9198-1939	Endpoint: Reproduction	CETIS Version: CETISv1.8.7	
Analyzed: 23 May-17 13:56	Analysis: Parametric-Control vs Treatments	Official Results: Yes	
Batch ID: 05-6302-7034	Test Type: Reproduction-Survival (7d)	Analyst: Mimi Tran	
Start Date: 26 Apr-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water	
Ending Date: 03 May-17 18:00	Species: Ceriodaphnia dubia	Brine:	
Duration: 7d 8h	Source: In-House Culture	Age: <24h	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-8096-0926	26 Apr-17	26 Apr-17	10h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Ait Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	18.4%	

Dunnett Multiple Comparison Test									
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control		FR_UFR1	0.5782	2.456	3.823	18	0.7154	CDF	Non-Significant Effect
		GH_ER2	-2.248	2.456	3.823	18	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	-7.902	2.456	3.823	18	1.0000	CDF	Non-Significant Effect
		GH_FR1	-2.056	2.456	3.823	18	0.9999	CDF	Non-Significant Effect
		GH_ERC	-0.3212	2.456	3.823	18	0.9534	CDF	Non-Significant Effect
		EV_HC1	-3.79	2.456	3.823	18	1.0000	CDF	Non-Significant Effect
		EV_MC2	-2.634	2.456	3.823	18	1.0000	CDF	Non-Significant Effect
		CM_MC2	-6.617	2.456	3.823	18	1.0000	CDF	Non-Significant Effect
		LC LCDSSLCC	3.148	2.456	3.823	18	0.0082	CDF	Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.6	267.7333	9	22.1	<0.0001	Significant Effect
Error	1090.4	12.11556	90			
Total	3500		99			

Distributional Tests					
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.722	21.67	0.4633	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9898	0.9654	0.6465	Normal Distribution

*Mimi Tran*  
 May 30/17

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-9198-1939 Endpoint: Reproduction  
 Analyzed: 23 May-17 13:56 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

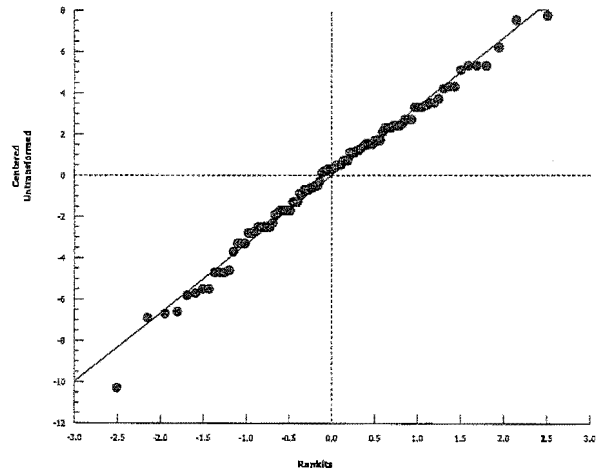
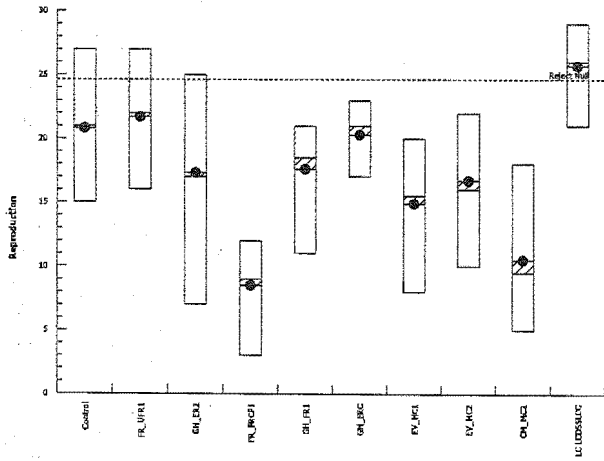
Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	10	20.8	18.28	23.32	21	15	27	1.114	16.93%	0.0%
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	-4.33%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	16.83%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	59.13%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	15.38%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	2.4%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	28.37%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	19.71%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	49.52%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-23.56%

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	27	22	22	18	18	21	21	15	19	25
FR_UFR1	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

Graphics



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**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 19-6830-3655	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 23 May-17 13:57	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-6302-7034	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 26 Apr-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 03 May-17 18:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC_LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.4%	

**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	2.83	2.424	3.768	18	0.0184	CDF	Significant Effect
		FR_FRCP1	8.491	2.424	3.768	18	<0.0001	CDF	Significant Effect
		GH_FR1	2.637	2.424	3.768	18	0.0301	CDF	Significant Effect
		GH_ERC	0.9006	2.424	3.768	18	0.5488	CDF	Non-Significant Effect
		EV_HC1	4.374	2.424	3.768	18	0.0001	CDF	Significant Effect
		EV_MC2	3.216	2.424	3.768	18	0.0063	CDF	Significant Effect
		CM_MC2	7.204	2.424	3.768	18	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	-2.573	2.424	3.768	18	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2281.156	285.1444	8	23.6	<0.0001	Significant Effect
Error	978.8	12.08395	81			
Total	3259.956		89			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.716	20.09	0.3668	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9867	0.962	0.4934	Normal Distribution

*Mimi Tran*  
 May 30/17

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-6830-3655 Endpoint: Reproduction  
 Analyzed: 23 May-17 13:57 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

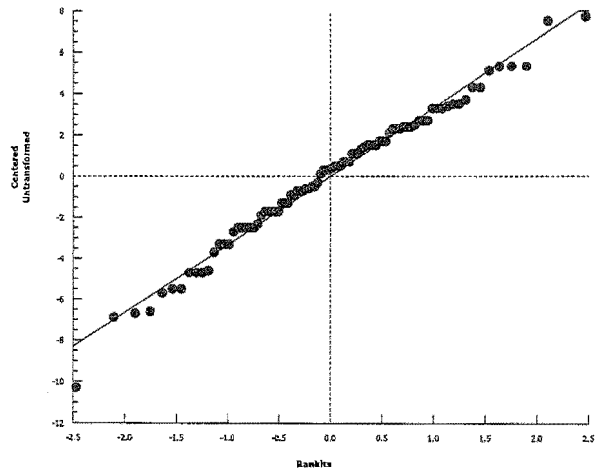
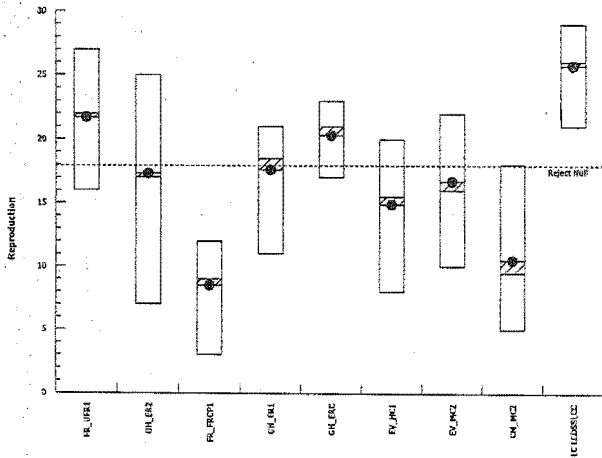
Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	0.0%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	20.28%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	60.83%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	18.89%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	6.45%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	31.34%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	23.04%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	51.61%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-18.43%

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	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

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 May 30/17

**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

<b>Analysis ID:</b> 14-7810-2846	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 23 May-17 13:57	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-6302-7034	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 26 Apr-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 03 May-17 18:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	17.4%	

**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	-2.83	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	-8.491	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		GH_FR1	-2.637	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		GH_ERC	-0.9006	2.424	3.768	18	0.9900	CDF	Non-Significant Effect
		EV_HC1	-4.374	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		EV_MC2	-3.216	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		CM_MC2	-7.204	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		LC LCDSSLCC	2.573	2.424	3.768	18	0.0352	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2281.156	285.1444	8	23.6	<0.0001	Significant Effect
Error	978.8	12.08395	81			
Total	3259.956		89			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.716	20.09	0.3668	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9867	0.962	0.4934	Normal Distribution

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 May 30/17

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-7810-2846      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 23 May-17 13:57      Analysis: Parametric-Control vs Treatments      Official Results: Yes

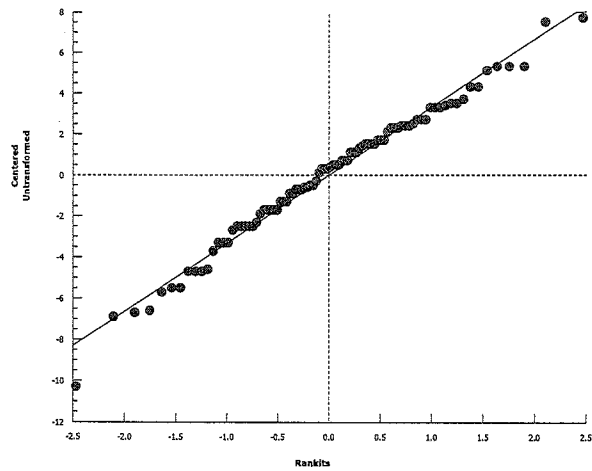
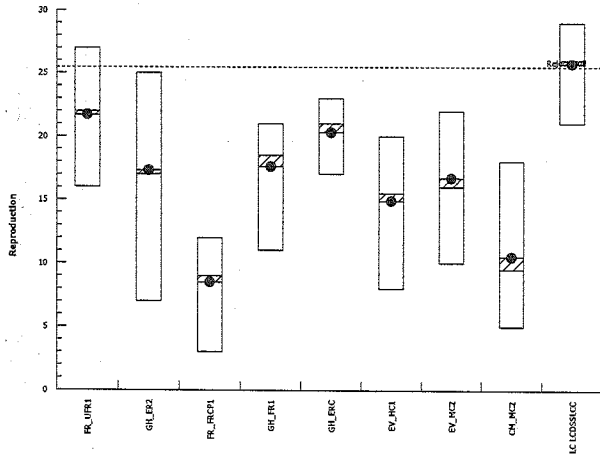
Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	0.0%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	20.28%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	60.83%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	18.89%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	6.45%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	31.34%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	23.04%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	51.61%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-18.43%

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	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

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 May 30/17

**CETIS Analytical Report**

**Report Date:** 23 May-17 13:58 (p 1 of 2)  
**Test Code:** 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 00-5624-9079	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 23 May-17 13:57	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-6302-7034	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 26 Apr-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 03 May-17 18:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.8%	

**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	-2.83	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	5.661	2.424	3.768	18	<0.0001	CDF	Significant Effect
		GH_FR1	-0.193	2.424	3.768	18	0.9275	CDF	Non-Significant Effect
		GH_ERC	-1.93	2.424	3.768	18	0.9998	CDF	Non-Significant Effect
		EV_HC1	1.544	2.424	3.768	18	0.2604	CDF	Non-Significant Effect
		EV_MC2	0.386	2.424	3.768	18	0.7726	CDF	Non-Significant Effect
		CM_MC2	4.374	2.424	3.768	18	0.0001	CDF	Significant Effect
		LC LCDSSLCC	-5.403	2.424	3.768	18	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2281.156	285.1444	8	23.6	<0.0001	Significant Effect
Error	978.8	12.08395	81			
Total	3259.956		89			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.716	20.09	0.3668	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9867	0.962	0.4934	Normal Distribution

*Mimi Tran*  
 May 30/17



Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 00-5624-9079      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 23 May-17 13:57      Analysis: Parametric-Control vs Treatments      Official Results: Yes

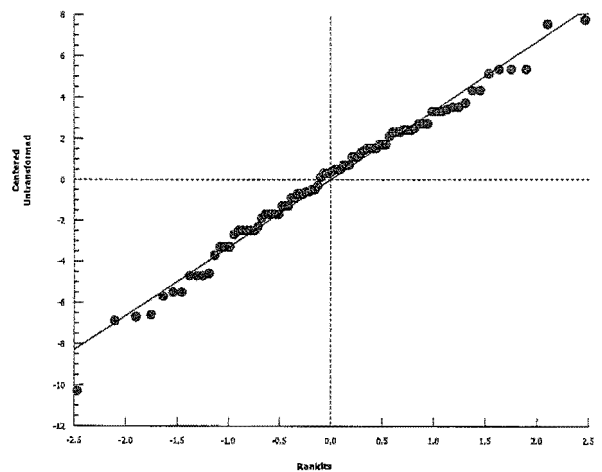
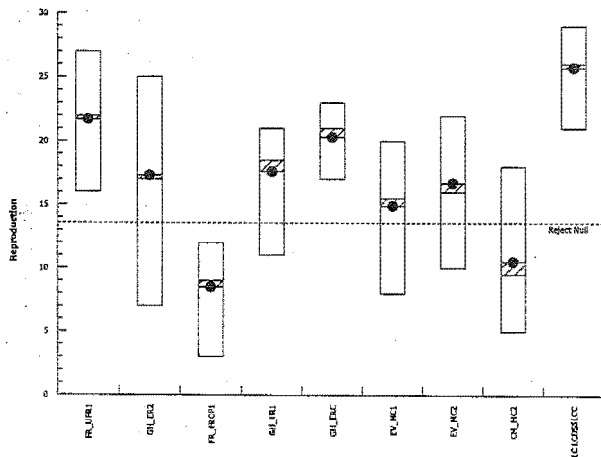
Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	0.0%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	20.28%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	60.83%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	18.89%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	6.45%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	31.34%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	23.04%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	51.61%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-18.43%

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	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

Graphics



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 May 30/17

**CETIS Analytical Report**

Report Date: 23 May-17 13:58 (p 1 of 2)  
 Test Code: 170358 | 07-1369-4595

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-9079-1730	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 23 May-17 13:57	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-6302-7034	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 26 Apr-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 03 May-17 18:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	49h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	46h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	47h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	48h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	45h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	48h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	46h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	46h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	43h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	21.8%	

**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	2.83	2.424	3.768	18	0.0184	CDF	Significant Effect
		FR_FRCP1	-5.661	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		GH_FR1	0.193	2.424	3.768	18	0.8374	CDF	Non-Significant Effect
		GH_ERC	1.93	2.424	3.768	18	0.1381	CDF	Non-Significant Effect
		EV_HC1	-1.544	2.424	3.768	18	0.9990	CDF	Non-Significant Effect
		EV_MC2	-0.386	2.424	3.768	18	0.9550	CDF	Non-Significant Effect
		CM_MC2	-4.374	2.424	3.768	18	1.0000	CDF	Non-Significant Effect
		LC LCDSSLCC	5.403	2.424	3.768	18	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2281.156	285.1444	8	23.6	<0.0001	Significant Effect
Error	978.8	12.08395	81			
Total	3259.956		89			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.716	20.09	0.3668	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9867	0.962	0.4934	Normal Distribution

*EW*  
 May 30/17

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-9079-1730 Endpoint: Reproduction  
 Analyzed: 23 May-17 13:57 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

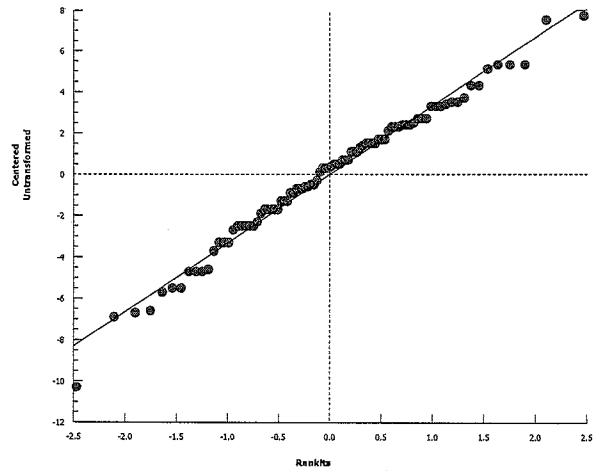
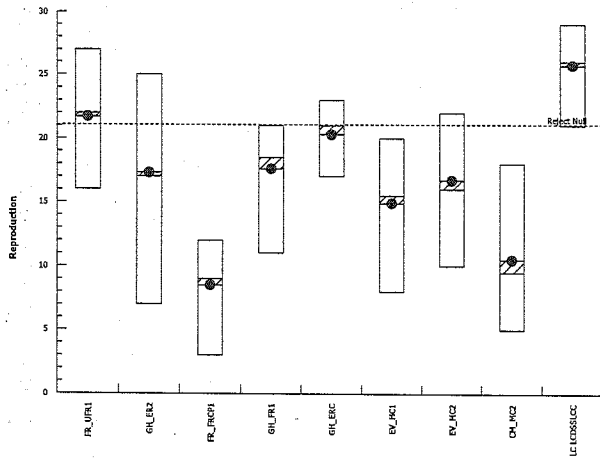
Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	10	21.7	18.76	24.64	22	16	27	1.3	18.94%	0.0%
GH_ER2	10	17.3	13.93	20.67	17	7	25	1.491	27.26%	20.28%
FR_FRCP1	10	8.5	6.708	10.29	9	3	12	0.7923	29.48%	60.83%
GH_FR1	10	17.6	15.26	19.94	18.5	11	21	1.035	18.6%	18.89%
GH_ERC	10	20.3	18.55	22.05	21	17	23	0.7753	12.08%	6.45%
EV_HC1	10	14.9	12.68	17.12	15.5	8	20	0.9826	20.85%	31.34%
EV_MC2	10	16.7	13.78	19.62	16	10	22	1.291	24.45%	23.04%
CM_MC2	10	10.5	7.755	13.24	9.5	5	18	1.213	36.54%	51.61%
LC LCDSSLCC	10	25.7	24.01	27.39	26	21	29	0.7461	9.18%	-18.43%

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	18	25	17	16	27	26	25	20	19	24
GH_ER2	21	19	16	16	25	16	7	20	15	18
FR_FRCP1	10	6	9	9	8	8	3	12	10	10
GH_FR1	19	17	18	20	20	20	17	13	11	21
GH_ERC	23	17	20	17	23	21	22	21	22	17
EV_HC1	17	14	14	16	15	13	16	20	16	8
EV_MC2	16	22	10	15	16	12	21	15	22	18
CM_MC2	11	8	5	12	14	8	18	13	8	8
LC LCDSSLCC	21	29	24	26	26	28	25	26	24	28

Graphics



Client: Teck Coal

W.O.#: 170358

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FRUFR1	Apr 24/17	Apr 26/17	50	6.1	6.3	118	50	6.7	124	KL
GH ER2	↓	↓	50	8.6	8.7	170	50	8.5	170	↓
FR FRCP1	↓	↓	50	9.5	9.7	186	50	20.9	418	↓
GH FRI	↓	↓	50	10.6	10.7	210	100	4.9	490	↓
GH ERC	↓	↓	50	8.7	8.7	174	50	9.3	180	↓
EV HCl	↓	↓	50	11.4	11.6	224	50	17.9	358	↓
EV MCB	↓	↓	50	8.0	8.2	156	50	10.5	210	↓
CM MCB	↓	↓	50	10.4	10.6	204	100	4.2	420	↓
LC LCOBCC	↓	↓	50	11.24 <sup>mg</sup>	11.4	220	100	4.9	490	↓
20% Perrier	Apr 26/17	Apr 26/17	50	5.0	5.1	98	50	5.0	100	MLT

Notes:

Reviewed by: ① diluted to 100mL with deionized water

Date Reviewed: May 30, 2017

### Ceriodaphnia dubia Summary Sheet

Client: Fock coal  
 Work Order No.: 170411

Start Date/Time: MAY 5/17 @ 1000  
 Set up by: EMM/JS

**Sample Information:**

Sample ID: vanus - see table of results  
 Sample Date: may 2/17  
 Date Received: may 3/17  
 Sample Volume: vanus

**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  $\geq 15$  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) =  $25 \pm 1$ ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

**Test Organism Information:**

Broodstock No.: 042777A  
 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: 0  
 Individual female # used  $\geq 8$  young on test day: 1234

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: Ca159  
 Stock Solution ID: 17NaCl  
 Date Initiated: MAY 3/17

7-d LC50 (95% CL): 2.1 (1.5-3.0) g/L NaCl  
 7-d IC50 (95% CL): 1.5 (0.6-1.9) 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: 1.5 (1.1-2.1) g/L NaCl CV (%): 17 <sup>emm</sup>

**Test Results:**

- ① significantly less than lab control
- ② significantly less than cm-mcl1
- Ⓐ significantly greater than lab control
- Ⓑ significantly greater than cm-mcl2

	Survival (%)	Reproduction (Mean $\pm$ SD)
Negative Control	100	18.9 $\pm$ 1.4
cm-mcl1-WS-2070502-N	100	27.3 $\pm$ 1.9 ⒶⒷ
cm-mcl2-WS-2070502-N	100	14.3 $\pm$ 5.1 ①②
		$\pm$
		$\pm$
		$\pm$
		$\pm$
		$\pm$
		$\pm$

Reviewed by: Jo

Date reviewed: July 24/17

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: CMML2 and CMML1 (pass/fail)  
 Work Order #: 170411

Start Date & Time: MAY 5/10 1000h  
 Stop Date & Time: MAY 11/10 1745h  
 Test Species: Ceriodaphnia dubia

100% (v/v)

Concentration	Days													
	0	1		2		3		4		5		final 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	25.0	
DO (mg/L)	8.0	7.6	8.1	7.5	8.2	7.3	8.0	7.1	8.1	7.7	8.0	7.6		
pH	7.9	7.7	7.9	7.7	7.8	7.8	7.9	7.7	8.0	7.6	8.0	7.8		
Cond. (µS/cm)	215	212		217		216		212		208		259		
Initials	EMM	JW		a		EMM		EMM		EMM		JS		

Concentration	Days													
	0	1		2		3		4		5		final 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	24.5	25.0	24.0	25.0	24.5	25.0		
DO (mg/L)	8.0	7.7	8.2	7.6	8.1	7.4	8.1	7.2	8.0	7.7	8.1	7.6		
pH	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.7	7.9	7.8	7.9	8.3		
Cond. (µS/cm)	217	280		282		278		280		282		257		
Initials	EMM	JW		a		EMM		EMM		EMM		JS		

Concentration	Days													
	0	1		2		3		4		5		final 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	25.5	25.0	24.0	25.0	24.5	25.0		
DO (mg/L)	8.2	7.8	8.2	7.6	8.2	7.5	8.0	7.2	8.2	7.7	8.2	7.6		
pH	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.8	7.9	7.9	7.9	8.0		
Cond. (µS/cm)	210	266		267		270		271		269		271		
Initials	EMM	JW		a		EMM		EMM		EMM		JS		

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: 1/2 pH meter: 1/2 Conductivity meter: 1/2

100% (v/v)

	Control	CMML2	CMML1
Hardness*	100	430	124
Alkalinity*	98	204	108

\* mg/L as CaCO3

Analysts: JS, MT, EMM, AWD

Reviewed by: Joh

Date reviewed: July 29/12

Sample Description: CMML2 = clear, colourless, odourless, some particulates; CMML1 = clear, colourless, odourless, no particulates

Comments: Broodboard Used: 04211A (1-4)

**Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data**

Client: Teck coal  
 Sample ID: cm-cm1-cm2 pass/fail 100% (v/v)  
 Work Order: 170911 100% (v/v)

Start Date & Time: May 5/17 @ 10:00h  
 Stop Date & Time: May 11/17 @ 17:56  
 Set up by: JS/EMM

Days	Concentration: <u>control 201 penx</u>											Concentration: <u>456 cm cm 1</u>											Concentration: <u>100% (v/v)</u> <u>3-12 cm cm 2</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	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A
2	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	A
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	EMM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	EMM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	EMM
4	3	3	4	3	3	2	3	3	2	3	EMM	3	2	2	3	2	3	3	3	4	4	EMM	3	3	4	3	3	2	3	3	2	3	EMM
5	6	7	7	6	6	5	6	7	6	6	MLB	8	7	8	8	7	8	7	7	8	8	MLB	6	✓	8	6	✓	7	4	4	6	4	MLB
6	10	15	9	9	8	10	12	10	10	10	JS	12	12	12	9	11	11	12	12	13	14	JS	9	3	8	10	10	10	4	6	9	✓	JS
7																																	
8																																	
Total	19	20	20	18	17	17	21	20	18	19	JS	23	21	22	20	20	22	22	25	26	26	JS	18	6	20	19	13	19	11	13	17	7	JS

Days	Concentration: <u>6.25</u>											Concentration: <u>12.5</u>											Concentration: <u>25</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																																						
5																																						
6																																						
7																																						
8																																						
Total																																						

Days	Concentration: <u>50</u>											Concentration: <u>100</u>											Concentration: <u></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																																						
5																																						
6																																						
7																																						
8																																						
Total																																						

Notes: X = mortality.

Sample Description: See WR page  
 Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JSM

Date reviewed: July 24/17

**CETIS Summary Report**

Report Date: 21 Jul-17 12:13 (p 1 of 1)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

Batch ID: 00-5127-6176      Test Type: Reproduction-Survival (7d)      Analyst: Emma Marus  
 Start Date: 05 May-17 10:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 11 May-17 17:45      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	21-2416-1469	05 May-17	05 May-17	10h	Teck Coal	
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	74h (4.5 °C)		
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		

**6d Survival Rate Summary**

C-%	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%
CM_MC2	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%

**Reproduction Summary**

C-%	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	10	18.9	17.92	19.88	17	21	0.4333	1.37	7.25%	0.0%
CM_MC2	10	14.3	10.65	17.95	6	20	1.613	5.1	35.67%	24.34%
CM_MC1	10	22.3	20.91	23.69	20	26	0.6155	1.947	8.73%	-17.99%

**6d Survival Rate Detail**

C-%	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
CM_MC2	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1

**Reproduction Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	19	20	20	18	17	17	21	20	18	19
CM_MC2	18	6	20	19	13	19	11	13	17	7
CM_MC1	23	21	22	20	20	22	22	22	25	26

**6d Survival Rate Binomials**

C-%	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
CM_MC2	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



# CETIS Analytical Report

Report Date: 21 Jul-17 12:13 (p 1 of 2)  
 Test Code: 170411 | 08-5083-0248

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 18-1978-7104	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 21 Jul-17 12:12	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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	21-2416-1469	05 May-17	05 May-17	10h	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_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%)
Lab Control		CM_MC1	1	1.0000	Exact	Non-Significant Effect

### Data Summary

C-%	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Negative Contr	10	0	10	1	0	0.0%
CM_MC1	10	0	10	1	0	0.0%

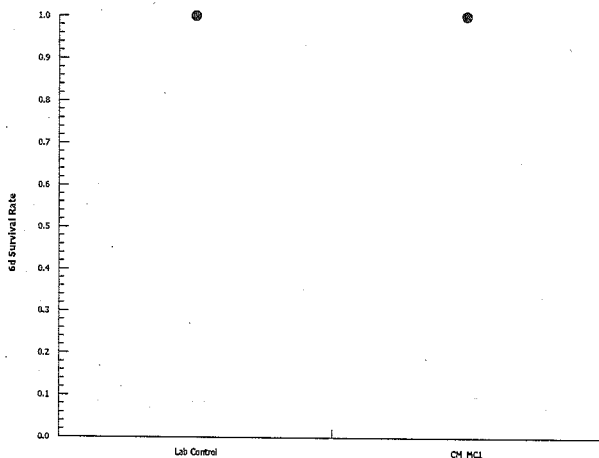
### 6d Survival Rate Detail

C-%	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
CM_MC1	1	1	1	1	1	1	1	1	1	1

### 6d Survival Rate Binomials

C-%	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
CM_MC1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

### Graphics



**CETIS Analytical Report**

Report Date: 21 Jul-17 12:13 (p 2 of 2)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 02-2316-1221	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 21 Jul-17 12:12	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	74h (4.5 °C)	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_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%)
CM_MC2		CM_MC1	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

C-%	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Upstream Contr	10	0	10	1	0	0.0%
CM_MC1	10	0	10	1	0	0.0%

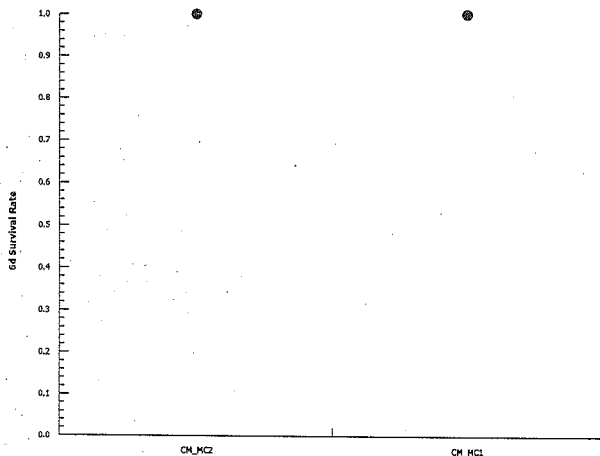
**6d Survival Rate Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
CM_MC2	1	1	1	1	1	1	1	1	1	1
CM_MC1	1	1	1	1	1	1	1	1	1	1

**6d Survival Rate Binomials**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
CM_MC2	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

**Graphics**



**CETIS Analytical Report**

Report Date: 21 Jul-17 12:12 (p 1 of 4)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 00-1094-8872	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 21 Jul-17 12:12	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 00-5127-6176	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 May-17 10:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 11 May-17 17:45	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 8h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	21-2416-1469	05 May-17	05 May-17	10h	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.91%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		CM_MC1	-4.517	1.734	1.305	18	0.9999	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	57.8	57.8	1	20.4	0.0003	Significant Effect
Error	51	2.833333	18			
Total	108.8		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.018	6.541	0.3105	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9543	0.866	0.4363	Normal Distribution

**Reproduction Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.9	17.92	19.88	19	17	21	0.4333	7.25%	0.0%
CM_MC1	10	22.3	20.91	23.69	22	20	26	0.6155	8.73%	-17.99%

**Reproduction Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Lab Control	19	20	20	18	17	17	21	20	18	19
CM_MC1	23	21	22	20	20	22	22	22	25	26

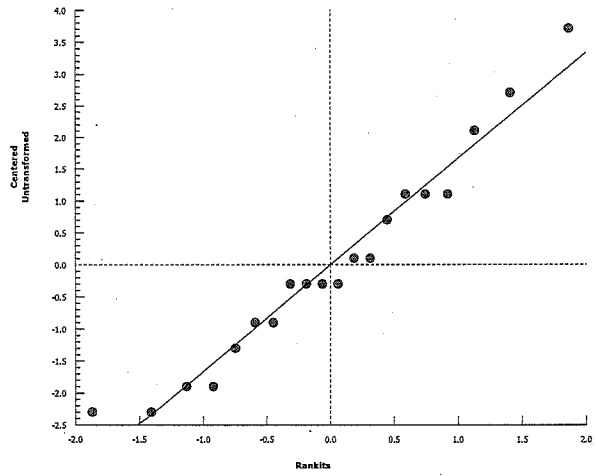
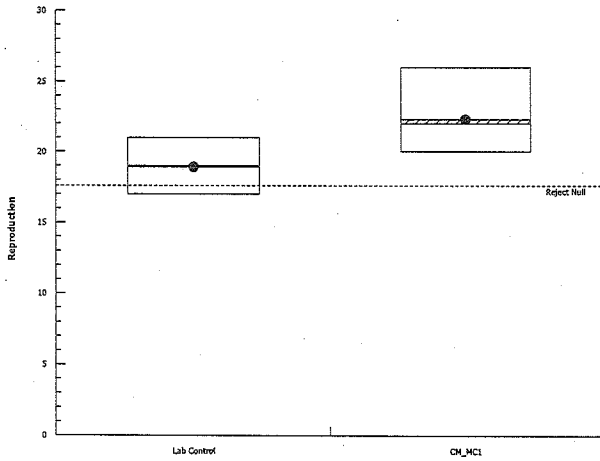
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 00-1094-8872      Endpoint: Reproduction  
Analyzed: 21 Jul-17 12:12      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 21 Jul-17 12:12 (p 3 of 4)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 01-4848-4698	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 21 Jul-17 12:12	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	74h (4.5 °C)	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.7%	

**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_MC1	-4.634	1.796	3.1	11	0.9996	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	320	320	1	21.48	0.0002	Significant Effect
Error	268.2	14.9	18			
Total	588.2		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	6.865	6.541	0.0084	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.94	0.866	0.2397	Normal Distribution

**Reproduction Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	10	14.3	10.65	17.95	15	6	20	1.613	35.67%	0.0%
CM_MC1	10	22.3	20.91	23.69	22	20	26	0.6155	8.73%	-55.94%

**Reproduction Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
CM_MC2	18	6	20	19	13	19	11	13	17	7
CM_MC1	23	21	22	20	20	22	22	22	25	26

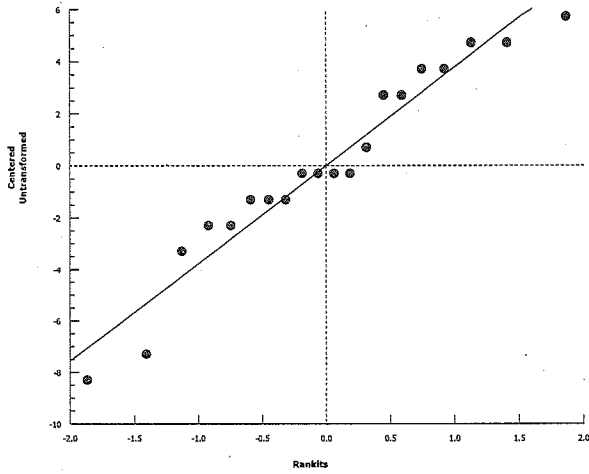
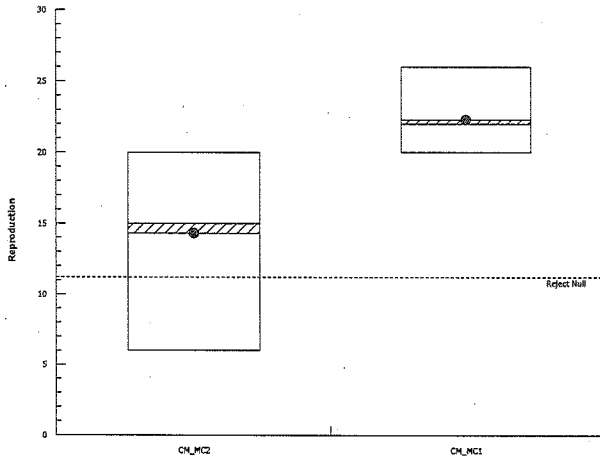
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-4848-4698      Endpoint: Reproduction  
Analyzed: 21 Jul-17 12:12      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 21 Jul-17 12:41 (p 1 of 2)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 18-4862-9514	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 21 Jul-17 12:41	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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	21-2416-1469	05 May-17	05 May-17	10h	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	6.91%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		CM_MC1	4.517	1.734	1.305	18	0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	57.8	57.8	1	20.4	0.0003	Significant Effect
Error	51	2.833333	18			
Total	108.8		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.018	6.541	0.3105	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9543	0.866	0.4363	Normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.9	17.92	19.88	19	17	21	0.4333	7.25%	0.0%
CM_MC1	10	22.3	20.91	23.69	22	20	26	0.6155	8.73%	-17.99%

**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	19	20	20	18	17	17	21	20	18	19
CM_MC1	23	21	22	20	20	22	22	22	25	26

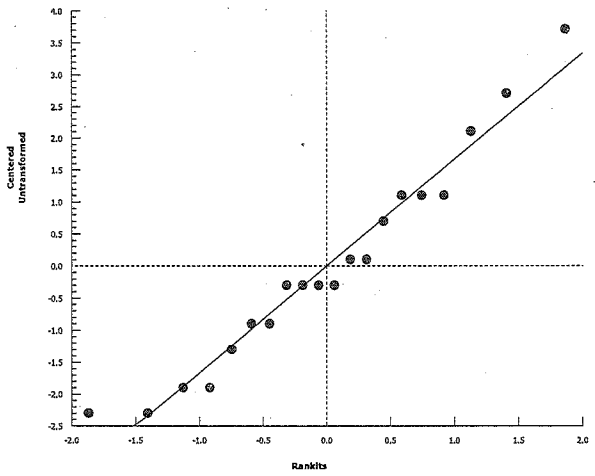
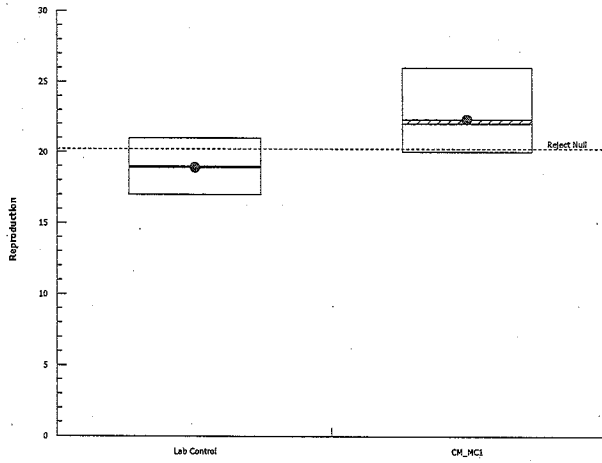
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 18-4862-9514      Endpoint: Reproduction  
Analyzed: 21 Jul-17 12:41      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 21 Jul-17 12:40 (p 1 of 2)  
 Test Code: 170411 | 08-5083-0248

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

Analysis ID: 18-6353-1963	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 21 Jul-17 12:40	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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	21-2416-1469	05 May-17	05 May-17	10h	Teck Coal	
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	74h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.0%	

**Unequal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		CM_MC2	2.754	1.812	3.027	10	0.0102	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	105.8	105.8	1	7.587	0.0130	Significant Effect
Error	251	13.94444	18			
Total	356.8		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	13.85	6.541	0.0006	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9449	0.866	0.2966	Normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.9	17.92	19.88	19	17	21	0.4333	7.25%	0.0%
CM_MC2	10	14.3	10.65	17.95	15	6	20	1.613	35.67%	24.34%

**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	19	20	20	18	17	17	21	20	18	19
CM_MC2	18	6	20	19	13	19	11	13	17	7

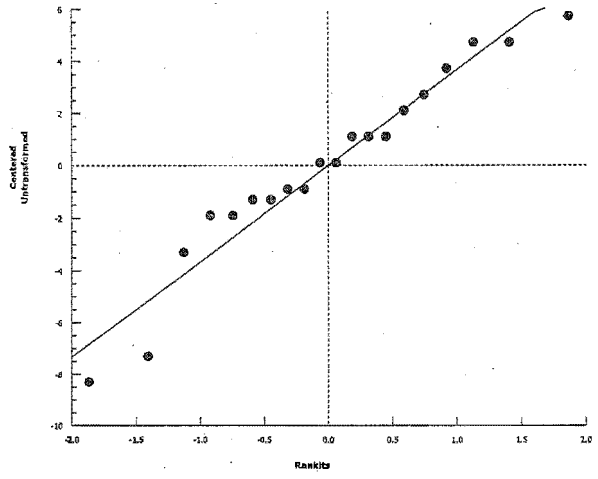
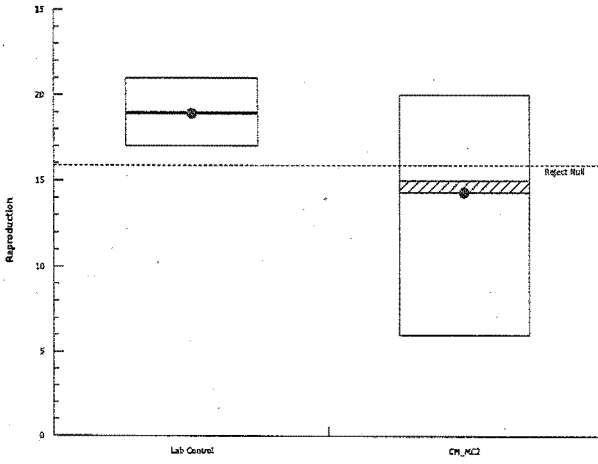
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 18-6353-1963      Endpoint: Reproduction  
Analyzed: 21 Jul-17 12:40      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 24 Jul-17 15:33 (p 1 of 2)  
 Test Code: 170411 | 08-5083-0248

Ceriodaphnia 7-d Survival and Reproduction Test Nautilus Environmental

Analysis ID: 20-4071-4429	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 24 Jul-17 15:33	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 00-5127-6176	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 05 May-17 10:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 11 May-17 17:45	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
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	74h (4.5 °C)	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	72h (3.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	21.7%	

**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_MC1	4.634	1.796	3.1	11	0.0004	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	320	320	1	21.48	0.0002	Significant Effect
Error	268.2	14.9	18			
Total	588.2		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	6.865	6.541	0.0084	Unequal Variances
Distribution	Shapiro-Wiik W Normality	0.94	0.866	0.2397	Normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	10	14.3	10.65	17.95	15	6	20	1.613	35.67%	0.0%
CM_MC1	10	22.3	20.91	23.69	22	20	26	0.6155	8.73%	-55.94%

**Reproduction Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
CM_MC2	18	6	20	19	13	19	11	13	17	7
CM_MC1	23	21	22	20	20	22	22	22	25	26

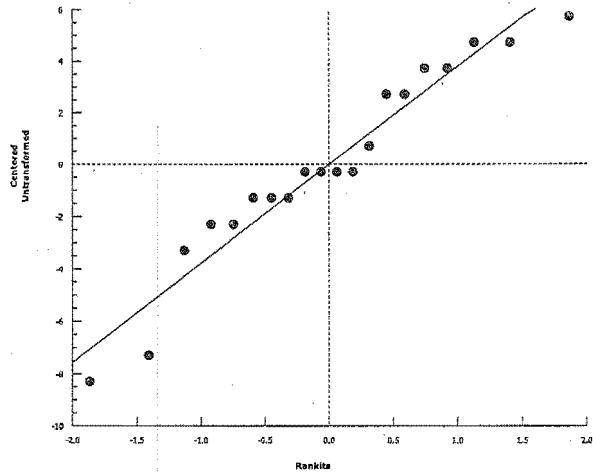
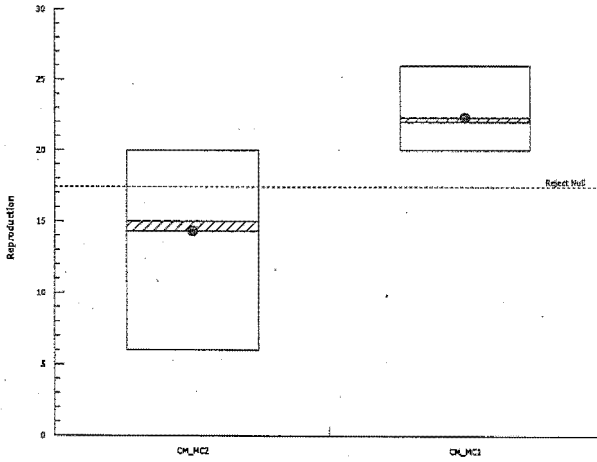
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 20-4071-4429      Endpoint: Reproduction  
Analyzed: 24 Jul-17 15:33      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



Client: Teck coal

W.O.#: 170411

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
cmmc2	May 5/17	May 5/17	50	10.4	10.6	204	50	21.5	430	thmm
cmmc1	↓	↓	↓	5.6	5.8	108	↓	6.2	124	↓
201pemer	↓	↓	↓	5.0	5.1	98	↓	5.0	100	↓

Notes: \_\_\_\_\_

Reviewed by: JG

Date Reviewed: July 24/17

**APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data**

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**Pseudokirchneriella subcapitata Summary Sheet**

Client: Teck Coal  
 Work Order No.: 170359

Start Date: April 25/17  
 Set up by: MLT

**Sample Information:**

Sample ID: various: see results table for IDs  
 Sample Date: April 24/17  
 Date Received: April 25/17  
 Sample Volume: various

**Test Organism Information:**

Culture Date: April 21/17  
 Age of culture (Day 0): 4d

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: SC156  
 Stock Solution ID: 172001  
 Date Initiated: April 25/17

72-h IC50 (95% CL): 31.7 (27.6 - 36.2) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 33.6 (25.5 - 44.3) µg/L Zn CV (%): 15

**Test Results:**

	Cell Yield (Mean ± SD)
Negative Control	28.4 ± 1.8
FR-UPRI-Q-03042017-N	141.4 ± 5.4 *
GH-ERA-WS-2017-04-24-N	147.5 ± 9.7 *
FR-FRCPI-Q-03042017-N	145.0 ± 7.2 *
GH- <sup>FRI</sup> PR-WS-2017-04-24-N	144.0 ± 5.0 *
GH-ERC-WS-2017-04-24-N	141.3 ± 6.3 *
EV-HCl-WS-2017-04-24-N	144.3 ± 7.1 *
EV-MC2-WS-2017-04-24-N	139.5 ± 9.3 *
EM-MC2-WS-2017-04-24-N	129.0 ± 7.4 *ab
LC-LDSSLCC-WS-2017-04-24-N	134.0 ± 4.2 *b

a. indicates cell yield that were significantly lower than site control FR-UPRI  
 b. indicates cell yield that were significantly lower than site control GH-ERA

\* indicates cell yield that were significantly greater than the lab control

Reviewed by: [Signature]

Date reviewed: May 19, 2017

## 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck coal Setup by: MLT  
 Sample ID: Various Test Date/Time: April 25/17 @ 1700h  
 Work Order No.: 170359 Test Species: Pseudokirchneriella subcapitata  
 Culture Date: April 21/17 Age of Culture: 4d Culture Health: Good  
 Culture Count: 1 290 2 320 Average: 305 Culture Cell Density (c1): 305 x 10<sup>4</sup> cells/ml

$$v1 = \frac{220,000 \text{ cells/ml} \times 100 \text{ ml}}{(c1) \quad 305 \times 10^4 \quad \text{cells/ml}} = 7.21$$

Time Zero Counts: 1 20 2 22 Average: 21

No. of Cells/mL: 21 x 10<sup>4</sup> Initial Density: # cells/mL + 220 μL x 10 μL = 9545 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	24.0	24.0	25.0	25.0	✓	✓	✓	✓
① FRUFRI	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① GHERZ	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
② FRFRCP1	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
③ ② GHPRI	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① GHERC	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① EV-HCl	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
② EV-MCZ	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
② CMLMCZ	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
① ULCSSICC	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT

Initial control pH: Well 1: 7.0 Well 2: 7.0  
 Final control pH: Well 1: 6.8 Well 2: 6.8

Light intensity (lux): 4220 Date measured: April 25/17

Instruments: Thermometer 4 pH meter 1 Light meter 1

Sample Description: ① clear, colourless, odourless, some brown particulates  
 ② clear, colourless, odourless, dark brown particulates  
 Comments: ③ clear, light brown, odourless, dark brown particulates

Reviewed: [Signature] Date reviewed: May 19, 2017



**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Truck Coal Start Date/Time: Apr 25/17 @ 1700h  
 Work Order #: 170359 Termination Date: Apr 28/17 @ 1700h  
 Sample ID: various 170359 M4 Test set up by: ML  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	29					ML
	B	32					
	C	30					
	D	28					
	E	29					
	F	31					
	G	30					
	H	26					
(site control) FRUPRI (95.2)	A	151					
	B	148					
	C	137					
	D	145					
	EA	140					
	FB	135					
	GC	141					
	HD	142					
(site control) GH ER2 (95.2)	A	152					
	B	140					
	C	155					
	D	133					
	EA	140					
	FB	160					
	GC	158					
	HD	150					
FR-FRCPI (95.2)	A	153					
	B	138					
	C	142					
	D	151					
GH FRI (95.2)	A	139					
	B	143					
	C	150					
	D	148					
GH ERC (95.2)	A	142					
	B	140					
	C	151					
	D	136					


Comments: \_\_\_\_\_

Reviewed by: [Signature] Date Reviewed: May 19, 2017

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck coal Start Date/Time: April 25/17 @ 1700h  
 Work Order #: 170359 Termination Date: April 28/17 @ 1700h  
 Sample ID: 170359<sup>M9</sup> vanow Test set up by: ML  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						
	B						
	C						
	D						
	E						
	F						
	G						
	H						
EV HCl (95.2)	A	135					ML
	B	151					
	C	149					
	D	146					
EV ML2 (95.2)	A	139					
	B	135					
	C	154					
	D	134					
CM ML2 (95.2)	A	129					
	B	131					
	C	139					
	D	121					
LC LC08SLCC (95.2)	A	140					
	B	136					
	C	130					
	D	134					
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Comments: \_\_\_\_\_  
 Reviewed by:  Date Reviewed: May 19, 2017



**Pseudokirchneriella subcapitata Algal Counts**

Client: Teck Coal Start Date/Time: 25-Apr-17 @ 1700h  
 WO#: 170359 Termination Date/Time: 28-Apr-17 @ 1700h  
 Sample ID: Teck Coal various samples pass/fail  
 Initial Cell Density: 9545 cell/mL

210000  
0.22  
0.01

Concentration %(v/v)	Rep	Count 1 (x 10 <sup>4</sup> )	Count 2 (x 10 <sup>4</sup> )	Count 3 (x 10 <sup>4</sup> )	Count 4 (x 10 <sup>4</sup> )	Mean (x 10 <sup>4</sup> )	Cell Yield (x 10 <sup>4</sup> ) cell/mL		9545.455
Control	A	29				29	28.0	mean	28.4
Lab Control	B	32				32	31.0	SD	1.846812
	C	30				30	29.0	CV	6.498179
	D	28				28	27.0		
	A	29				29	28.0		
	B	31				31	30.0		
	C	30				30	29.0		
	D	26				26	25.0		
EV_HC1	A	135				135	134.0		
95.2% (v/v)	B	151				151	150.0		
	C	149				149	148.0		
	D	146				146	145.0		
EV_MC2	A	139				139	138.0		
95.2% (v/v)	B	135				135	134.0		
	C	154				154	153.0		
	D	134				134	133.0		
CM_MC2	A	129				129	128.0		
95.2% (v/v)	B	131				131	130.0		
	C	139				139	138.0		
	D	121				121	120.0		
LC_LCDSSLC	A	140				140	139.0		
95.2% (v/v)	B	136				136	135.0		
	C	130				130	129.0		
	D	134				134	133.0		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		

Reviewed by: 

Date reviewed: May 19, 2017

**CETIS Summary Report**

Report Date: 12 May-17 14:19 (p 1 of 1)  
 Test Code: 170359 | 06-5796-1795

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Batch ID: 12-1762-9257      Test Type: Cell Growth      Analyst: Mimi Tran  
 Start Date: 25 Apr-17 17:00      Protocol: EC/EPS 1/RM/25      Diluent: Deionized Water + nutrients  
 Ending Date: 28 Apr-17 17:00      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	12-8157-2031	25 Apr-17	25 Apr-17	17h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	32h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	29h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	30h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	31h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	28h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	31h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	29h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	29h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	26h (5 °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_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

① Lab control =  
 Deionized water w/  
 nutrients  
 FR\_UFR1 = site control  
 GH\_ER2 = site control

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	28.38	26.83	29.92	25	31	0.6529	1.847	6.51%	0.0%
FR_UFR1	8	141.4	136.9	145.9	134	150	1.908	5.397	3.82%	-398.2%
GH_ER2	8	147.5	139.4	155.6	132	159	3.443	9.739	6.6%	-419.8%
FR_FRCP1	4	145	133.6	156.4	137	152	3.582	7.165	4.94%	-411.0%
GH_FR1	4	144	136.1	151.9	138	149	2.483	4.967	3.45%	-407.5%
GH_ERC	4	141.3	131.2	151.3	135	150	3.172	6.344	4.49%	-397.8%
EV_HC1	4	144.3	132.9	155.6	134	150	3.568	7.136	4.95%	-408.4%
EV_MC2	4	139.5	124.8	154.2	133	153	4.628	9.256	6.64%	-391.6%
CM_MC2	4	129	117.2	140.8	120	138	3.697	7.394	5.73%	-354.6%
LC LCDSSLCC	4	134	127.4	140.6	129	139	2.082	4.163	3.11%	-372.2%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	28	31	29	27	28	30	29	25
FR_UFR1	150	147	136	144	139	134	140	141
GH_ER2	151	139	154	132	139	159	157	149
FR_FRCP1	152	137	141	150				
GH_FR1	138	142	149	147				
GH_ERC	141	139	150	135				
EV_HC1	134	150	148	145				
EV_MC2	138	134	153	133				
CM_MC2	128	130	138	120				
LC LCDSSLCC	139	135	129	133				

*EW*  
 May 19 17

**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 1 of 3)  
 Test Code: 170359 | 06-5796-1795

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 04-4309-9765	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 12 May-17 14:16	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 12-1762-9257	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 25 Apr-17 17:00	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 28 Apr-17 17:00	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	12-8157-2031	25 Apr-17	25 Apr-17	17h	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	32h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	29h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	30h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	31h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	28h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	31h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	29h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	29h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	26h (5 °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_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	36.8%	

**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	33.9	2.559	8.529	14	<0.0001	CDF	Significant Effect
		GH_ER2	35.74	2.559	8.529	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	28.57	2.559	10.45	10	<0.0001	CDF	Significant Effect
		GH_FR1	28.33	2.559	10.45	10	<0.0001	CDF	Significant Effect
		GH_ERC	27.65	2.559	10.45	10	<0.0001	CDF	Significant Effect
		EV_HC1	28.39	2.559	10.45	10	<0.0001	CDF	Significant Effect
		EV_MC2	27.22	2.559	10.45	10	<0.0001	CDF	Significant Effect
		CM_MC2	24.65	2.559	10.45	10	<0.0001	CDF	Significant Effect
		LC LCDSSLCC	25.88	2.559	10.45	10	<0.0001	CDF	Significant Effect

*Mimi Tran*  
 May 19 17

**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 2 of 3)  
 Test Code: 170359 | 06-5796-1795

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 04-4309-9765      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 12 May-17 14:16      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	87641.67	9737.964	9	219.2	<0.0001	Significant Effect
Error	1866.25	44.43452	42			
Total	89507.92		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	15.5	21.67	0.0781	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9926	0.9388	0.9856	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	28.38	26.83	29.92	28.5	25	31	0.6529	6.51%	0.0%
FR_UFR1	8	141.4	136.9	145.9	140.5	134	150	1.908	3.82%	-398.2%
GH_ER2	8	147.5	139.4	155.6	150	132	159	3.443	6.6%	-419.8%
FR_FRCP1	4	145	133.6	156.4	145.5	137	152	3.582	4.94%	-411.0%
GH_FR1	4	144	136.1	151.9	144.5	138	149	2.483	3.45%	-407.5%
GH_ERC	4	141.3	131.2	151.3	140	135	150	3.172	4.49%	-397.8%
EV_HC1	4	144.3	132.9	155.6	146.5	134	150	3.568	4.95%	-408.4%
EV_MC2	4	139.5	124.8	154.2	136	133	153	4.628	6.64%	-391.6%
CM_MC2	4	129	117.2	140.8	129	120	138	3.697	5.73%	-354.6%
LC LCDSSLCC	4	134	127.4	140.6	134	129	139	2.082	3.11%	-372.2%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	28	31	29	27	28	30	29	25
FR_UFR1	150	147	136	144	139	134	140	141
GH_ER2	151	139	154	132	139	159	157	149
FR_FRCP1	152	137	141	150				
GH_FR1	138	142	149	147				
GH_ERC	141	139	150	135				
EV_HC1	134	150	148	145				
EV_MC2	138	134	153	133				
CM_MC2	128	130	138	120				
LC LCDSSLCC	139	135	129	133				

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 May 19/17

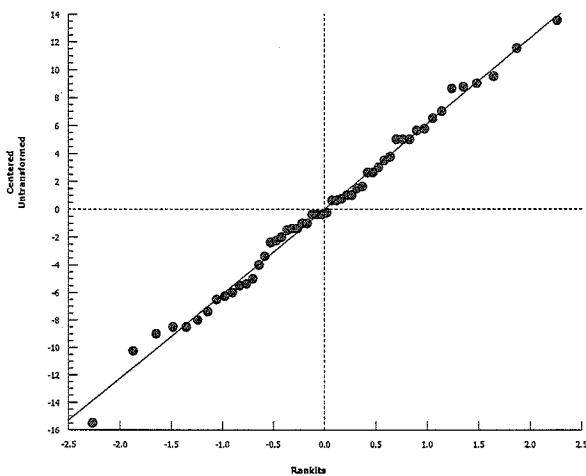
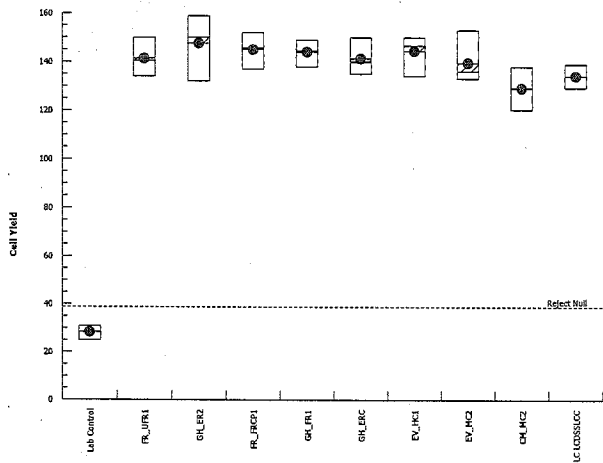
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 04-4309-9765      Endpoint: Cell Yield  
Analyzed: 12 May-17 14:16      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



*EW*  
*May 19/17*



**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 1 of 2)  
 Test Code: 170359 | 06-5796-1795

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-5388-0653	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 12 May-17 14:17	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 12-1762-9257	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 25 Apr-17 17:00	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 28 Apr-17 17:00	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	32h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	29h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	30h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	31h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	28h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	31h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	29h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	29h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	26h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.99%	

**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	-1.688	2.541	9.219	14	0.9999	CDF	Non-Significant Effect
	FR_FRCP1	-0.8159	2.541	11.29	10	0.9954	CDF	Non-Significant Effect
	GH_FR1	-0.5908	2.541	11.29	10	0.9894	CDF	Non-Significant Effect
	GH_ERC	0.02813	2.541	11.29	10	0.9298	CDF	Non-Significant Effect
	EV_HC1	-0.6471	2.541	11.29	10	0.9913	CDF	Non-Significant Effect
	EV_MC2	0.422	2.541	11.29	10	0.8275	CDF	Non-Significant Effect
	CM_MC2	2.785	2.541	11.29	10	0.0287	CDF	Significant Effect
	LC LCDSSLCC	1.66	2.541	11.29	10	0.2603	CDF	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.2751	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1257.511	157.1889	8	2.986	0.0117	Significant Effect
Error	1842.375	52.63929	35			
Total	3099.886		43			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.543	20.09	0.8051	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9872	0.9295	0.9021	Normal Distribution

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-5388-0653      Endpoint: Cell Yield  
 Analyzed: 12 May-17 14:17      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

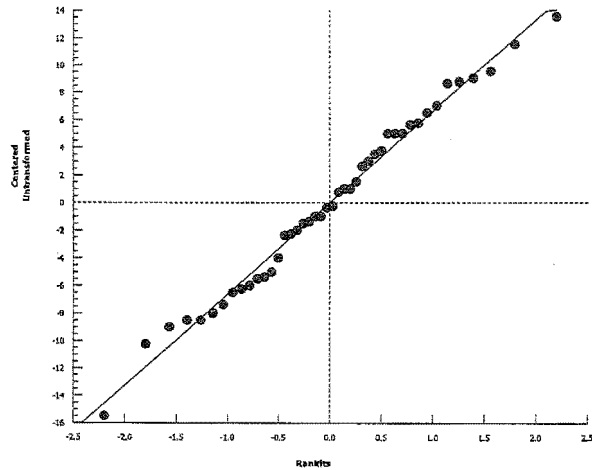
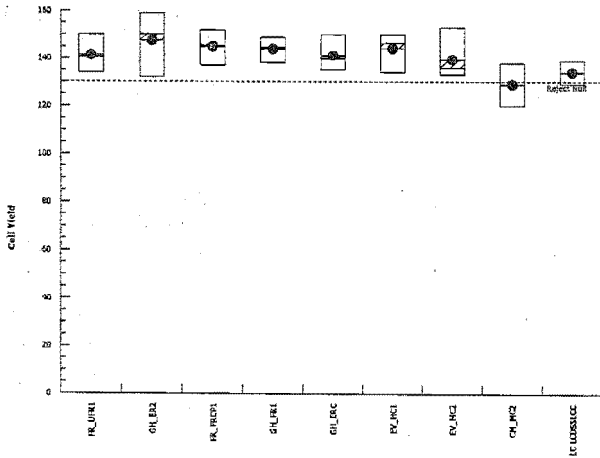
Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	141.4	136.9	145.9	140.5	134	150	1.908	3.82%	0.0%
GH_ER2	8	147.5	139.4	155.6	150	132	159	3.443	6.6%	-4.33%
FR_FRCP1	4	145	133.6	156.4	145.5	137	152	3.582	4.94%	-2.56%
GH_FR1	4	144	136.1	151.9	144.5	138	149	2.483	3.45%	-1.86%
GH_ERC	4	141.3	131.2	151.3	140	135	150	3.172	4.49%	0.09%
EV_HC1	4	144.3	132.9	155.6	146.5	134	150	3.568	4.95%	-2.03%
EV_MC2	4	139.5	124.8	154.2	136	133	153	4.628	6.64%	1.33%
CM_MC2	4	129	117.2	140.8	129	120	138	3.697	5.73%	8.75%
LC LCDSSLCC	4	134	127.4	140.6	134	129	139	2.082	3.11%	5.22%

Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	150	147	136	144	139	134	140	141
GH_ER2	151	139	154	132	139	159	157	149
FR_FRCP1	152	137	141	150				
GH_FR1	138	142	149	147				
GH_ERC	141	139	150	135				
EV_HC1	134	150	148	145				
EV_MC2	138	134	153	133				
CM_MC2	128	130	138	120				
LC LCDSSLCC	139	135	129	133				

Graphics



**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 1 of 2)  
 Test Code: 170359 | 06-5796-1795

<b>EC Alga Growth Inhibition Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 16-6353-6143	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7			
Analyzed: 12 May-17 14:17	Analysis: Parametric-Control vs Treatments	Official Results: Yes			
Batch ID: 12-1762-9257	Test Type: Cell Growth	Analyst: Mimi Tran			
Start Date: 25 Apr-17 17:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients			
Ending Date: 28 Apr-17 17:00	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	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	32h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	29h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	30h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	31h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	28h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	31h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	29h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	29h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	26h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	7.99%	

**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	1.688	2.541	9.219	14	0.2493	CDF	Non-Significant Effect
	FR_FRCP1	0.8159	2.541	11.29	10	0.6635	CDF	Non-Significant Effect
	GH_FR1	0.5908	2.541	11.29	10	0.7639	CDF	Non-Significant Effect
	GH_ERC	-0.02813	2.541	11.29	10	0.9395	CDF	Non-Significant Effect
	EV_HC1	0.6471	2.541	11.29	10	0.7403	CDF	Non-Significant Effect
	EV_MC2	-0.422	2.541	11.29	10	0.9813	CDF	Non-Significant Effect
	CM_MC2	-2.785	2.541	11.29	10	1.0000	CDF	Non-Significant Effect
	LC LCDSSLCC	-1.66	2.541	11.29	10	0.9999	CDF	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.2751	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1257.511	157.1889	8	2.986	0.0117	Significant Effect
Error	1842.375	52.63929	35			
Total	3099.886		43			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.543	20.09	0.8051	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9872	0.9295	0.9021	Normal Distribution

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 16-6353-6143      Endpoint: Cell Yield  
 Analyzed: 12 May-17 14:17      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

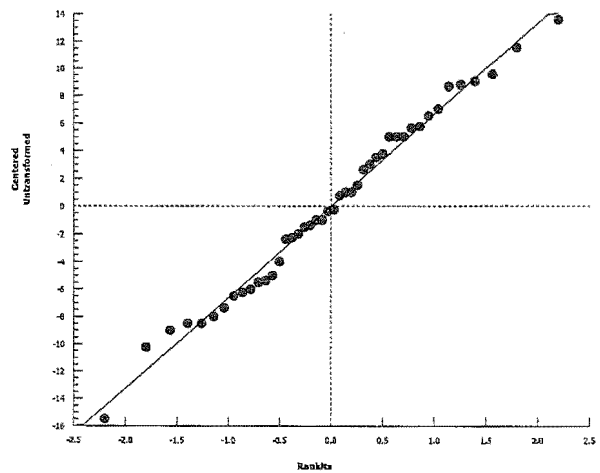
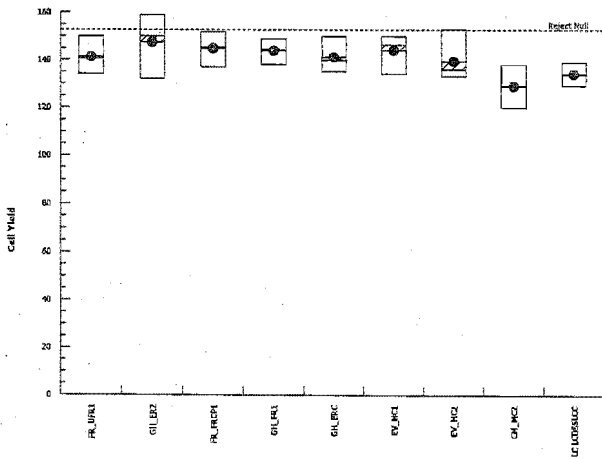
**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	141.4	136.9	145.9	140.5	134	150	1.908	3.82%	0.0%
GH_ER2	8	147.5	139.4	155.6	150	132	159	3.443	6.6%	-4.33%
FR_FRCP1	4	145	133.6	156.4	145.5	137	152	3.582	4.94%	-2.56%
GH_FR1	4	144	136.1	151.9	144.5	138	149	2.483	3.45%	-1.86%
GH_ERC	4	141.3	131.2	151.3	140	135	150	3.172	4.49%	0.09%
EV_HC1	4	144.3	132.9	155.6	146.5	134	150	3.568	4.95%	-2.03%
EV_MC2	4	139.5	124.8	154.2	136	133	153	4.628	6.64%	1.33%
CM_MC2	4	129	117.2	140.8	129	120	138	3.697	5.73%	8.75%
LC LCDSSLCC	4	134	127.4	140.6	134	129	139	2.082	3.11%	5.22%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	150	147	136	144	139	134	140	141
GH_ER2	151	139	154	132	139	159	157	149
FR_FRCP1	152	137	141	150				
GH_FR1	138	142	149	147				
GH_ERC	141	139	150	135				
EV_HC1	134	150	148	145				
EV_MC2	138	134	153	133				
CM_MC2	128	130	138	120				
LC LCDSSLCC	139	135	129	133				

**Graphics**



**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 1 of 2)  
 Test Code: 170359 | 06-5796-1795

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-5516-3085	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 12 May-17 14:19	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 12-1762-9257	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 25 Apr-17 17:00	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 28 Apr-17 17:00	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 4d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	32h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	29h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	30h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	31h (4.5 °C)		
GH_ERC	19-4505-3033	24 Apr-17 13:00	25 Apr-17 09:00	28h (5.5 °C)		
EV_HC1	18-0028-3700	24 Apr-17 10:10	25 Apr-17 09:00	31h (3.5 °C)		
EV_MC2	08-8227-4872	24 Apr-17 12:00	25 Apr-17 09:00	29h (4 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	29h (4.5 °C)		
LC LCDSSLCC	10-6359-5836	24 Apr-17 15:20	25 Apr-17 09:00	26h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-04-24_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-04-24_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		
LC LCDSSLCC	Water Sample	Teck Coal	LC LCDSSLCC WS 2017-04-24 N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.66%	

**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	1.688	2.541	9.219	14	0.2493	CDF	Non-Significant Effect
	FR_FRCP1	0.5627	2.541	11.29	10	0.7753	CDF	Non-Significant Effect
	GH_FR1	0.7878	2.541	11.29	10	0.6769	CDF	Non-Significant Effect
	GH_ERC	1.407	2.541	11.29	10	0.3696	CDF	Non-Significant Effect
	EV_HC1	0.7315	2.541	11.29	10	0.7030	CDF	Non-Significant Effect
	EV_MC2	1.801	2.541	11.29	10	0.2088	CDF	Non-Significant Effect
	CM_MC2	4.164	2.541	11.29	10	0.0007	CDF	Significant Effect
	LC LCDSSLCC	3.039	2.541	11.29	10	0.0155	CDF	Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.7195	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1257.511	157.1889	8	2.986	0.0117	Significant Effect
Error	1842.375	52.63929	35			
Total	3099.886		43			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.543	20.09	0.8051	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9872	0.9295	0.9021	Normal Distribution

*Handwritten signature and date: mag 19/17*

**CETIS Analytical Report**

Report Date: 12 May-17 14:19 (p 2 of 2)  
 Test Code: 170359 | 06-5796-1795

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 08-5516-3085      Endpoint: Cell Yield  
 Analyzed: 12 May-17 14:19      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

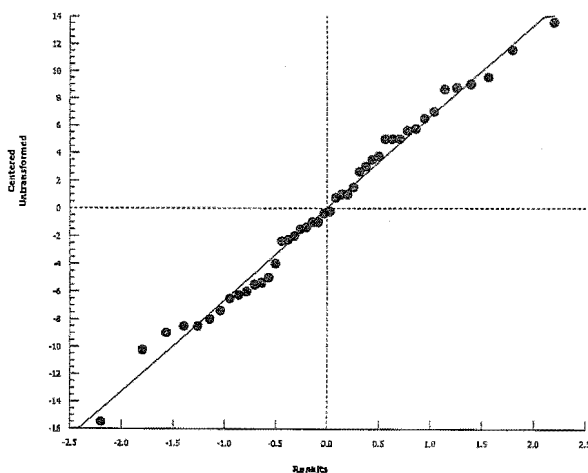
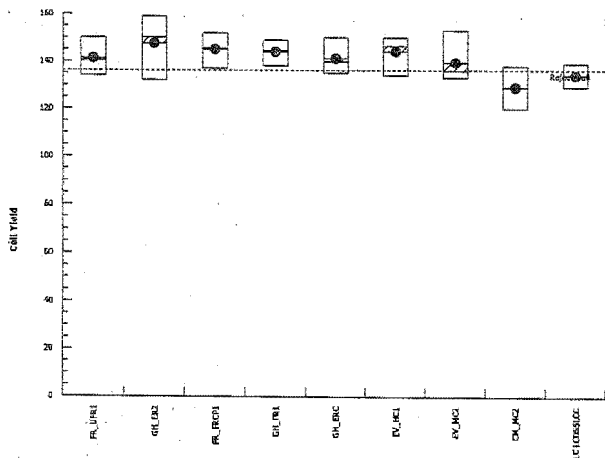
**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	141.4	136.9	145.9	140.5	134	150	1.908	3.82%	0.0%
GH_ER2	8	147.5	139.4	155.6	150	132	159	3.443	6.6%	-4.33%
FR_FRCP1	4	145	133.6	156.4	145.5	137	152	3.582	4.94%	-2.56%
GH_FR1	4	144	136.1	151.9	144.5	138	149	2.483	3.45%	-1.86%
GH_ERC	4	141.3	131.2	151.3	140	135	150	3.172	4.49%	0.09%
EV_HC1	4	144.3	132.9	155.6	146.5	134	150	3.568	4.95%	-2.03%
EV_MC2	4	139.5	124.8	154.2	136	133	153	4.628	6.64%	1.33%
CM_MC2	4	129	117.2	140.8	129	120	138	3.697	5.73%	8.75%
LC LCDSSLCC	4	134	127.4	140.6	134	129	139	2.082	3.11%	5.22%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	150	147	136	144	139	134	140	141
GH_ER2	151	139	154	132	139	159	157	149
FR_FRCP1	152	137	141	150				
GH_FR1	138	142	149	147				
GH_ERC	141	139	150	135				
EV_HC1	134	150	148	145				
EV_MC2	138	134	153	133				
CM_MC2	128	130	138	120				
LC LCDSSLCC	139	135	129	133				

**Graphics**



*Handwritten signature and date:*  
 May 19/17

**Pseudokirchneriella subcapitata Summary Sheet**

Client: Teck Coal  
 Work Order No.: 170416

Start Date: May 5/17  
 Set up by: MLJ

**Sample Information:**

Sample ID: Various; see tables<sup>147</sup> of results for IDs.  
 Sample Date: May 2/17  
 Date Received: May 3/17  
 Sample Volume: Various

**Test Organism Information:**

Culture Date: April 28/17  
 Age of culture (Day 0): 7d

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: SC156  
 Stock Solution ID: 17Zn01  
 Date Initiated: April 25/17

72-h IC50 (95% CL): 31.7 (27.6 - 36.2) µg/L Zn


72-h IC50 Reference Toxicant Mean and Range: 33.6 (29.5 - 44.3) µg/L Zn CV (%): 15

**Test Results:**

	Cell Yield (Mean ± SD)
Negative Control	29.9 ± 1.6
CM-MC1-WS-20170502-N	170.0 ± 11.6 <sup>#</sup>
CM-MC2-WS-20170502-N	151.8 ± 11.0 <sup>#a</sup>
	±
	±
	±
	±
	±
	±

a. indicates that cell yield was significantly lower than site control CM-MC1

<sup>#</sup> indicates cell yield that were significantly greater than lab control.

Reviewed by: 

Date reviewed: July 7, 2017

## 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Tect Coal

Setup by: MLT

Sample ID: Various

Test Date/Time: May 5/17 @ 0745h

Work Order No.: 170410

Test Species: Pseudokirchneriella subcapitata

Culture Date: Apr 28/17 Age of Culture: 7d Culture Health: Good

Culture Count: 1 525 2 490 Average: 507.5 Culture Cell Density (c1): 507.5 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 150 \text{ mL}}{(c1) \quad 507.5 \times 10^4 \text{ cells/mL}} = 4.33 \text{ mL}$$

Time Zero Counts: 1 23 2 24 Average: 23.5

No. of Cells/mL: 23.5 x 10<sup>4</sup> Initial Density: # cells/mL + 220 μL x 10 μL = 10682 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature (°C)				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	7.2	24.0	25.0	24.0	24.0	24.0	✓	✓	✓	✓
(site control) CM-MC1	7.9	24.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MC2	8.0	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	A	~	MLT	MLT	A	A	MLT

Initial control pH: Well 1: 7.2 Well 2: 7.2

Final control pH: Well 1: 7.0 Well 2: 7.0

Light intensity (lux): 4240 Date measured: May 5/17

Instruments: Thermometer 4 pH meter 1 Light meter 1

Sample Description: CM-MC1: clear, colourless, odourless, no particulates  
CM-MC2: clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_


Reviewed: [Signature] Date reviewed: July 7, 2017



**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck Coal Start Date/Time: May 5/17 @ 0745h  
 Work Order #: 170410 Termination Date: May 8/17 @ 0745h  
 Sample ID: Various Test set up by: MCI  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	33					MCI
	B	32					
	C	30					
	D	33					
	E	29					
	F	30					
	G	29					
	H	31					
(95.2) CM MCI (site control)	A	170					
	B	164					
	C	178					
	D	181					
	EA	154					
	FB	160					
	GC	178					
	HD	189					
(95.2%) CM MCI	A	143					
	B	165					
	C	159					
	D	144					
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Comments: \_\_\_\_\_  
 Reviewed by:  Date Reviewed: July 7, 2017



**CETIS Summary Report**

Report Date: 28 May-17 15:59 (p 1 of 1)  
 Test Code: 170410 | 19-1503-8227

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Batch ID: 05-5993-4510      Test Type: Cell Growth      Analyst: Mimi Tran  
 Start Date: 05 May-17 07:45      Protocol: EC/EPS 1/RM/25      Diluent: Deionized Water + nutrients  
 Ending Date: 08 May-17 07:45      Species: Pseudokirchneriella subcapitata      Brine:  
 Duration: 72h      Source: In-House Culture      Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	21-2416-1469	05 May-17	05 May-17	8h	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	70h (3.2 °C)		
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	71h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	29.88	28.5	31.25	28	32	0.5806	1.642	5.5%	0.0%
CM_MC1	8	170	160.3	179.7	153	188	4.084	11.55	6.8%	-469.0%
CM_MC2	4	151.8	134.3	169.2	142	164	5.483	10.97	7.23%	-407.9%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	32	31	29	32	28	29	28	30
CM_MC1	169	163	171	180	153	159	177	188
CM_MC2	142	164	158	143				

*[Handwritten Signature]*  
 July 7/17

**CETIS Analytical Report**

Report Date: 28 May-17 15:57 (p 1 of 2)  
 Test Code: 170410 | 19-1503-8227

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-7225-1827	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 28 May-17 15:56	<b>Analysis:</b> Nonparametric-Multiple Comparison	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-5993-4510	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 05 May-17 07:45	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 08 May-17 07:45	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	21-2416-1469	05 May-17	05 May-17	8h	Teck Coal	
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	70h (3.2 °C)		
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	71h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	38.0%	

**Wilcoxon/Bonferroni Adj Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		CM_MC1	36	NA	0	14	0.0002	Exact	Significant Effect
		CM_MC2	10	NA	0	10	0.0040	Exact	Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1258	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	87130.58	43565.29	2	563.8	<0.0001	Significant Effect
Error	1313.625	77.27206	17			
Total	88444.2		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	16.77	9.21	0.0002	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9755	0.866	0.8647	Normal Distribution

**Cell Yield Summary**

C-%	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	29.88	28.5	31.25	29.5	28	32	0.5806	5.5%	0.0%
CM_MC1	8	170	160.3	179.7	170	153	188	4.084	6.8%	-469.0%
CM_MC2	4	151.8	134.3	169.2	150.5	142	164	5.483	7.23%	-407.9%

**Cell Yield Detail**

C-%	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	32	31	29	32	28	29	28	30
CM_MC1	169	163	171	180	153	159	177	188
CM_MC2	142	164	158	143				

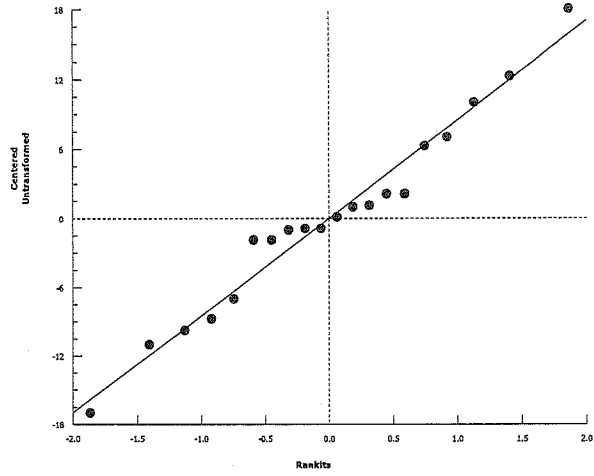
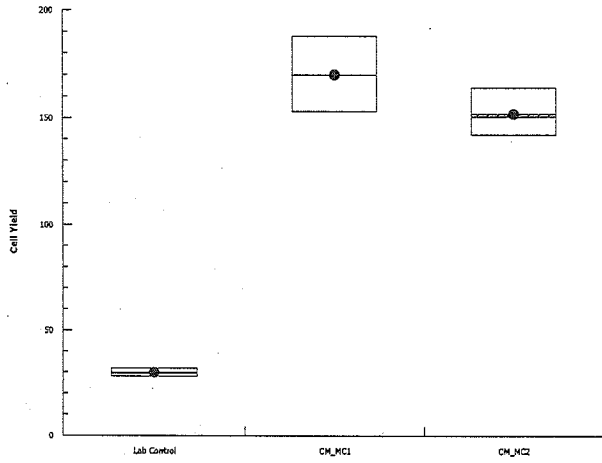
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-7225-1827      Endpoint: Cell Yield  
Analyzed: 28 May-17 15:56      Analysis: Nonparametric-Multiple Comparison

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 28 May-17 15:59 (p 1 of 2)  
 Test Code: 170410 | 19-1503-8227

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-5370-3524	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 28 May-17 15:59	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-5993-4510	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 05 May-17 07:45	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 08 May-17 07:45	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	15-2595-6436	02 May-17 10:00	03 May-17 09:45	70h (3.2 °C)	Teck Coal	
CM_MC2	19-3585-4439	02 May-17 08:30	03 May-17 09:45	71h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170502_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170502_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.43%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		CM_MC2	2.619	1.812	12.63	10	0.0128	CDF	Significant Effect

**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	888.1667	888.1667	1	6.86	0.0256	Significant Effect
Error	1294.75	129.475	10			
Total	2182.917		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.11	44.43	1.0261	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9631	0.8025	0.8267	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	8	170	160.3	179.7	170	153	188	4.084	6.8%	0.0%
CM_MC2	4	151.8	134.3	169.2	150.5	142	164	5.483	7.23%	10.74%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
CM_MC1	169	163	171	180	153	159	177	188
CM_MC2	142	164	158	143				

# CETIS Analytical Report

Report Date: 28 May-17 15:59 (p 2 of 2)  
Test Code: 170410 | 19-1503-8227

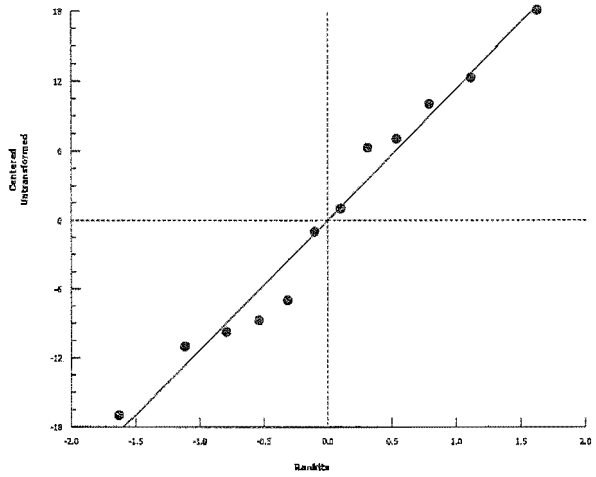
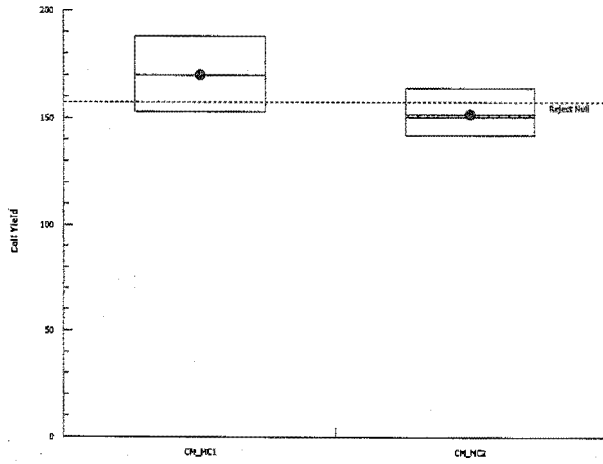
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 11-5370-3524      Endpoint: Cell Yield  
Analyzed: 28 May-17 15:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**APPENDIX C – *Hyaella azteca* Toxicity Test Data**

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## Hyalella azteca Test Summary Sheet

Client: Teck  
 Work Order No.: 170361

Start Date: 26-Apr-17  
 Set up by: KJL

**Sample Information:**

Sample ID: Various - See below  
 Sample Date: April 24, May 2, 9, 16, 2017  
 Date Received: April 25, May 3, 10, 17, 2017  
 Sample Volume: 5-8x 20L per refresh

**Test Organism Information:**

Species: Hyalella azteca  
 Supplier: Aquatic Research Organisms, NH  
 Date received: 26-Apr-17  
 Age or size (Day 0): 8-days

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: HA128  
 Stock Solution ID: n/a  
 Date Initiated: 26-Apr-17

96-h LC50 (95% CL): 6.0 (4.8 - 7.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.7 (5.0 - 6.6) g/L NaCl CV (%): 7

**Test Results:**

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	86.0 ± 5.5	0.90 ± 0.06
FR_UFR1	86.0 ± 11.4	0.91 ± 0.04
GH_ER2	94.0 ± 5.5	0.83 ± 0.04 <sup>*,†</sup>
FR_FRCP1	86.0 ± 11.4	0.80 ± 0.10 <sup>†</sup>
GH_FR1	86.0 ± 11.4	0.89 ± 0.07
CM_MC2	50.0 ± 18.7 <sup>*,†,α</sup>	0.14 ± 0.02 <sup>*,†,α</sup>

\* Samples that are significantly different from Control

† Samples that are significantly different from reference site FR\_UFR1

α Samples that are significantly different from reference site GH\_ER2

Reviewed by: 

Date reviewed: July 20, 2017

### Chronic *H. azteca* Toxicity Test Data Sheet Water Quality

Client: Teck  
 WO #: 170361  
 Sample ID: Various - See below

Start Date: Apr 26/17  
 Termination Date: May 24/17  
 Test Organism: *H. azteca*

#### Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Laboratory Control	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
FR_UFR1	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
GH_ER2	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
<del>CM_MC1</del> <sup>KS</sup>															
FR_FRCP1	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
GH_FR1	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
CM_MC2	22.0	22.5	23.0	22.6	22.6	23.0	22.0	23.0	23.0	23.0	23.5	23.0	23.0	23.0	22.5
Technician Initials	KJL	KJL	KJL	A	A	KJL	KJL	KJL	KJL	KJL	A	A	KJL	KJL	KJL

#### Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Laboratory Control	454	463	477	452	461	475	460	468	460	459	445	420	482	456	459
FR_UFR1	360	379	346	351	350	356	350	339	355	365	359	368	351	392	378
GH_ER2	402	427	415	407	412	425	435	426	430	417	409	415	430	424	429
<del>CM_MC1</del> <sup>KS</sup>															
FR_FRCP1	820	843	852	850	855	861	864	865	866	878	888	1004	1000	1008	1002
GH_FR1	789	803	809	819	821	830	838	839	835	831	801	822	824	826	830
CM_MC2	769	868	863	850	845	879	888	842	850	875	857	850	892	889	863
Technician Initials	KJL	KJL	KJL	A	A	KJL	KJL	KJL	KJL	KJL	A	A	KJL	KJL	KJL

#### Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Laboratory Control	8.4	6.5	6.6	6.8	6.7	6.8	7.7	7.3	7.1	6.9	6.4	5.9	6.6	6.3	6.5
FR_UFR1	8.5	6.7	6.8	6.8	6.8	6.9	7.1	7.2	7.0	7.0	6.4	6.0	6.7	6.3	6.6
GH_ER2	8.5	6.6	6.7	6.7	6.7	7.0	7.0	7.2	7.1	6.9	6.4	6.0	6.6	6.2	6.7
<del>CM_MC1</del> <sup>KS</sup>															
FR_FRCP1	8.5	6.7	6.6	6.8	6.7	7.0	7.1	7.2	7.1	6.9	6.4	6.1	6.5	6.2	6.8
GH_FR1	8.4	6.8	6.7	6.7	6.6	6.9	7.2	7.1	7.2	7.1	6.4	6.0	6.6	6.1	6.7
CM_MC2	8.5	6.7	6.6	6.8	6.7	6.9	7.2	7.2	7.1	7.0	6.6	6.0	6.7	6.2	6.7
Technician Initials	KJL	KJL	KJL	A	A	KJL	KJL	KJL	KJL	KJL	A	A	KJL	KJL	KJL

#### pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Laboratory Control	7.8	7.2	7.1	7.6	7.3	7.1	7.2	7.2	7.2	7.2	7.1	7.2	7.2	7.0	7.2
FR_UFR1	8.0	7.5	7.2	7.9	7.9	7.2	7.0	7.2	7.4	7.3	7.5	7.6	7.4	7.2	7.4
GH_ER2	8.0	7.7	7.4	7.8	7.9	7.7	7.3	7.3	7.4	7.3	7.7	7.9	7.5	7.2	7.5
<del>CM_MC1</del> <sup>KS</sup>															
FR_FRCP1	8.0	7.8	7.6	7.8	7.9	7.6	7.5	7.5	7.7	7.7	8.0	8.0	7.7	7.5	7.6
GH_FR1	8.0	7.8	7.6	7.8	7.8	7.6	7.5	7.5	7.7	7.8	8.0	8.0	7.7	7.7	7.7
CM_MC2	8.0	7.8	7.6	7.9	7.9	7.6	7.5	7.6	7.8	7.8	8.0	8.0	7.6	7.7	7.6
Technician Initials	KJL	KJL	KJL	A	A	KJL	KJL	KJL	KJL	KJL	A	A	KJL	KJL	KJL

Comments: Samples amended with 0.25 mg/L Cl and 0.02 mg/L Br

Reviewed by:  Date Reviewed: July 5, 2017

2/2

## Chronic *H. azteca* Toxicity Test Data Sheet Water Quality

Client: Teck  
 WO #: 170361  
 Sample ID: Various - See below

Start Date: Apr 26/17  
 Termination Date: May 24/17  
 Test Organism: *H. azteca*

### Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Laboratory Control	23.5	23.0	23.5	23.5	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
FR_UFR1	23.5	23.0	23.5	23.5	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
GH_ER2	23.5	23.0	23.5	23.5	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
<del>CM_MC1</del>														
FR_FRCP1	23.5	23.0	23.5	23.5	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
GH_FR1	23.5	23.0	23.5	23.6	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
CM_MC2	23.5	23.0	23.5	23.6	23.0	23.0	23.0	23.0	23.0	23.5	23.0	23.0	22.0	23.0
Technician Initials	KJL	KJL	K	A	KJL	KJL	KJL	KJL	KJL	K	A	JW	KJL	KJL

### Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Laboratory Control	435	437	435	445	444	442	445	434	429	425	446	458	456	459
FR_UFR1	329	344	341	336	343	342	353	341	332	309	334	335	334	337
GH_ER2	419	416	402	397	405	409	418	411	403	388	395	399	401	405
<del>CM_MC1</del>														
FR_FRCP1	1028	722	700	656	686	683	692	707	731	730	734	733	731	740
GH_FR1	825	756	744	676	690	633	634	620	644	625	636	646	647	655
CM_MC2	846	823	734	714	731	727	740	731	723	711	731	720	731	739
Technician Initials	KJL	KJL	K	A	KJL	KJL	KJL	KJL	KJL	K	A	JW	KJL	KJL

### Dissolved oxygen (mg/L)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Laboratory Control	6.7	6.1	5.4	6.3	6.7	6.8	7.1	6.7	6.5	5.5	5.6	5.1	6.2	6.0
FR_UFR1	6.8	6.0	5.4	6.4	6.7	6.8	7.2	6.8	6.4	5.6	5.5	5.1	6.1	5.9
GH_ER2	6.8	6.2	5.8	6.4	6.6	6.7	7.0	6.7	6.5	5.6	5.4	5.9	6.2	5.8
<del>CM_MC1</del>														
FR_FRCP1	6.7	6.0	5.9	6.5	6.7	6.8	7.1	6.6	6.6	5.2	5.6	5.0	6.4	5.3
GH_FR1	6.7	5.9	5.8	6.5	6.7	6.8	7.1	6.7	6.5	5.1	5.4	5.5	6.3	5.5
CM_MC2	6.7	6.0	5.4	6.6	6.6	6.8	7.0	6.8	6.4	5.2	5.5	5.1	6.2	5.3
Technician Initials	KJL	KJL	K	A	KJL	KJL	KJL	KJL	KJL	K	A	JW	KJL	KJL

### pH

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Laboratory Control	7.3	7.2	7.0	7.2	7.2	7.2	7.3	7.5	7.5	7.2	7.4	7.4	7.2	7.2
FR_UFR1	7.7	7.6	7.5	7.7	7.4	7.4	7.6	7.6	7.6	7.4	7.6	7.6	7.6	7.5
GH_ER2	7.8	7.6	7.8	7.9	7.6	7.6	7.8	7.9	7.9	7.7	7.7	8.0	7.9	7.7
<del>CM_MC1</del>														
FR_FRCP1	7.9	7.8	7.9	8.0	7.6	7.5	7.7	7.9	7.9	7.6	7.7	7.8	7.8	7.7
GH_FR1	8.0	7.8	7.8	7.9	7.6	7.5	7.7	7.9	7.9	7.6	7.8	7.8	7.8	7.8
CM_MC2	8.0	7.7	7.7	8.0	7.6	7.5	7.7	7.9	7.8	7.6	7.7	7.8	7.8	7.7
Technician Initials	KJL	KJL	K	A	KJL	KJL	KJL	KJL	KJL	K	A	JW	KJL	KJL

Comments:

\_\_\_\_\_

\_\_\_\_\_

Reviewed by:



Date Reviewed:

July 5, 2017

### H. azteca Toxicity Test Data Sheet Survival and Weight

Client: Teck  
 Work Order No: 170361  
 Sample ID: Various - See below

Start Date: Apr 26/17  
 Termination Date: May 24/17  
 Test Organism: Hyalella azteca

Sample ID	Pan No. <small>PM Orange</small>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Laboratory Control	1	A	8	0	2	KJL	1007.80	1014.94	8	KJL
	2	B	9	0	1		1013.97	1021.87	9	
	3	C	9	1	0		1031.76	1039.10	9	
	4	D	9	0	1		1026.15	1035.07	9	
	5	E	8	0	2		1022.47	1029.67	8	
FR_UFR1	6	A	9	0	1	KJL	1008.25	1016.39	9	
	7	B	10	0	0		1020.15	1029.20	10	
	8	C	9	0	1		1026.43	1034.18	9	
	9	D	7	0	3		1003.05	1009.80	7	
	10	E	8	0	2		1006.95	1014.17	8	
GH_ER2	11	A	9	0	1	KJL	1003.43	1011.03	9	
	12	B	10	0	0		1013.56	1021.50	10	
	13	C	9	0	1		1020.46	1028.41	9	
	14	D	10	0	0		1011.58	1019.55	10	
	15	E	9	0	1		995.34	1002.73	9	
CM_MC1	16	A					998.16			
	17	B					1011.09			
	18	C					1005.24			
	19	D					998.00			
	20	E					998.62			

Comments: 10% Re-weigh = # 5. 1029.61 # 29. 1042.25  
(mg) # 12. 1021.41 # 35. 1004.79

Reviewed by:  Date Reviewed: July 5, 2017

### H. azteca Toxicity Test Data Sheet Survival and Weight

Client: Teck  
Work Order No: 170361  
Sample ID: Various - See below

Start Date: Apr 26/17  
Termination Date: May 24/17  
Test Organism: Hyalella azteca

Sample ID	Pan No.	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
FR_FRCP1	21	A	9	0	1	KDL	1005.03	1012.38	9	KL
	22	B	9	0	1		1005.99	1013.61	9	
	23	C	7	0	3		1005.73	1012.27	7	
	24	D	10	0	0		1016.58	1023.84	10	
	25	E	8	0	2		1013.13	1018.50	8	
GH_FR1	26	A	7	0	3		1015.33	1022.05	7	
	27	B	10	0	0		1026.47	1034.40	10	
	28	C	8	0	2		996.02	1002.90	8	
	29	D	9	0	1		1034.11	1042.35	9	
	30	E	9	0	1		1023.67	1032.14	9	
CM_MC2	31	A	4	1	5		1017.65	1018.09	4	
	32	B	3	2	5		1011.95	1012.43	3	
	33	C	7	0	3		1022.47	1023.28	7	
	34	D	4	0	6		1003.39	10034.00	4	
	35	E	7	0	3		1003.75	1004 <sup>mv</sup> .76	7	
		A								
		B								
		C								
		D								
		E								

Comments: Organisms in CM\_MC2 are very small

Reviewed by: 

Date Reviewed: July 5, 2017

Client: TECL

W.O.#: 170361

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
Day 0 Control	Apr 24/17	Apr 26/17	50	2.9	3.0	56	50	7.0	140	KDL
FR_UFRI	↓	↓	↓	6.1	6.3	118	↓	6.7	134	KL
GH_ER2	↓	↓	↓	8.6	8.7	170	↓	8.5	170	↓
FR-FRCPI	↓	↓	↓	9.5	9.7	186	↓	20.9	418	↓
GH-FRI	↓	↓	↓	10.6	10.7	210	100	4.9	490	↓
CM-MC2	↓	↓	↓	10.4	10.6	204	100	4.2	420	↓
Day 28 Control	May 24/17	Jun 22/17	50	3.0	3.1	58	50	7.1	142	KDL
FR_UFRI	↓	↓	50	6.0	6.2	116	50	6.4	128	↓
GH_ER2	↓	↓	50	7.9	7.9	150	50	8.4	168	↓
FR-FRCPI	↓	↓	50	8.8	9.0	172	50	17.2	344	↓
GH-FRI	↓	↓	50	8.2	8.4	160	100	3.1	310	↓
CM-MC2	↓	↓	50	8.6	8.8	168	100	3.4	340	↓

Notes:

Reviewed by: 

Date Reviewed: July 5, 2017

**CETIS Summary Report**

Report Date: 22 Jun-17 15:51 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

Batch ID: 06-8871-2647      Test Type: Survival-Growth      Analyst: Karen Lee  
 Start Date: 26 Apr-17      Protocol: EPA/600/R-99/064 (2000)      Diluent: Site Water  
 Ending Date: 24 May-17      Species: Hyalella azteca      Brine:  
 Duration: 28d 0h      Source: Aquatic Research Organisms, NH      Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	12-7042-5880	26 Apr-17	26 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8. °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

**Test Acceptability**

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
19-2319-3354	Survival Rate	Control Resp	0.86	0.8 - NL	Yes	Passes Acceptability Criteria

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.8954	0.8172	0.9736	0.8156	0.9911	0.02817	0.063	7.04%	0.0%
FR_UFR1	5	0.9075	0.8618	0.9532	0.8611	0.9643	0.01646	0.0368	4.06%	-1.35%
GH_ER2	5	0.828	0.7819	0.874	0.794	0.8833	0.01658	0.03707	4.48%	7.53%
FR_FRCP1	5	0.799	0.6709	0.927	0.6712	0.9343	0.04612	0.1031	12.91%	10.77%
GH_FR1	5	0.8939	0.8097	0.9781	0.793	0.96	0.03033	0.06782	7.59%	0.16%
CM_MC2	5	0.1365	0.1087	0.1643	0.11	0.16	0.01001	0.02237	16.39%	84.76%

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.86	0.792	0.928	0.8	0.9	0.02449	0.05477	6.37%	0.0%
FR_UFR1	5	0.86	0.7184	1	0.7	1	0.05099	0.114	13.26%	0.0%
GH_ER2	5	0.94	0.872	1	0.9	1	0.02449	0.05477	5.83%	-9.3%
FR_FRCP1	5	0.86	0.7184	1	0.7	1	0.05099	0.114	13.26%	0.0%
GH_FR1	5	0.86	0.7184	1	0.7	1	0.05099	0.114	13.26%	0.0%
CM_MC2	5	0.5	0.2677	0.7323	0.3	0.7	0.08367	0.1871	37.42%	41.86%

**CETIS Summary Report**

Report Date: 22 Jun-17 15:51 (p 2 of 2)  
 Test Code: 170361 | 12-7313-9285

**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
Control	0.8925	0.8778	0.8156	0.9911	0.9
FR_UFR1	0.9044	0.905	0.8611	0.9643	0.9025
GH_ER2	0.8444	0.794	0.8833	0.797	0.8211
FR_FRCP1	0.8167	0.8467	0.9343	0.726	0.6712
GH_FR1	0.96	0.793	0.86	0.9156	0.9411
CM_MC2	0.11	0.16	0.1157	0.1525	0.1443

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.8	0.9	0.9	0.9	0.8
FR_UFR1	0.9	1	0.9	0.7	0.8
GH_ER2	0.9	1	0.9	1	0.9
FR_FRCP1	0.9	0.9	0.7	1	0.8
GH_FR1	0.7	1	0.8	0.9	0.9
CM_MC2	0.4	0.3	0.7	0.4	0.7

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	8/10	9/10	9/10	9/10	8/10
FR_UFR1	9/10	10/10	9/10	7/10	8/10
GH_ER2	9/10	10/10	9/10	10/10	9/10
FR_FRCP1	9/10	9/10	7/10	10/10	8/10
GH_FR1	7/10	10/10	8/10	9/10	9/10
CM_MC2	4/10	3/10	7/10	4/10	7/10



**CETIS Analytical Report**

Report Date: 20 Jul-17 15:14 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-7447-1771	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 15:14	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 06-8871-2647	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Karen Lee
<b>Start Date:</b> 26 Apr-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Site Water
<b>Ending Date:</b> 24 May-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	12-7042-5880	26 Apr-17	26 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	15.6%	

**Equal Variance t Two-Sample Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	FR_UFR1	-0.1183	1.86	0.148	8	0.5456	CDF	Non-Significant Effect
	GH_ER2	-2.304	1.86	0.098	8	0.9749	CDF	Non-Significant Effect
	FR_FRCP1	-0.1183	1.86	0.148	8	0.5456	CDF	Non-Significant Effect
	GH_FR1	-0.1183	1.86	0.148	8	0.5456	CDF	Non-Significant Effect
	CM_MC2	4.385	1.86	0.172	8	0.0012	CDF	Significant Effect

**Test Acceptability Criteria**

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.86	0.8 - NL	Yes	Passes Acceptability Criteria

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.8453348	0.169067	5	7.968	0.0002	Significant Effect
Error	0.5092649	0.02121937	24			
Total	1.3546		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.134	15.09	0.5303	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9171	0.9031	0.0226	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	0.86	0.792	0.928	0.9	0.8	0.9	0.02449	6.37%	0.0%
FR_UFR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_ER2	5	0.94	0.872	1	0.9	0.9	1	0.02449	5.83%	-9.3%
FR_FRCP1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_FR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
CM_MC2	5	0.5	0.2677	0.7323	0.4	0.3	0.7	0.08367	37.42%	41.86%

**CETIS Analytical Report**

Report Date: 20 Jul-17 15:14 (p 2 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 07-7447-1771      Endpoint: Survival Rate  
 Analyzed: 20 Jul-17 15:14      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	1.192	1.096	1.289	1.249	1.107	1.249	0.03476	6.52%	0.0%
FR_UFR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	-0.79%
GH_ER2	5	1.314	1.203	1.425	1.249	1.249	1.412	0.03992	6.79%	-10.23%
FR_FRCP1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	-0.79%
GH_FR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	-0.79%
CM_MC2	5	0.7863	0.548	1.025	0.6847	0.5796	0.9912	0.08581	24.4%	34.05%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.8	0.9	0.9	0.9	0.8
FR_UFR1	0.9	1	0.9	0.7	0.8
GH_ER2	0.9	1	0.9	1	0.9
FR_FRCP1	0.9	0.9	0.7	1	0.8
GH_FR1	0.7	1	0.8	0.9	0.9
CM_MC2	0.4	0.3	0.7	0.4	0.7

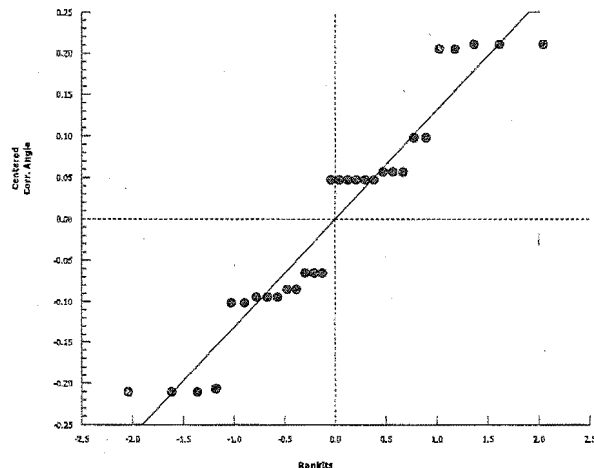
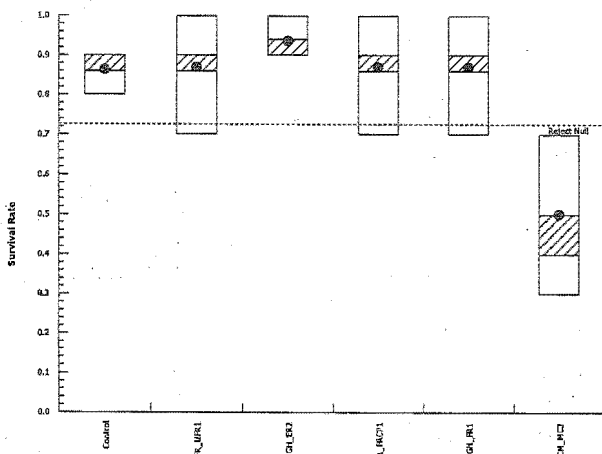
**Angular (Corrected) Transformed Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	1.107	1.249	1.249	1.249	1.107
FR_UFR1	1.249	1.412	1.249	0.9912	1.107
GH_ER2	1.249	1.412	1.249	1.412	1.249
FR_FRCP1	1.249	1.249	0.9912	1.412	1.107
GH_FR1	0.9912	1.412	1.107	1.249	1.249
CM_MC2	0.6847	0.5796	0.9912	0.6847	0.9912

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	8/10	9/10	9/10	9/10	8/10
FR_UFR1	9/10	10/10	9/10	7/10	8/10
GH_ER2	9/10	10/10	9/10	10/10	9/10
FR_FRCP1	9/10	9/10	7/10	10/10	8/10
GH_FR1	7/10	10/10	8/10	9/10	9/10
CM_MC2	4/10	3/10	7/10	4/10	7/10

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 15:15 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 05-9718-0403	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 15:15	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 06-8871-2647	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 26 Apr-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Site Water
Ending Date: 24 May-17	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Research Organisms, NH	Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	12-7042-5880	26 Apr-17	26 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.21%	

**Equal Variance t Two-Sample Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	FR_UFR1	-0.3701	1.86	0.061	8	0.6396	CDF	Non-Significant Effect
	GH_ER2	2.062	1.86	0.061	8	0.0366	CDF	Significant Effect
	FR_FRCP1	1.784	1.86	0.101	8	0.0561	CDF	Non-Significant Effect
	GH_FR1	0.03515	1.86	0.077	8	0.4864	CDF	Non-Significant Effect
	CM_MC2	25.38	1.86	0.056	8	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.256242	0.4512484	5	120.7	<0.0001	Significant Effect
Error	0.08972411	0.003738505	24			
Total	2.345966		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.896	15.09	0.0782	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9823	0.9031	0.8836	Normal Distribution

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	0.8954	0.8172	0.9736	0.8925	0.8156	0.9911	0.02817	7.04%	0.0%
FR_UFR1	5	0.9075	0.8618	0.9532	0.9044	0.8611	0.9643	0.01646	4.06%	-1.35%
GH_ER2	5	0.828	0.7819	0.874	0.8211	0.794	0.8833	0.01658	4.48%	7.53%
FR_FRCP1	5	0.799	0.6709	0.927	0.8167	0.6712	0.9343	0.04612	12.91%	10.77%
GH_FR1	5	0.8939	0.8097	0.9781	0.9156	0.793	0.96	0.03033	7.59%	0.16%
CM_MC2	5	0.1365	0.1087	0.1643	0.1443	0.11	0.16	0.01001	16.39%	84.76%

# CETIS Analytical Report

Report Date: 20 Jul-17 15:15 (p 2 of 2)  
 Test Code: 170361 | 12-7313-9285

## Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

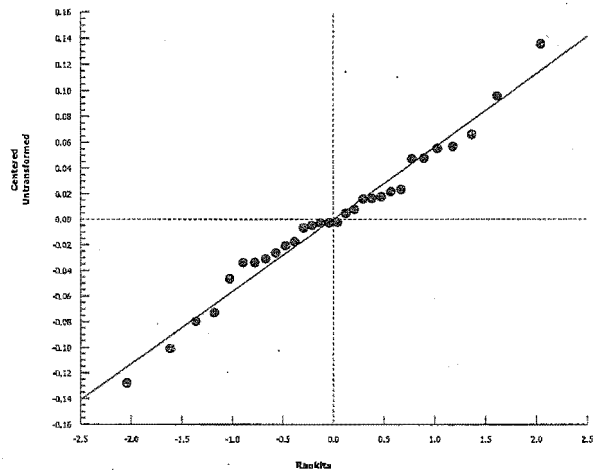
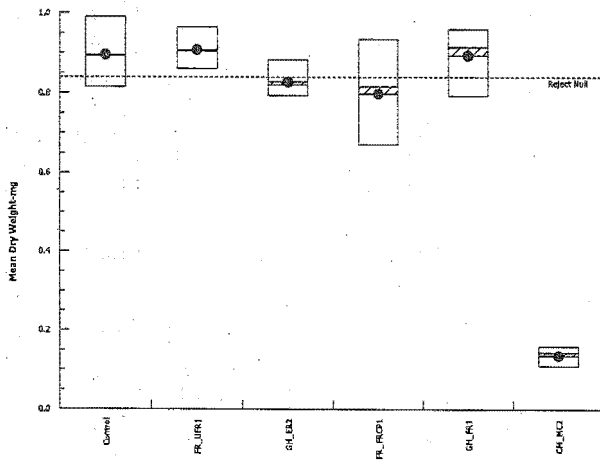
Analysis ID: 05-9718-0403      Endpoint: Mean Dry Weight-mg  
 Analyzed: 20 Jul-17 15:15      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.8925	0.8778	0.8156	0.9911	0.9
FR_UFR1	0.9044	0.905	0.8611	0.9643	0.9025
GH_ER2	0.8444	0.794	0.8833	0.797	0.8211
FR_FRCP1	0.8167	0.8467	0.9343	0.726	0.6712
GH_FR1	0.96	0.793	0.86	0.9156	0.9411
CM_MC2	0.11	0.16	0.1157	0.1525	0.1443

### Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 15:17 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 15-7875-0596	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 15:16	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 06-8871-2647	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 26 Apr-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Site Water
Ending Date: 24 May-17	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Research Organisms, NH	Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	18.3%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	-1.376	1.86	0.152	8	0.8969	CDF	Non-Significant Effect
		FR_FRCP1	0	1.86	0.188	8	0.5000	CDF	Non-Significant Effect
		GH_FR1	0	1.86	0.188	8	0.5000	CDF	Non-Significant Effect
		CM_MC2	3.721	1.86	0.208	8	0.0029	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.8344228	0.2086057	4	8.6	0.0003	Significant Effect
Error	0.4851032	0.02425516	20			
Total	1.319526		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.986	13.28	0.7383	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9089	0.8877	0.0288	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_ER2	5	0.94	0.872	1	0.9	0.9	1	0.02449	5.83%	-9.3%
FR_FRCP1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_FR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
CM_MC2	5	0.5	0.2677	0.7323	0.4	0.3	0.7	0.08367	37.42%	41.86%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
GH_ER2	5	1.314	1.203	1.425	1.249	1.249	1.412	0.03992	6.79%	-9.37%
FR_FRCP1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
GH_FR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
CM_MC2	5	0.7863	0.548	1.025	0.6847	0.5796	0.9912	0.08581	24.4%	34.57%

**CETIS Analytical Report**

Report Date: 20 Jul-17 15:17 (p 2 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 15-7875-0596      Endpoint: Survival Rate  
 Analyzed: 20 Jul-17 15:16      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9	1	0.9	0.7	0.8
GH_ER2	0.9	1	0.9	1	0.9
FR_FRCP1	0.9	0.9	0.7	1	0.8
GH_FR1	0.7	1	0.8	0.9	0.9
CM_MC2	0.4	0.3	0.7	0.4	0.7

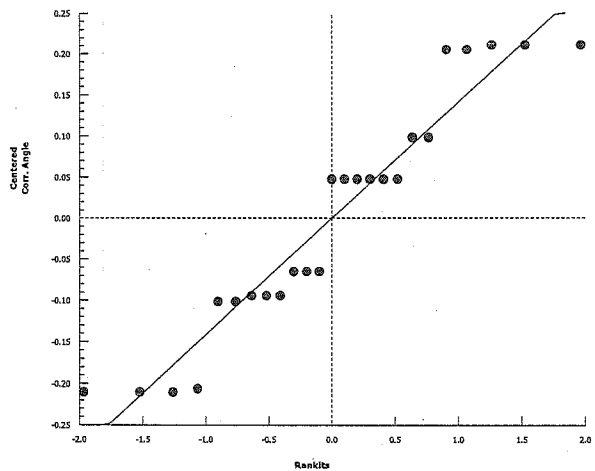
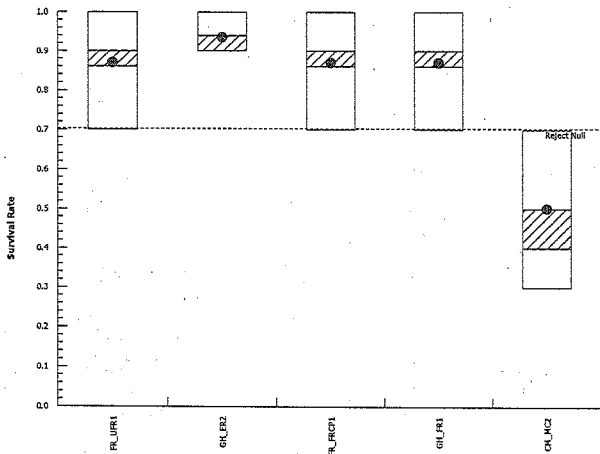
**Angular (Corrected) Transformed Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1.249	1.412	1.249	0.9912	1.107
GH_ER2	1.249	1.412	1.249	1.412	1.249
FR_FRCP1	1.249	1.249	0.9912	1.412	1.107
GH_FR1	0.9912	1.412	1.107	1.249	1.249
CM_MC2	0.6847	0.5796	0.9912	0.6847	0.9912

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	9/10	10/10	9/10	7/10	8/10
GH_ER2	9/10	10/10	9/10	10/10	9/10
FR_FRCP1	9/10	9/10	7/10	10/10	8/10
GH_FR1	7/10	10/10	8/10	9/10	9/10
CM_MC2	4/10	3/10	7/10	4/10	7/10

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 15:17 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 20-1523-6076	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 15:17	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 06-8871-2647	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 26 Apr-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Site Water
Ending Date: 24 May-17	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Research Organisms, NH	Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h-(4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	3.95%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	3.403	1.86	0.043	8	0.0047	CDF	Significant Effect
		FR_FRCP1	2.216	1.86	0.091	8	0.0288	CDF	Significant Effect
		GH_FR1	0.3922	1.86	0.064	8	0.3526	CDF	Non-Significant Effect
		CM_MC2	40.03	1.86	0.036	8	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.11759	0.5293974	4	143.4	<0.0001	Significant Effect
Error	0.07384932	0.003692466	20			
Total	2.191439		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.863	13.28	0.0428	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9736	0.8877	0.7379	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	0.9075	0.8618	0.9532	0.9044	0.8611	0.9643	0.01646	4.06%	0.0%
GH_ER2	5	0.828	0.7819	0.874	0.8211	0.794	0.8833	0.01658	4.48%	8.76%
FR_FRCP1	5	0.799	0.6709	0.927	0.8167	0.6712	0.9343	0.04612	12.91%	11.96%
GH_FR1	5	0.8939	0.8097	0.9781	0.9156	0.793	0.96	0.03033	7.59%	1.49%
CM_MC2	5	0.1365	0.1087	0.1643	0.1443	0.11	0.16	0.01001	16.39%	84.96%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9044	0.905	0.8611	0.9643	0.9025
GH_ER2	0.8444	0.794	0.8833	0.797	0.8211
FR_FRCP1	0.8167	0.8467	0.9343	0.726	0.6712
GH_FR1	0.96	0.793	0.86	0.9156	0.9411
CM_MC2	0.11	0.16	0.1157	0.1525	0.1443

# CETIS Analytical Report

Report Date: 20 Jul-17 15:17 (p 2 of 2)  
Test Code: 170361 | 12-7313-9285

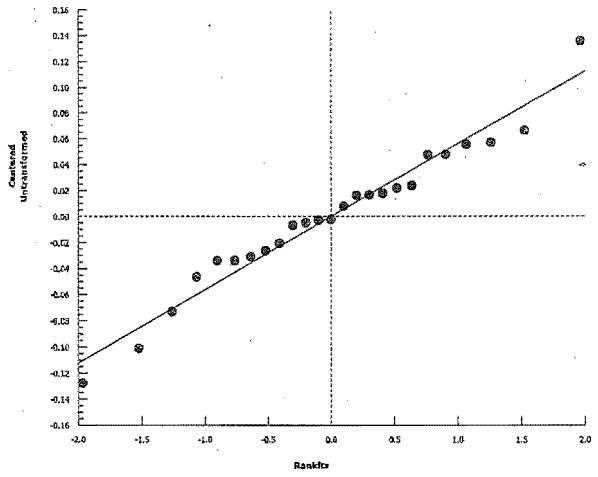
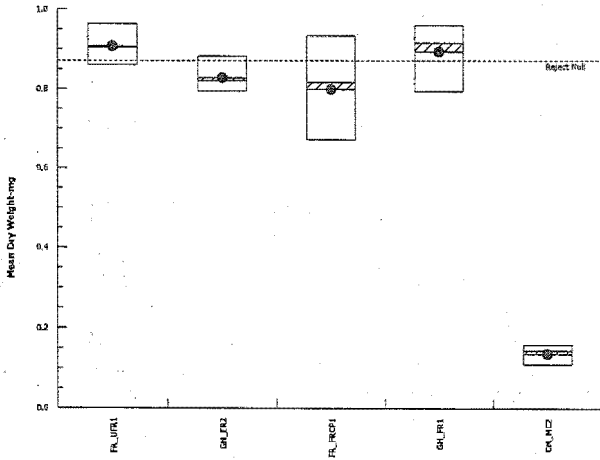
## Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 20-1523-6076      Endpoint: Mean Dry Weight-mg  
Analyzed: 20 Jul-17 15:17      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics





**CETIS Analytical Report**

Report Date: 20 Jul-17 15:18 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-2607-1018	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 15:18	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 06-8871-2647	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Karen Lee
<b>Start Date:</b> 26 Apr-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Site Water
<b>Ending Date:</b> 24 May-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Research Organisms, NH	<b>Age:</b> 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	12.3%	

**Equal Variance t Two-Sample Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2	FR_UFR1	1.376	1.86	0.152	8	0.1031	CDF	Non-Significant Effect
	FR_FRCP1	1.376	1.86	0.152	8	0.1031	CDF	Non-Significant Effect
	GH_FR1	1.376	1.86	0.152	8	0.1031	CDF	Non-Significant Effect
	CM_MC2	5.578	1.86	0.176	8	0.0003	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.8344228	0.2086057	4	8.6	0.0003	Significant Effect
Error	0.4851032	0.02425516	20			
Total	1.319526		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.986	13.28	0.7383	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9089	0.8877	0.0288	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_ER2	5	0.94	0.872	1	0.9	0.9	1	0.02449	5.83%	-9.3%
FR_FRCP1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
GH_FR1	5	0.86	0.7184	1	0.9	0.7	1	0.05099	13.26%	0.0%
CM_MC2	5	0.5	0.2677	0.7323	0.4	0.3	0.7	0.08367	37.42%	41.86%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
GH_ER2	5	1.314	1.203	1.425	1.249	1.249	1.412	0.03992	6.79%	-9.37%
FR_FRCP1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
GH_FR1	5	1.202	1.003	1.4	1.249	0.9912	1.412	0.07141	13.29%	0.0%
CM_MC2	5	0.7863	0.548	1.025	0.6847	0.5796	0.9912	0.08581	24.4%	34.57%

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 17-2607-1018      Endpoint: Survival Rate  
 Analyzed: 20 Jul-17 15:18      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9	1	0.9	0.7	0.8
GH_ER2	0.9	1	0.9	1	0.9
FR_FRCP1	0.9	0.9	0.7	1	0.8
GH_FR1	0.7	1	0.8	0.9	0.9
CM_MC2	0.4	0.3	0.7	0.4	0.7

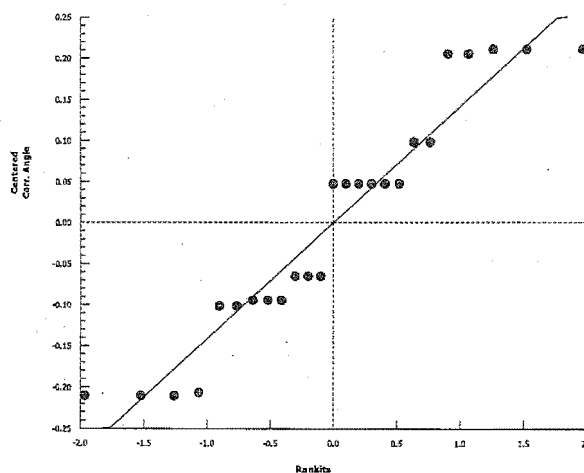
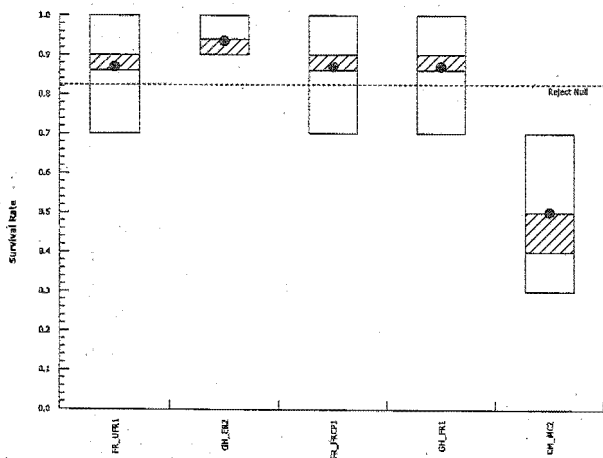
Angular (Corrected) Transformed Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1.249	1.412	1.249	0.9912	1.107
GH_ER2	1.249	1.412	1.249	1.412	1.249
FR_FRCP1	1.249	1.249	0.9912	1.412	1.107
GH_FR1	0.9912	1.412	1.107	1.249	1.249
CM_MC2	0.6847	0.5796	0.9912	0.6847	0.9912

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	9/10	10/10	9/10	7/10	8/10
GH_ER2	9/10	10/10	9/10	10/10	9/10
FR_FRCP1	9/10	9/10	7/10	10/10	8/10
GH_FR1	7/10	10/10	8/10	9/10	9/10
CM_MC2	4/10	3/10	7/10	4/10	7/10

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 15:18 (p 1 of 2)  
 Test Code: 170361 | 12-7313-9285

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 10-5753-0015	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 15:18	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 06-8871-2647	Test Type: Survival-Growth	Analyst: Karen Lee
Start Date: 26 Apr-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Site Water
Ending Date: 24 May-17	Species: Hyalella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Research Organisms, NH	Age: 8-d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	39h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	36h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	37h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	38h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	36h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	4.35%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	-3.403	1.86	0.043	8	0.9953	CDF	Non-Significant Effect
		FR_FRCP1	0.5918	1.86	0.091	8	0.2852	CDF	Non-Significant Effect
		GH_FR1	-1.908	1.86	0.064	8	0.9536	CDF	Non-Significant Effect
		CM_MC2	35.71	1.86	0.036	8	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.11759	0.5293974	4	143.4	<0.0001	Significant Effect
Error	0.07384932	0.003692466	20			
Total	2.191439		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.863	13.28	0.0428	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9736	0.8877	0.7379	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	0.9075	0.8618	0.9532	0.9044	0.8611	0.9643	0.01646	4.06%	0.0%
GH_ER2	5	0.828	0.7819	0.874	0.8211	0.794	0.8833	0.01658	4.48%	8.76%
FR_FRCP1	5	0.799	0.6709	0.927	0.8167	0.6712	0.9343	0.04612	12.91%	11.96%
GH_FR1	5	0.8939	0.8097	0.9781	0.9156	0.793	0.96	0.03033	7.59%	1.49%
CM_MC2	5	0.1365	0.1087	0.1643	0.1443	0.11	0.16	0.01001	16.39%	84.96%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.9044	0.905	0.8611	0.9643	0.9025
GH_ER2	0.8444	0.794	0.8833	0.797	0.8211
FR_FRCP1	0.8167	0.8467	0.9343	0.726	0.6712
GH_FR1	0.96	0.793	0.86	0.9156	0.9411
CM_MC2	0.11	0.16	0.1157	0.1525	0.1443

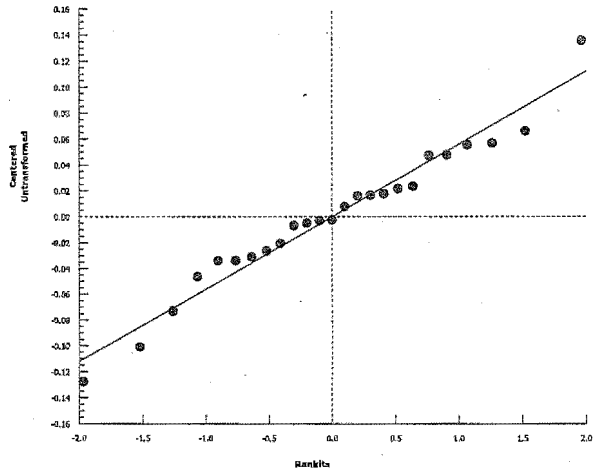
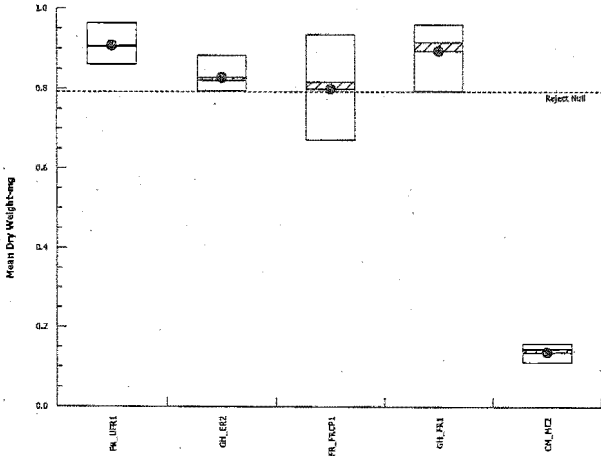
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 10-5753-0015      Endpoint: Mean Dry Weight-mg  
Analyzed: 20 Jul-17 15:18      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**APPENDIX D – *Pimephales promelas* Toxicity Test Data**

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Client:	NAU104
Reference:	1617-0886

**Client:**

Client: Nautilus Environmental  
 Address: 8664 Commerce Court  
 City: Burnaby  
 Province: BC  
 Country: Canada  
 Postal Code: V5A 4N7

Operation: Burnaby  
 Billing: not given  
 Contact: Krysta Pearcy  
 Tel: 604 420 8773  
 Fax: not given  
 Email: [krysta@nautilusenvironmental.ca](mailto:krysta@nautilusenvironmental.ca)

**Sample:**

type: water  
 collected: 2017/04/24 at: 1000 collection method: grab  
 shipped: 2017/04/24 by: drop off by: JK  
 received: 2017/04/25 at: 1100 by: EJ/CQ  
 signed-in: 2017/04/25 at: 1300 by: EJ/CQ  
 container: 2 x 20 L carboys sample condition: good condition  
 seals present: no initials on seals: no  
 storage: 4 ± 2°C in darkness initial temperature (°C): 8  
 Samples are disposed following PERS-SWI-004

**Chemical and Physical Measurements at Sample Receipt:**

sample week:	01	02	03	04	05	
client code:						<b>GH_FR1</b>
collection date:	2017/04/24	2017/05/02	2017/05/09	2017/05/16	2017/05/23	
collection time:	1000	1010	1000	1330	0930	

pH:	7.9	7.1	7.7	7.6	7.8
EC (µS/cm):	748	691	510	607	495
DO (mg/L):	9.3	7.6	10.4	8.1	8.1
temp (°C):	17.3	20	16.9	16.8	20
hardness:	356	362	204	224	232
alkalinity:	157	206	152	141	52
colour:	colourless	colourless	colourless	colourless	colourless
salinity	2	1	0	1	2

Meter/Probe Used: chem cart 1/chem cart 2/chem cart 3/chem cart 4

**Test Log:**

test code:	FM-32S
started:	2017/04/28
ended:	2017/05/30

Client:	NAU104
Reference:	1617-0887

**Client:**

Client: Nautilus Environmental  
 Address: 8664 Commerce Court  
 City: Burnaby  
 Province: BC  
 Country: Canada  
 Postal Code: V5A 4N7

Operation: Burnaby  
 Billing: not given  
 Contact: Krysta Pearcy  
 Tel: 604 420 8773  
 Fax: not given  
 Email: [krysta@nautilusenvironmental.ca](mailto:krysta@nautilusenvironmental.ca)

**Sample:**

type: water  
 collected: 2017/04/24 at: 1200 collection method: grab  
 shipped: 2017/04/24 by: drop off by: JE  
 received: 2017/04/25 at: 1100 by: EJ/CQ  
 signed-in: 2017/04/25 at: 1300 by: EJ/CQ  
 container: 2 x 20 L carboys sample condition: good condition  
 seals present: no initials on seals: no  
 storage: 4 ± 2°C in darkness initial temperature (°C): 8  
 Samples are disposed following PERS-SWI-004

**Chemical and Physical Measurements at Sample Receipt:**

sample week:	01	02	03	04	05	
client code:						<b>GH_ER2</b>
collection date:	2017/04/24	2017/05/02	2017/05/09	2017/05/16	2017/05/23	
collection time:	1200	1221	1241	0955	-	

pH:	7.9	7.8	7.8	7.5	7.8
EC (µS/cm):	343	308	290	327	291
DO (mg/L):	9.5	7.9	9.9	9.3	8.2
temp (°C):	16.9	19.5	17.2	14.2	20
hardness:	160	141	143	140	122
alkalinity:	152	158	138	126	123
colour:	colourless	colourless	colourless	colourless	colourless
salinity	1	0	0	1	3

Meter/Probe Used: chem cart 1/chem cart 2/chem cart 3/chem cart 4

**Test Log:**

test code:	FM-32S
started:	2017/04/28
ended:	2017/05/30

Client:	NAU104
Reference:	1617-0888

**Client:**

Client: Nautilus Environmental  
 Address: 8664 Commerce Court  
 City: Burnaby  
 Province: BC  
 Country: Canada  
 Postal Code: V5A 4N7

Operation: Burnaby  
 Billing: not given  
 Contact: Krysta Pearcy  
 Tel: 604 420 8773  
 Fax: not given  
 Email: [krysta@nautilusenvironmental.ca](mailto:krysta@nautilusenvironmental.ca)

**Sample:**

type: water  
 collected: 2017/04/24 at: 1055 collection method: grab  
 shipped: 2017/04/24 by: drop off by: DB  
 received: 2017/04/25 at: 1100 by: EJ/CQ  
 signed-in: 2017/04/25 at: 1300 by: EJ/CQ  
 container: 2 x 20 L carboys sample condition: good condition  
 seals present: no initials on seals: no  
 storage: 4 ± 2°C in darkness initial temperature (°C): 8  
 Samples are disposed following PERS-SWI-004

**Chemical and Physical Measurements at Sample Receipt:**

sample week:	01	02	03	04	05	
client code:						<b>FR_FRCP1</b>
collection date:	2017/04/24	2017/05/02	2017/05/09	2017/05/16	2017/05/23	
collection time:	1055	1037	0953	1117	0916	

pH:	8.0	7.1	7.8	7.6	7.8
EC (µS/cm):	787	308	550	536	513
DO (mg/L):	8.3	7.8	10.2	8.4	8.3
temp (°C):	19.1	2	16.2	18.2	19.5
hardness:	397	436	266	100	202
alkalinity:	154	186	149	108	134
colour:	colourless	colourless	colourless	colourless	colourless
salinity	2	0	0	1	2

Meter/Probe Used: chem cart 1/chem cart 2/chem cart 3/chem cart 4

**Test Log:**

test code:	FM-32S
started:	2017/04/28
ended:	2017/05/30



Client:	NAU104
Reference:	1617-0889

**Client:**

Client: Nautilus Environmental  
 Address: 8664 Commerce Court  
 City: Burnaby  
 Province: BC  
 Country: Canada  
 Postal Code: V5A 4N7

Operation: Burnaby  
 Billing: not given  
 Contact: Krysta Pearcy  
 Tel: 604 420 8773  
 Fax: not given  
 Email: [krysta@nautilusenvironmental.ca](mailto:krysta@nautilusenvironmental.ca)

**Sample:**

type: water  
 collected: 2017/04/24 at: 0914 collection method: grab  
 shipped: 2017/04/24 by: drop off by: DB  
 received: 2017/04/25 at: 1100 by: EJ/CQ  
 signed-in: 2017/04/25 at: 1300 by: EJ/CQ  
 container: 2 x 20 L carboys sample condition: good condition  
 seals present: no initials on seals: no  
 storage: 4 ± 2°C in darkness initial temperature (°C): 8  
 Samples are disposed following PERS-SWI-004

**Chemical and Physical Measurements at Sample Receipt:**

sample week:	01	02	03	04	05	
client code:						<b>FR_UFR1</b>
collection date:	2017/04/24	2017/05/02	2017/05/09	2017/05/16	2017/05/23	
collection time:	0914	0941	1208	0954	0925	

pH:	7.9	7.9	7.7	7.7	7.9
EC (µS/cm):	272	262	253	249	217
DO (mg/L):	9.3	7.8	10.2	9.5	8.5
temp (°C):	18.9	19.6	16.3	14.7	19
hardness:	120	160	148	100	82
alkalinity:	111	102	108	108	104
colour:	colourless	colourless	colourless	colourless	colourless
salinity	0	1	0	1	2

Meter/Probe Used: chem cart 1/chem cart 2/chem cart 3/chem cart 4

**Test Log:**

test code:	FM-32S
started:	2017/04/28
ended:	2017/05/30

Our liability is limited to the cost of the test requested. The test results only relate to 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.

Client:	NAU104
Reference:	1617-0890

**Client:**

Client: Nautilus Environmental  
 Address: 8664 Commerce Court  
 City: Burnaby  
 Province: BC  
 Country: Canada  
 Postal Code: V5A 4N7

Operation: Burnaby  
 Billing: not given  
 Contact: Krysta Pearcy  
 Tel: 604 420 8773  
 Fax: not given  
 Email: [krysta@nautilusenvironmental.ca](mailto:krysta@nautilusenvironmental.ca)

**Sample:**

type: water  
 collected: 2017/04/24 at: not given collection method: grab  
 shipped: 2017/04/24 by: drop off by: DS/BW  
 received: 2017/04/25 at: 1100 by: EJ/CQ  
 signed-in: 2017/04/25 at: 1300 by: EJ/CQ  
 container: 2 x 20 L carboys sample condition: good condition  
 seals present: no initials on seals: no  
 storage: 4 ± 2°C in darkness initial temperature (°C): 8  
 Samples are disposed following PERS-SWI-004

**Chemical and Physical Measurements at Sample Receipt:**

sample week:	01	02	03	04	05	
client code:						<b>CM_MC2</b>
collection date:	2017/04/24	2017/05/02	2017/05/09	2017/05/16	2017/05/23	
collection time:	not given	0830	1100	0830	1230	

pH:	7.9	7.9	7.6	7.8	7.9
EC (µS/cm):	811	743	602	674	501
DO (mg/L):	8.3	8.5	9.9	9.7	8.8
temp (°C):	18.9	19.6	16.7	14.3	18.4
hardness:	364	340	322	243	194
alkalinity:	197	172	153	147	115
colour:	colourless	colourless	colourless	colourless	colourless
salinity	1	1	0	2	2

Meter/Probe Used: chem cart 1/chem cart 2/chem cart 3/chem cart 4

**Test Log:**

test code:	FM-32S
started:	2017/04/28
ended:	2017/05/30

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/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-UNT		CTL- Cu		1617-0886		1617-0887		1617-0888		1617-0889		1617-0890	
	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	15	0	15	0	15	0	15	0	15	0	15	0	15	0
b	15	0	15	0	15	0	15	0	15	1	14	1	15	0
c	15	0	15	0	15	0	15	0	15	0	15	0	15	0
d	14	1	15	0	15	0	15	0	15	0	15	0	14	1
e	30	0	30	0	30	0	30	0	28	2	28	1	29	1
f	30	0	30	0	30	0	30	0	29	1	30	0	30	0

Comments/Observations:

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT			CTL- Cu			1617-0886			1617-0887		
	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	11	4	15	15	0	15	14	1	15	15	0	15
b	14	1	15	15	0	15	14	1	15	15	0	15
c	13	2	15	15	0	15	13	2	15	15	0	15
d	14	0	15	15	0	15	14	1	15	15	0	15
e	30	0		30	0		28	1		30	0	
f	30	0		30	0		30	0		30	0	

replicate	1617-0888			1617-0889			1617-0890		
	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	15	0	15
b	14	0	15	14	1	15	15	0	15
c	15	0	15	15	0	15	15	0	15
d	15	0	15	15	0	15	15	0	15
e	28	0		30	0		30	0	
f	29	0		30	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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT		CTL- Cu		1617-0886		1617-0887		1617-0888		1617-0889		1617-0890	
	Day 3		Day 3		Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	12	3	13	2	12	3	13	2	12	3	7	8	11	4
b	12	3	15	0	12	3	14	1	11	4	14	1	8	7
c	11	4	13	2	13	2	12	3	14	1	13	1	8	7
d	14	1	15	0	15	0	11	4	7	8	8	7	9	6

Comments/Observations:

replicate	CTL-UNT		CTL- Cu		1617-0886		1617-0887		1617-0888		1617-0889		1617-0890	
	Day 4		Day 4		Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	4	11	1	14	14	14	0	15	2	13	0	15	0	15
b	0	15	0	15	2	13	0	15	3	12	3	12	0	15
c	0	15	0	13	2	13	3	12	3	12	0	15	0	15
d	0	15	2	12	7	8	1	14	3	12	0	15	0	15

Comments/Observations: \* 2 dead (were hatched) in CTL-Cu rep 3

replicate	CTL-UNT		CTL- Cu		1617-0886		1617-0887		1617-0888		1617-0889		1617-0890	
	Day 5		Day 5		Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	15	15	15	15	15	15	15	15	14	15	15	15	15	15
b	15	15	15	15	15	15	15	15	15	15	15	15	15	15
c	15	15	15	15	15	15	15	15	15	15	15	15	15	15
d	15	15	15	15	15	15	15	15	15	15	15	15	15	15

0889 2 half hatched fish

Comments/Observations: 0888 1 also hatched ~ 0889 1 bent/faint fish, but still moving

replicate	CTL-UNT		CTL- Cu		1617-0886		1617-0887		1617-0888		1617-0889		1617-0890	
	Day 6		Day 6		Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	15	15	15	15	15	15	15	15	14	15	15	15	15	15
b	15	15	15	15	15	15	15	15	15	15	15	15	15	15
c	15	15	15	15	15	15	15	15	15	15	15	15	15	15
d	15	15	15	15	14	15	15	15	14	15	15	15	15	15

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	15	15	14 15	15	15(1)
b	15(1)	15	14	15	15	15	15
c	14 15	15	12	15(1)	15	15	15
d	15	15	14	15	14(1)	15	15(1)

Comments/Observations: 0886C - 3 dead, no micro growth - just white bow covered in debris

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	14 15	15	14	5	15	15	15
b	15**	15	14	15	15	15	15
c	14 15	15	10*	15(1)	15	15	15
d	15	15	14	15	14(1)	15	15(1)

Comments/Observations: 0886C - some micro growth (white fuzz) on dead FM  
\* Control unt (b) one with bent tail

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	14	15	15	15	15
b	15(1)	15	14	15	15	15	15
c	15 14 15	15	9	15(1)	15	15	15
d	15	15	14	15	14(1)	15	15(1)

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	9	15	15	15	15(1)
b	15	15	14	15	15	15	15
c	15	15	8	15	15	15	15
d	15	15	9	15	14	15	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	15	15(1)
b		15(1)	15	14	15	15	15	15
c		15	15	8	15	15	15	15
d		15	15	9	15	14	15	14(1)

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	15(1)	15
b		15(1)	15	14	15	15	15	15
c		15	15	8	14	15	15	15
d		15	15	9	15	14(1)	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	15(1)	15
b		14	14	14	15	15	15	15
c		15	15	8	14	15	15	14
d		15	15	8	15	14(1)	15	14

Comments/Observations: 1617-0886 dead in debris. No microbial death in any jar

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	15(1)	15
b		14	14	14	15	15	15	15
c		15	15	8	14	15	15	14
d		15	15	8	15	14(1)	15	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13 <sup>*</sup>	15(1)
b		14	14	14	15	15	14	15
c		15	15	8	14	15	15	14
d		15	15	8	15	14(1)	15	14

Comments/Observations:

0889A - 2 missing - took out some debris that could be decayed hatches - but no full dead bodies

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13	15/14
b		14	14	14	15	15	14	15
c		15	15	8	14	15	15	14
d		15	15(1)	8	15	14(1)	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13	14
b		14	14	14	15	15	14	15
c		15	15	8	14	15	15	14
d		15	15	8	15	14(1)	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13	14
b		14	14	14	15	15	14	15
c		15	15	8(1)	14	15	15	14
d		15	15	8	15	14(1)	15	14

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13	14
b		14	14	14	15	15	14	14
c		15	15	8(1)	14	15	15	14
d		15	15	8	15	14	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	15	15	13	14
b		14	14	14	15	15	14	14
c		15	15	8(1)	14	15	15	14
d		15	15	8	15	14	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	14	15	13	14
b		14	14	14	15	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	14	15	13	14
b		14	14	14	15	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15	14

Comments/Observations:



Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

Number of Alive Embryos and Hatched Organisms							
	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	9	14	15	13	14
b	14	14	14	15	15	14	14
c	15	15	7	14	15	15	14
d	15	15	8	15	14	15	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	9	14	15	13	14
b	14	14	14	15	15	14	14
c	15	15	7	14	15	15	14
d	15	15	8	15	14	15	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	9	14	15	13	14
b	14	14	14	15	15	14	14
c	15	15	7	14	15	15	14
d	15	15	8	15	14	15	14

Comments/Observations:

	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	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	15	15	9	14	15	13	14
b	14	14	14	15	15	14	14
c	15	15	7	14	15	15	14
d	15	15	8	15	14(1)	15(1)	14

Comments/Observations: \*0889 - bent body.

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	14	15	13	14
b		14	14	14	14*	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15(1)	14

Comments/Observations: 0887B - 1 dead, no microbial

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	14	15	13	14
b		14	14	14	14	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15(1)	14

Comments/Observations: 0890B - bent body.

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	9	14	15	13	14
b		14	14	14	14	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15(1)	14

Comments/Observations:

		CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
		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		15	15	8	14	15	13	14
b		14	13	14	14	15	14	14
c		15	15	7	14	15	15	14
d		15	15	8	15	13	15(1)	14

Comments/Observations: CTL-Cu - 1 dead in jar, not microbial death

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31	Day 31
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	15	8	14	15 (1)	13	14
b	14	13	14	14	15	14	14
c	15	15	7	14	15	15	14
d	15	15	8	15	13	15 (1)	14

Comments/Observations: 0888A - dem body

replicate	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	15	8	14	<del>15</del> 14 <sup>m</sup>	13	14
b	14	13	14	14	15	14	14
c	15	15	7	14	15	15	13*
d	15	15	8	15	13	15 (1)	14

Comments/Observations: 0890-C 1 dead, not microbial, smaller FM.

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
Day							
	pH (units)						
0	7.3	8.1	8.2	8.2	8.2	8.2	8.2
1	8.3	8.3	8.4	8.4	8.3	8.3	8.3
2	8.3	8.4	8.4	8.4	8.3	8.4	8.3
3	8.1	8.1	8.0	8.1	8.0	8.1	8.0
4	8.2	8.2	8.3	8.2	8.0	8.3	8.1
5	8.2	8.2	8.3	8.2	8.1	8.3	8.1
6	8.2	8.2	8.3	8.1	8.2	8.2	8.1
7	8.3	8.4	8.5	8.4	8.4	8.4	8.4
8	8.2	8.2	8.3	8.3	8.3	8.3	8.3

**Conductance (µS/cm)**

0	506	464	729	325	762	764	784
1	463	466	742	339	786	275	796
2	450	463	726	335	766	796	796
3	477	476	743	337	786	271	809
4	487	481	731	343	791	274	821
5	352	367	550	272	599	204	642
6	347	370	557	254	708	220	605
7	350	406	552	252	722	212	602
8	351	351	551	254	725	216	605

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0	7.3	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.2	7.2	7.3	7.2	7.1
2	7.3	7.3	7.3	7.2	7.3	7.2	7.2
3	7.3	7.3	7.2	7.2	7.2	7.2	7.2
4	7.3	7.2	7.1	7.1	7.2	7.2	7.2
5	7.3	7.3	7.2	7.2	7.2	7.2	7.2
6	7.3	7.3	7.2	7.2	7.2	7.2	7.2
7	7.3	7.3	7.1	7.0	7.1	7.0	7.1
8	7.1	7.1	7.2	7.1	7.1	7.1	7.1

**Temperature (°C)**

0	24.0	24.1	24.1	24.0	23.9	24.0	23.9
1	24.3	24.4	24.6	24.9	24.4	24.7	24.8
2	24.4	24.4	24.4	24.6	24.4	24.7	24.6
3	24.2	24.4	25.1	25.3	25.4	25.2	25.1
4	24.0	24.6	25.7	25.6	24.9	25.3	25.4
5	23.9	23.7	24.7	25.0	24.8	24.5	24.8
6	24.2	23.9	24.8	24.9	25.2	25.1	25.3
7	24.1	24.0	25.4	25.6	25.4	25.4	25.6
8	25.1	25.5	25.4	25.6	25.5	25.2	25.3

**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-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
Day						
	pH (units)					
0						
1	8.1	8.1	8.2	8.2	8.3	8.1
2	8.2	8.3	8.4	8.3	8.4	8.2
3	8.1	8.1	8.2	8.1	8.2	8.1
4	8.1	8.1	8.2	8.2	8.2	8.0
5	8.2	8.1	8.2	8.1	8.2	8.1
6	7.9	7.9	8.2	8.1	8.2	8.1
7	8.1	8.2	8.4	8.3	8.2	8.3
8	8.0	8.1	8.2	8.2	8.1	8.2

**Conductance (µS/cm)**

0						
1	459	467	709	340	797	283
2	462	470	734	336	801	281
3	469	478	726	346	803	308
4	488	468	303	327	804	300
5	362	368	601	255	602	209
6	369	378	540	261	594	211
7	348	373	557	259	691	221
8	371	381	552	268	704	232

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0						
1	7.1	7.1	6.9	7.1	7.0	7.2
2	6.6	6.6	6.8	6.8	6.9	7.0
3	6.8	6.8	7.2	7.2	7.2	7.1
4	7.2	7.2	7.2	7.3	7.5	7.2
5	7.3	7.3	7.2	7.2	7.3	7.3
6	6.9	6.9	6.9	6.9	6.9	6.9
7	6.7	6.7	6.8	6.7	6.8	6.8
8	6.8	6.7	6.6	6.7	6.6	6.7

**Temperature (°C)**

0						
1	23.5	23.5	23.5	23.5	23.5	23.5
2	23.5	23.5	23.5	23.5	23.5	23.5
3	23.5	23.5	23.5	23.5	23.5	23.5
4	23.5	23.5	23.5	23.5	23.5	23.5
5	23.5	23.5	23.6	23.6	23.6	23.6
6	23.5	23.5	23.5	23.5	23.5	23.5
7	24.4	24.0	23.6	23.5	23.5	23.7
8	23.9	24.1	24.3	24.1	24.5	24.6

#267

8.3\*

7.2\*

7.4\*

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

New Solutions

Conc. (%)	CTL-UNT	CTL-Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
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Old Solutions

CTL-UNT	CTL-Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
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\* old sol'n Day 9 in new sol'n table

Day	pH (units)						
9	8.0	8.1	8.2	8.1	7.9	8.1	8.0
10	8.3	8.2	8.2	8.0	8.1	8.1	8.1
11	8.1	8.1	8.2	8.1	8.1	8.2	8.0
12	8.1	8.2	8.2	8.2	8.2	8.2	8.1
13	8.2	8.2	8.3	8.3	8.2	8.3	8.3
14	8.2	8.2	8.3	8.3	8.3	8.2	8.2
15	8.2	8.2	8.4	8.3	8.3	8.2	8.4
16	8.2	8.2	8.4	8.4	8.3	8.3	8.4
17	8.1	8.0	8.2	8.1	8.2	8.2	8.0

Day	pH (units)						
9	8.0	7.8	8.2	8.2	8.1	8.0	8.1
10	8.3	8.3	8.2	8.3	8.1	8.2	8.1
11	8.0	8.0	8.2	8.1	7.9	8.0	7.9
12	8.0	8.0	8.2	8.1	8.0	8.1	8.0
13	7.7	8.0	8.2	8.1	7.9	8.0	7.9
14	8.0	8.0	8.2	8.1	8.1	8.0	8.0
15	7.9	8.0	8.2	8.2	8.1	8.1	8.1
16	7.9	8.0	8.2	8.1	8.2	8.1	8.2
17	7.6	7.8	8.1	8.1	7.9	7.9	7.9

\* New old sol'n Day 9 in old sol'n table (switch) 20.7.10.54 JTW

New week solutions

Day	Conductance (µS/cm)						
9	347	349	533	860	699	232	587
10	356	357	559	255	716	217	604
11	463	421	649	294	827	263	700
12	407	395	608	282	760	239	650
13	373	402	448	253	500	214	530
14	374	381	448	260	492	211	527
15	364	371	442	251	487	206	509
16	377	389	442	262	474	214	513
17	365	363	446	261	492	226	505

Day	Conductance (µS/cm)						
9	255	351	513	221	718	212	582
10	365	366	549	269	715	223	602
11	436	423	646	307	824	279	691
12	415	402	611	292	783	259	631
13	421	407	614	292	791	253	661
14	378	413	490	275	571	230	576
15	461	400	461	279	516	274	534
16	379	389	441	268	513	231	548
17	379	380	462	278	508	221	525

Day	Dissolved Oxygen (mg/L) (40-100% saturation)						
9	6.9	6.8	6.7	6.7	6.7	6.8	6.7
10	7.3	7.3	7.2	7.2	7.2	7.2	7.2
11	7.3	7.2	7.2	7.2	7.2	7.2	7.2
12	7.1	7.2	7.2	7.2	7.2	7.3	7.3
13	7.2	7.2	7.2	7.3	7.3	7.3	7.3
14	7.1	7.1	7.2	7.2	7.2	7.3	7.2
15	7.2	7.2	7.2	7.2	7.2	7.2	7.2
16	7.2	7.2	7.2	7.2	7.2	7.3	7.3
17	7.2	7.2	7.2	7.2	7.1	7.1	7.1

Day	Dissolved Oxygen (mg/L) (40-100% saturation)						
9	7.2	7.2	7.2	7.2	7.3	7.2	7.2
10	6.7	6.7	7.0	6.8	6.9	6.8	7.0
11	6.8	6.8	6.9	6.9	6.8	6.8	7.0
12	7.0	6.6	6.9	7.0	6.8	6.8	6.9
13	6.9	6.8	6.8	6.8	6.7	6.2	6.7
14	6.9	7.0	6.9	6.6	6.5	6.8	6.3
15	6.8	6.7	6.6	6.7	6.6	6.5	6.5
16	6.9	6.1	6.4	6.4	6.5	6.4	6.4
17	6.1	6.1	6.3	6.2	6.2	6.3	6.2

Day	Temperature (°C)						
9	24.1	24.1	25.8	25.9	25.9	23.9	23.8
10	24.1	23.8	25.4	25.4	25.1	24.9	25.1
11	24.1	24.4	25.2	25.4	25.2	25.4	25.4
12	25.5	24.8	25.4	25.4	25.4	24.4	24.4
13	24.8	24.5	24.6	24.1	24.2	24.3	24.2
14	25.5	25.1	25.1	25.1	24.9	24.4	25.3
15	25.2	25.4	25.6	25.3	25.1	24.7	24.9
16	25.5	25.6	25.3	25.0	24.7	23.8	24.4
17	24.8	25.1	25.1	25.1	25.6	25.6	25.8

Day	Temperature (°C)						
9	21.5	25.0	25.1	24.8	24.3	24.7	24.9
10	23.6	23.7	23.7	23.7	23.6	23.6	23.6
11	23.8	23.6	23.7	23.8	23.7	23.7	23.7
12	23.8	23.9	24.1	24.0	24.1	24.3	24.2
13	23.8	23.8	23.9	23.9	23.8	24.0	24.0
14	23.8	23.8	23.8	24.8	24.8	24.6	24.8
15	24.1	24.0	23.6	23.9	23.6	23.6	23.9
16	23.5	23.6	23.5	23.6	23.6	23.9	24.0
17	23.5	23.5	23.5	23.5	23.5	23.5	23.5

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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

New Solutions							
Conc. (%)	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
Day	7.7 mM		8.3				
	pH (units)		pH (units)				
18	7.9	8.1	8.3	7.8	8.3	8.3	8.3
19	8.1	8.1	8.3	8.2	8.2	8.2	8.2
20	8.1	8.1	8.4	8.3	8.3	8.3	8.4
21	8.2	8.2	8.4	8.4	8.3	8.3	8.3
22	8.1	8.2	8.3	8.2	8.2	8.2	8.2
23	8.5	8.3	8.3	8.3	8.3	8.4	8.4
24	8.1	8.1	8.2	8.2	8.3	8.3	8.2
25	8.1	8.2	8.4	8.3	8.3	8.3	8.3
26	8.1	8.1	8.3	8.3	8.3	8.2	8.3
	362 370 mM Conductance (µS/cm)						
18	379	359	435	260	497	204	525
19	457	456	567	334	624	264	663
20	462	461	576	313	684	259	678
21	442	464	586	322	671	257	640
22	441	476	588	315	658	254	664
23	444	477	573	322	665	247	659
24	464	470	592	327	660	267	678
25	444	463	584	336	677	255	673
26	425	440	553	308	644	247	638
	7.1 Dissolved Oxygen (mg/L) (40-100% saturation)						
18	5.8	7.2	7.2	7.2	7.2	7.2	7.2
19	7.1	7.2	7.2	7.1	7.2	7.2	7.2
20	7.2	7.2	7.2	7.2	7.2	7.2	7.2
21	7.2	7.2	7.2	7.2	7.2	7.2	7.2
22	7.3	7.3	7.2	7.2	7.2	7.2	7.2
23	7.3	7.3	7.2	7.2	7.2	7.2	7.2
24	7.2	7.3	7.2	7.1	7.1	7.1	7.2
25	7.2	7.2	7.3	7.3	7.2	7.3	7.3
26	7.1	7.1	7.2	7.1	7.1	7.1	7.1
	24.2 Temperature (°C)						
18	23	24.9	24.6	25.1	25.3	25.2	25.4
19	25.5	25.1	25.4	25.5	24.9	25.1	25.1
20	25.1	24.8	25.4	25.4	25.3	25.4	25.4
21	24.7	24.6	24.8	25.2	25.4	25.1	24.8
22	23.8	23.9	25.0	25.4	25.0	24.8	24.7
23	24.5	24.4	24.7	25.0	24.7	24.7	25.4
24	24.2	24.3	25.4	25.7	25.7	25.4	25.4
25	25.4	25.4	24.4	24.4	25.7	24.4	24.4
26	25.9	25.6	25.4	25.5	25.6	25.8	25.6

Old Solutions							
CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890	
7.7 mM		pH (units)					
18	7.7	7.8	8.2	8.1	8.1	7.9	8.1
19	7.7	7.6	8.2	8.0	7.9	7.8	8.0
20	7.6	7.6	8.1	8.0	8.0	7.8	8.0
21	7.8	7.9	8.2	8.1	8.2	7.9	8.2
22	7.7	7.8	8.1	8.0	8.1	7.9	8.2
23	7.9	7.9	8.1	8.1	8.2	7.9	8.2
24	7.6	7.6	8.0	7.9	8.0	7.9	8.0
25	7.5	7.7	8.1	7.9	8.0	7.7	8.0
26	7.7	7.7	8.1	7.9	8.1	7.7	8.1
	370 mM Conductance (µS/cm)						
18	370	370	456	267	499	221	542
19	475	423	579	344	649	293	683
20	462	468	573	347	642	281	678
21	449	472	572	341	685	286	691
22	466	476	578	331	692	284	688
23	454	493	580	336	687	282	688
24	475	485	574	338	701	284	679
25	500	490	589	349	707	278	699
26	429	448	562	315	651	253	651
	Dissolved Oxygen (mg/L) (40-100% saturation)						
18	6.1	6.1	6.1	6.1	6.2	6.1	6.0
19	6.2	6.1	6.1	6.0	6.1	5.9	5.9
20	6.1	6.0	6.4	6.2	6.4	6.2	5.8
21	6.7	6.4	6.9	6.2	6.6	6.3	6.2
22	6.5	6.4	6.4	6.4	6.6	6.4	6.3
23	6.9	6.1	5.7	5.8	5.8	6.4	5.8
24	5.6	5.6	5.6	5.6	5.6	5.7	5.6
25	6.5	6.2	6.6	6.1	6.5	5.9	5.9
26	6.6	6.4	6.1	5.8	5.8	5.8	5.7
	Temperature (°C)						
18	24.0	24.7	24.5	24.6	24.4	24.7	24.7
19	23.8	23.5	24.1	24.1	24.4	24.2	24.1
20	23.8	24.0	23.9	23.5	24.5	24.5	24.5
21	23.6	24.1	23.5	23.9	23.5	24.0	23.5
22	24.4	24.5	24.1	24.2	24.2	24.4	24.3
23	23.8	24.0	24.5	24.1	24.4	23.9	24.2
24	24.4	24.4	24.8	24.7	24.7	24.4	24.6
25	25.5	24.5	24.6	25.0	25.0	24.9	24.7
26	23.6	23.5	24.0	24.5	24.4	24.2	24.6

**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:**

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
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Day	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	pH (units)						
27	8.1	8.1	8.2	8.1	8.1	8.2	8.0 <sup>8.2 EP</sup>
28	8.1	8.1	8.3	8.1	8.3	8.1	8.3
29	8.1	8.2	8.3	8.3	8.3	8.2	8.3
30	8.3	8.3	8.5	8.4	8.4	8.3	8.4
31	8.2	8.2	8.3	8.3	8.3	8.1	8.2
32							

**Conductance (µS/cm)**

27	412	440	573	285	515	223	507
28	422	451	509	283	508	213	499
29	411	418	501	275	424	207	483
30	449	418	505	295	520	208	502
31	419	416	503	277	503	221	483
32							

**Dissolved Oxygen (mg/L) (40-100% saturation)**

27	7.3	7.3	7.2	7.1	7.2	7.2	7.2
28	7.1	7.2	7.2	7.2	7.2	7.2	7.2
29	7.2	7.1	7.1	7.2	7.1	7.1	7.1
30	7.1	7.2	7.2	7.2	7.2	7.2	7.2
31	7.1	7.1	7.1	7.1	7.1	7.1	7.1
32							

**Temperature (°C)**

27	24.4	24.4	25.7	24.8	24.9	24.9	25.1
28	25.6	24.5	25.2	25.1	24.8	25.4	25.4
29	24.7	25.9	26.1	25.4	25.9	26.3	26.2
30	26.8	24.6	26.1	25.9	26.1	26.4	26.0
31	25.8	25.9	26.4	26.4	26.2	26.4	26.3
32							

**Old Solutions**

CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
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Day	CTL-UNT	CTL- Cu	1617-0886	1617-0887	1617-0888	1617-0889	1617-0890
	pH (units)						
27	7.4	7.8	8.0	7.9	8.1	7.8	8.1
28	7.4	7.3	7.9	7.9	8.0	7.8	8.0
29	7.9	7.8	8.1	8.0	8.1	7.6	8.1
30	7.9	7.9	8.1	8.0	8.1	7.8	8.0
31	7.9	7.8	8.0	7.9	7.9	7.8	8.0 <sup>8.1 m</sup>
32	8.0	7.9	8.1	8.0	8.1	7.9	8.1

**Conductance (µS/cm)**

27	457	448	559	312	653	220	648
28	456	454	515	298	557	247	559
29	459	463	512	299	540	243	542
30	445	440	525	305	539	232	523
31	464	433	523	299	531	238	526
32	479	427	504	301	524	257	527

**Dissolved Oxygen (mg/L) (40-100% saturation)**

27	6.9	6.6	6.4	6.6	6.4	6.7	6.0
28	6.1	6.1	6.3	6.0	6.2	6.2	6.0
29	6.4	6.2	6.2	6.1	6.2	5.9	6.0
30	6.0	6.1	5.9	6.2	5.8	5.9	5.7
31	6.0	6.1	6.2	6.1	6.0	6.0	5.8
32	6.9	6.9	6.6	6.7	6.6	6.8	6.5

**Temperature (°C)**

27	23.6	23.5	23.6	23.6	23.7	23.6	24.3
28	23.8	24.2	24.6	24.6	24.7	24.2	24.6
29	25.2	25.8	25.7	25.0	25.7	26.1	26.0
30	24.3	24.6	25.0	24.9	25.3	25.0	25.0
31	24.9	25.1	24.7	25.1	25.1	25.0	25.1
32	23.5	26.0	24.1	24.0	23.9	23.6	23.6

**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:**

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/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	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	9	N	1	7	N	1	9	N
	2	6		2	8		2	7		2	6	
	3	9		3	9		3	8		3	7	
	4	8		4	8		4	8		4	8	
	5	10		5	8		5	7		5	8	
	6	7		6	9		6	9		6	9	
	7	7		7	8		7	10		7	9	
	8	6		8	8		8	7		8	10	
	9	8		9	8		9	6		9	9	
	10	8		10	8		10	8		10	8	
	11	6		11	7		11	8		11	8	
	12	10		12	8		12	8		12	9	
	13	11		13	7		13	9		13	8	
	14	8		14	8		14	8		14	9	
	15	7		15	7		15	8		15	8	

Comments

CTL-Cu	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	8	N	1	8	N	1	7	N
	2	8		2	8		2	7		2	8	
	3	10		3	10		3	9		3	8	
	4	9		4	5		4	9		4	8	
	5	7		5	7		5	8		5	10	
	6	9		6	8		6	8		6	8	
	7	9		7	8		7	7		7	9	
	8	8		8	8		8	10		8	7	
	9	9		9	8		9	9		9	9	
	10	8		10	9		10	9		10	8	
	11	7		11	9		11	10		11	10	
	12	7		12	9		12	8		12	8	
	13	9		13	10		13	8		13	8	
	14	10		14	7		14	8		14	8	
	15	9		15	7		15	8		15	9	

Comments



Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/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.

1617-0886

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	9	N	1	9	N	1	10	N	1	10	N
2	11	↓	2	8	↓	2	10	↓	2	9	↓
3	8	↓	3	8	↓	3	8	↓	3	8	↓
4	8	↓	4	8	↓	4	7	↓	4	9	↓
5	8	↓	5	8	↓	5	8	↓	5	10	↓
6	10	↓	6	7	↓	6	12	↓	6	10	↓
7	9	↓	7	9	↓	7	10	↓	7	9	↓
8	9	↓	8	7	↓	8	—	—	8	10	↓
9	—	—	9	8	↓	9	—	—	9	—	—
10	—	—	10	8	↓	10	—	—	10	—	—
11	—	—	11	8	↓	11	—	—	11	—	—
12	—	—	12	9	↓	12	—	—	12	—	—
13	—	—	13	8	↓	13	—	—	13	—	—
14	—	—	14	8	↓	14	—	—	14	—	—
15	—	—	15	—	—	15	—	—	15	—	—

Comments

1617-0887

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	7	N	1	8	N	1	7	N
2	8	↓	2	9	↓	2	9	↓	2	8	↓
3	8	↓	3	FT	↓	3	8	↓	3	8	↓
4	8	↓	4	FT	↓	4	10	↓	4	9	↓
5	7	↓	5	8	↓	5	8	↓	5	9	↓
6	9	↓	6	8	↓	6	7	↓	6	8	↓
7	9	↓	7	11	↓	7	8	↓	7	9	↓
8	8	↓	8	8	↓	8	7	↓	8	10	↓
9	9	↓	9	10	↓	9	11	↓	9	8	↓
10	8	↓	10	9	↓	10	9	↓	10	8	↓
11	9	AS	11	9	↓	11	9	↓	11	10	↓
12	7	N	12	FT	↓	12	9	↓	12	9	↓
13	8	↓	13	8	↓	13	8	↓	13	8	↓
14	9	↓	14	10	↓	14	7	↓	14	8	↓
15	—	—	15	—	—	15	—	—	15	8	↓

Comments

0887A-11 - crooked spine

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/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.

1617-0888

Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1	10	N
A	2	8	
A	3	10	
A	4	8	
A	5	9	AS
A	6	8	N
A	7	8	
A	8	9	
A	9	8	
A	10	8	
A	11	8	
A	12	7	
A	13	8	
A	14	8	
A	15		
B	1	9	N
B	2	9	
B	3	9	
B	4	8	
B	5	8	
B	6	8	
B	7	6	
B	8	8	
B	9	9	
B	10	8	
B	11	9	
B	12	8	
B	13	8	
B	14	8	
B	15	9	
C	1	8	N
C	2	8	
C	3	7	
C	4	9	
C	5	8	
C	6	8	
C	7	9	
C	8	9	
C	9	9	
C	10	9	
C	11	9	
C	12	8	
C	13	8	
C	14	8	
C	15	8	
D	1	9	N
D	2	8	
D	3	9	
D	4	9	
D	5	8	
D	6	8	
D	7	8	
D	8	8	
D	9	8	
D	10	9	
D	11	10	
D	12	8	
D	13	8	
D	14	8	
D	15	8	

Comments

1617-0889

Replicate #	Fish	Length (mm)	Normal/Abnormal
A	1	10	N
A	2	8	
A	3	10	
A	4	11	
A	5	7	
A	6	8	
A	7	8	
A	8	9	
A	9	8	
A	10	8	
A	11	7	
A	12	7	
A	13	9	
A	14		
A	15		
B	1	8	N
B	2	8	
B	3	9	
B	4	7	
B	5	7	
B	6	10	
B	7	7	
B	8	8	
B	9	8	
B	10	10	
B	11	8	
B	12	7	
B	13	8	
B	14	8	
B	15		
C	1	8	N
C	2	8	
C	3	9	
C	4	9	
C	5	9	
C	6	7	
C	7	8	
C	8	9	
C	9	8	
C	10	8	
C	11	7	
C	12	10	
C	13	9	
C	14	9	
C	15	8	
D	1	8	N
D	2	7	
D	3	9	
D	4	7	
D	5	8	
D	6	9	
D	7	7	
D	8	9	
D	9	7	
D	10	8	
D	11	9	
D	12	8	
D	13	9	
D	14	8	
D	15	8	

Comments

Method FMD 32 Day ELS Client NAU104

Sample: 1617-0886, 1617-0887, 1617-0888, 1617-0889, 1617-0890 Copper (10 µg/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.  
1617-  
0890

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	9	N	1	7	N	1	8	N
2	9		2	9		2	10		2	8	
3	8		3	8		3	10		3	8	
4	9		4	8		4	8		4	10	
5	9		5	7		5	7		5	8	
6	8		6	8		6	9		6	8	
7	8		7	8		7	9		7	8	
8	8		8	9		8	8		8	9	
9	9		9	9		9	8		9	8	
10	8		10	8		10	8		10	7	
11	9		11	8		11	9		11	8	
12	9		12	9		12	9		12	8	
13	9		13	8		13	8		13	10	
14	10		14	7		14			14	9	
15			15			15			15		

Comments

# Organism Weights Bench Sheet

Client NAU104 Sample SP1617-028 32-d Organism FM

Initial Weight (mg) (dried pan)

Date: 2017/05/29 Initials: SS Balance\*: Nettler #1

Conc.	CTL UNT	CTL CU	NAU0886	NAU0887	NAU0888	NAU0889	NAU0890
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Replicate	<u>991.91 SS</u>							
a	<u>1017.21</u>	<u>985.36</u>	<u>1002.08</u>	<u>994.54</u>	<u>999.71</u>	<u>990.32</u>	<u>1025.06</u>	
b	<u>1018.99</u>	<u>1000.60</u>	<u>1017.23</u>	<u>1028.26</u>	<u>931.58</u>	<u>998.37</u>	<u>986.87</u>	
c	<u>1004.10</u>	<u>973.70</u>	<u>1025.38</u>	<u>1003.70</u>	<u>1009.82</u>	<u>1013.56</u>	<u>986.87</u>	<u>1028.74</u>
d	<u>1017.21</u>	<u>978.76</u>	<u>987.93</u>	<u>985.03</u>	<u>1007.04</u>	<u>1012.37</u>	<u>984.52</u>	
e								

Final Weight (mg) (dried pan+organisms)

Date: 2017/06/08 Initials: EP Balance\*: #1

Conc.	CTL UNT	CTL CU	NAU 0886	NAU 0887	NAU 0888	NAU 0889	NAU 0890
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Replicate								
a	<u>1003.11</u>	<u>997.37</u>	<u>1010.25</u>	<u>1006.55</u>	<u>1011.12</u>	<u>1003.92</u>	<u>1038.67</u>	
b	<u>1028.77</u>	<u>1012.29</u>	<u>1027.77</u>	<u>1040.73</u>	<u>942.59</u>	<u>1010.31</u>	<u>999.14</u>	
c	<u>1013.84</u>	<u>984.77</u>	<u>1035.45</u>	<u>1015.10</u>	<u>1020.09</u>	<u>1027.23</u>	<u>1040.56</u>	
d	<u>1030.56</u>	<u>989.86</u>	<u>997.78</u>	<u>997.23</u>	<u>1018.98</u>	<u>1023.76</u>	<u>997.19</u>	
e			<u>947.69</u>					

Test Validity Met: Yes/No/NA

Results are Logical\*\*: Yes/No

\*\*no negative numbers, consistent values across replicates

\*Same balance must be used for initial and final weights

\*For FM/HA/CT must use scale with 0.01 mg accuracy

Balance Calibration Check:

Initial  
 first pan weighed: CTL UNTD  
 weight of first pan: 1017.21  
 re-weigh of first pan after  
 all weights measured: 1017.19

Final  
 first pan+org weighed: CTL UNTA  
 weight of first pan + org: 1003.11  
 re-weigh of first pan + org  
 after all weights measured: 1003.13

% difference <5%: Yes/No

% difference <5%: Yes/No

Calculation: % difference = [(initial weight-reweight)/((initial weight+reweight)/2)]x100

If "no" is circled for any parameter, notify Lab Supervisor/QA Group to determine appropriate action

**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: 20170428FM

**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): 8.2  
conductance (µS/cm): 470  
dissolved oxygen (mg/L): 7.3  
NH<sub>4</sub><sup>+</sup> (mg/L): 24.7  
hardness (mg CaCO<sub>3</sub>/L): 167  
alkalinity (mg CaCO<sub>3</sub>/L): 124  
total residual chlorine (mg/L): <0.01

**Comments:**

The test data and results are authorized and verified correct.



Senior Verifier

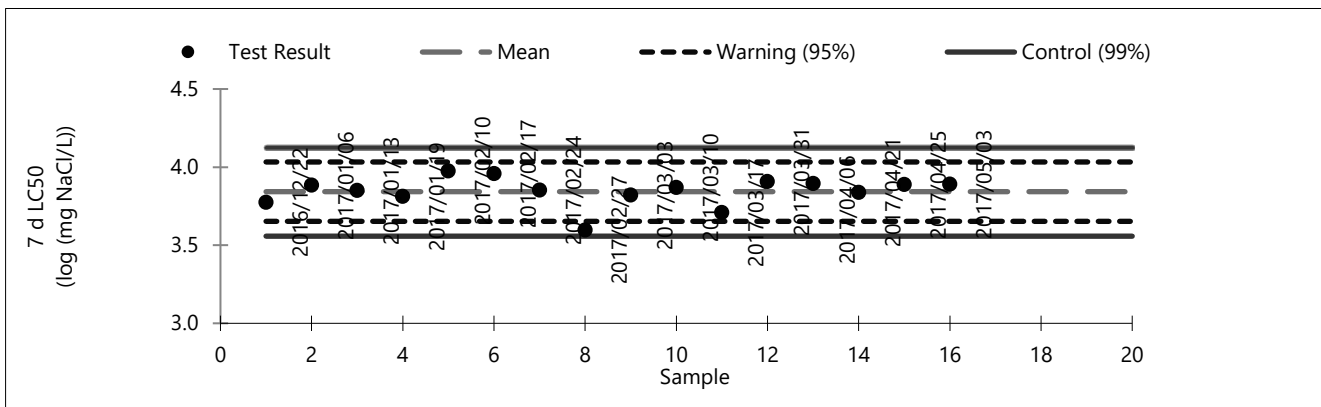
### Mortality

#### Current Test

toxicant Sodium Chloride (NaCl)				
started on 2017/05/03		ended on 2017/05/10		
Result (7 d LC50):	3.89	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.84	upper	3.95

#### Historical Values

mean	3.84	sd	0.10	cv(%):	14.5
	lower	upper			
warning limits ( $\pm 2$ sd)	3.65	4.03	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.56	4.13	(99% confidence limits)		

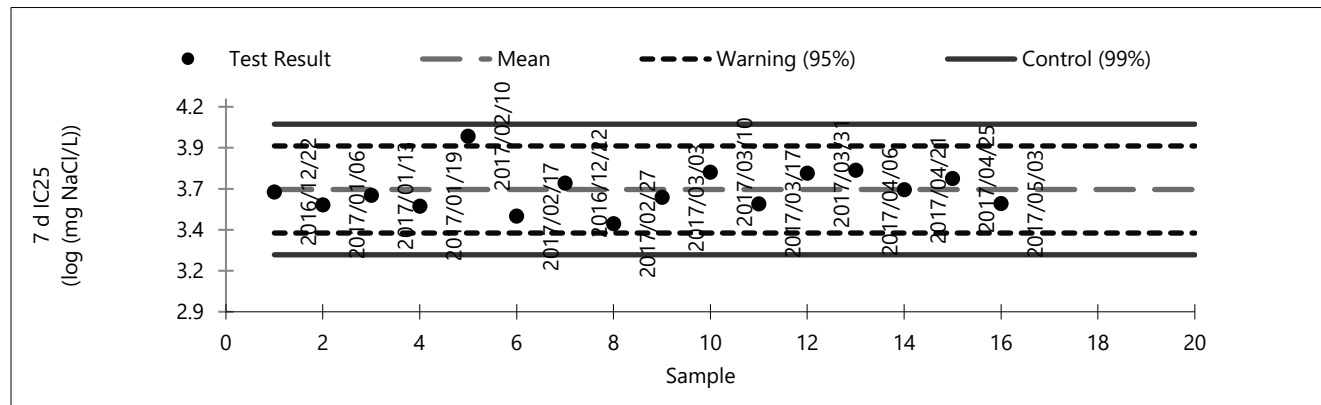


### Biomass

started on 2017/05/03				
ended on 2017/05/10		log (mg NaCl/L); geometric mean		
Result (7 d IC25):	3.56	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.51	upper	3.63

#### Historical Values

mean	3.65	sd	0.13	cv(%):	20.3
	lower	upper			
warning limits ( $\pm 2$ sd)	3.38	3.91	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.25	4.04	(99% confidence limits)		



notes: sd, standard deviation; cv, coefficient of variance; N/A, could not be calculated

**CETIS Summary Report**

Report Date: 27 Jul-17 09:45 (p 1 of 4)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Batch ID: 07-2611-2218      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Apr-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 30 May-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

**CETIS Summary Report**

Report Date: 27 Jul-17 09:45 (p 2 of 4)  
 Test Code: 170362 | 04-3243-4745

**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	4	1	1	1	1	1	0	0	0.0%	0.0%
Lab Copper Cont	4	1	1	1	1	1	0	0	0.0%	0.0%
FR_UFR1	4	1	1	1	1	1	0	0	0.0%	0.0%
GH_ER2	4	1	1	1	1	1	0	0	0.0%	0.0%
FR_FRCP1	4	1	1	1	1	1	0	0	0.0%	0.0%
GH_FR1	4	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC2	4	1	1	1	1	1	0	0	0.0%	0.0%

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	8.101	7.623	8.579	7.867	8.533	0.1502	0.3005	3.71%	0.0%
Lab Copper Cont	4	8.415	8.316	8.515	8.333	8.467	0.03126	0.06253	0.74%	-3.88%
FR_UFR1	4	8.218	7.785	8.65	7.867	8.462	0.1359	0.2717	3.31%	-1.44%
GH_ER2	4	8.367	8.19	8.544	8.214	8.467	0.05563	0.1113	1.33%	-3.28%
FR_FRCP1	4	8.255	7.891	8.618	7.933	8.462	0.1143	0.2285	2.77%	-1.9%
GH_FR1	4	8.933	7.984	9.882	8.071	9.375	0.2981	0.5963	6.68%	-10.27%
CM_MC2	4	8.419	8.132	8.706	8.214	8.643	0.09021	0.1804	2.14%	-3.92%

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.7345	0.5545	0.9145	0.6493	0.89	0.05656	0.1131	15.4%	0.0%
Lab Copper Cont	4	0.7645	0.7156	0.8134	0.738	0.8007	0.01536	0.03072	4.02%	-4.08%
FR_UFR1	4	0.8433	0.7203	0.9664	0.7593	0.9113	0.03866	0.07731	9.17%	-14.82%
GH_ER2	4	0.8013	0.7531	0.8495	0.76	0.8313	0.01515	0.03029	3.78%	-9.1%
FR_FRCP1	4	0.7438	0.6692	0.8185	0.6847	0.796	0.02346	0.04691	6.31%	-1.27%
GH_FR1	4	0.6423	0.5333	0.7514	0.5447	0.7027	0.03427	0.06853	10.67%	12.55%
CM_MC2	4	0.8395	0.7587	0.9203	0.788	0.9073	0.0254	0.0508	6.05%	-14.3%

**Proportion Normal Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
Lab Copper Cont	4	1	1	1	1	1	0	0	0.0%	0.0%
FR_UFR1	4	1	1	1	1	1	0	0	0.0%	0.0%
GH_ER2	4	0.9821	0.9253	1	0.9286	1	0.01786	0.03571	3.64%	1.79%
FR_FRCP1	4	0.9821	0.9253	1	0.9286	1	0.01786	0.03571	3.64%	1.79%
GH_FR1	4	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC2	4	1	1	1	1	1	0	0	0.0%	0.0%

**Survival 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%
Lab Copper Cont	4	0.9667	0.8606	1	0.8667	1	0.03333	0.06667	6.9%	1.7%
FR_UFR1	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
GH_ER2	4	0.95	0.897	1	0.9333	1	0.01667	0.03333	3.51%	3.39%
FR_FRCP1	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
GH_FR1	4	0.6167	0.277	0.9563	0.4667	0.9333	0.1067	0.2134	34.61%	37.29%
CM_MC2	4	0.9167	0.8636	0.9697	0.8667	0.9333	0.01667	0.03333	3.64%	6.78%



**CETIS Summary Report**

Report Date: 27 Jul-17 09:45 (p 3 of 4)  
 Test Code: 170362 | 04-3243-4745

**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	1
Lab Copper Cont	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	1	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	7.933	8.071	7.867	8.533
Lab Copper Cont	8.467	8.462	8.4	8.333
FR_UFR1	8.462	8.143	8.4	7.867
GH_ER2	8.214	8.357	8.429	8.467
FR_FRCP1	8.357	8.267	7.933	8.462
GH_FR1	9	8.071	9.286	9.375
CM_MC2	8.643	8.214	8.462	8.357

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.7467	0.652	0.6493	0.89
Lab Copper Cont	0.8007	0.7793	0.738	0.74
FR_UFR1	0.9067	0.796	0.9113	0.7593
GH_ER2	0.8007	0.8313	0.76	0.8133
FR_FRCP1	0.7607	0.734	0.6847	0.796
GH_FR1	0.5447	0.7027	0.6713	0.6507
CM_MC2	0.9073	0.818	0.788	0.8447

**Proportion Normal Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	1
Lab Copper Cont	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	0.9286	1	1	1
FR_FRCP1	0.9286	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	0.9333	1	1
Lab Copper Cont	1	0.8667	1	1
FR_UFR1	0.8667	0.9333	1	1
GH_ER2	0.9333	0.9333	0.9333	1
FR_FRCP1	0.9333	1	1	0.8667
GH_FR1	0.5333	0.9333	0.4667	0.5333
CM_MC2	0.9333	0.9333	0.8667	0.9333

# CETIS Summary Report

Report Date: 27 Jul-17 09:45 (p 4 of 4)  
Test Code: 170362 | 04-3243-4745

## 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	15/15	15/15	15/15
Lab Copper Cont	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
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	15/15	15/15

### Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	14/14	15/15	15/15
Lab Copper Cont	15/15	13/13	15/15	15/15
FR_UFR1	13/13	14/14	15/15	15/15
GH_ER2	13/14	14/14	14/14	15/15
FR_FRCP1	13/14	15/15	15/15	13/13
GH_FR1	8/8	14/14	7/7	8/8
CM_MC2	14/14	14/14	13/13	14/14

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	14/15	15/15	15/15
Lab Copper Cont	15/15	13/15	15/15	15/15
FR_UFR1	13/15	14/15	15/15	15/15
GH_ER2	14/15	14/15	14/15	15/15
FR_FRCP1	14/15	15/15	15/15	13/15
GH_FR1	8/15	14/15	7/15	8/15
CM_MC2	14/15	14/15	13/15	14/15

**CETIS Analytical Report**

Report Date: 20 Jul-17 14:44 (p 1 of 1)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 05-8178-0715	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:25	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		

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%)
Lab Copper Cont		Lab Control	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	60	0	60	1	0	0.0%
Lab Copper Cont Negative Contr	60	0	60	1	0	0.0%

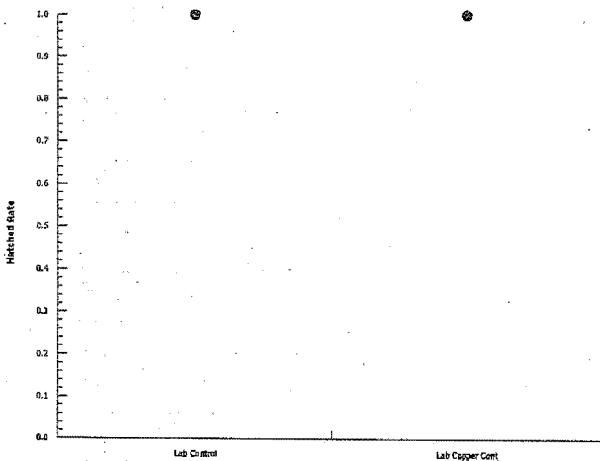
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	1
Lab Copper Cont	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	15/15
Lab Copper Cont	15/15	15/15	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:44 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 20-0308-7244	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:21	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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 Copper Cont		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_ER2	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		FR_FRCP1	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		CM_MC2	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Copper Cont Negative Contr	60	0	60	1	0	0.0%
FR_UFR1	60	0	60	1	0	0.0%
GH_ER2	60	0	60	1	0	0.0%
FR_FRCP1	60	0	60	1	0	0.0%
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
Lab Copper Cont	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	1	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

# CETIS Analytical Report

Report Date: 20 Jul-17 14:44 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-0308-7244  
Analyzed: 20 Jul-17 14:21

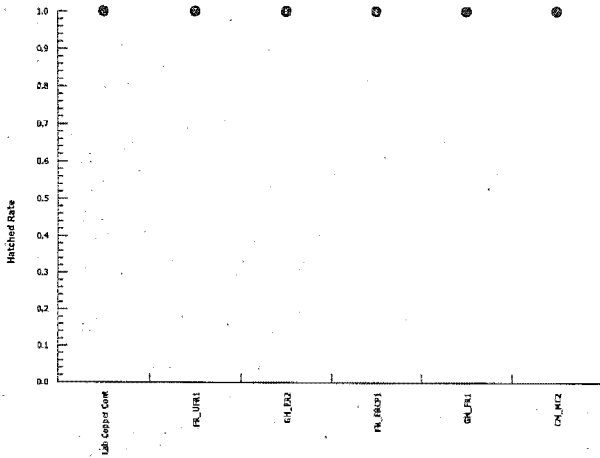
Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	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
FR_FRCP1	15/15	15/15	15/15	15/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	15/15	15/15

### Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:44 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 13-8462-5458	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:30	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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	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		CM_MC2	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%
GH_ER2	60	0	60	1	0	0.0%
FR_FRCP1	60	0	60	1	0	0.0%
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	1	1	1	1
GH_ER2	1	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	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
GH_ER2	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	15/15
CM_MC2	15/15	15/15	15/15	15/15

# CETIS Analytical Report

Report Date: 20 Jul-17 14:44 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

## Fathead Minnow 32-d Survival and Growth Test

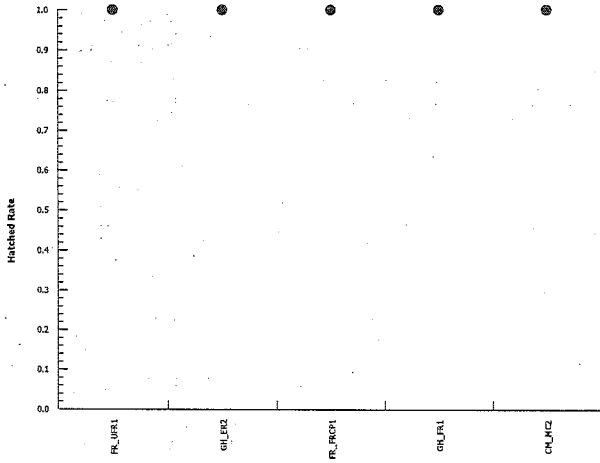
Nautilus Environmental

Analysis ID: 13-8462-5458  
Analyzed: 20 Jul-17 14:30

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:45 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 09-5509-3541	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:35	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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		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	
FR_UFR1	60	0	60	1	0	0.0%	
GH_ER2	Receiving Wate	60	0	60	1	0	0.0%
FR_FRCP1	60	0	60	1	0	0.0%	
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	1	1	1	1
GH_ER2	1	1	1	1
FR_FRCP1	1	1	1	1
GH_FR1	1	1	1	1
CM_MC2	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
GH_ER2	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	15/15
CM_MC2	15/15	15/15	15/15	15/15



# CETIS Analytical Report

Report Date: 20 Jul-17 14:45 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

Fathead Minnow 32-d Survival and Growth Test

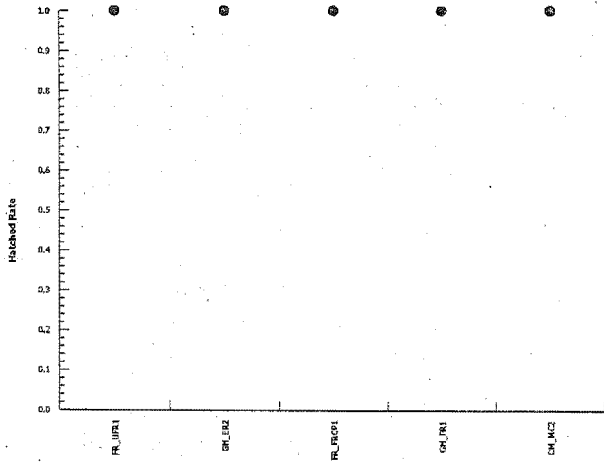
Nautilus Environmental

Analysis ID: 09-5509-3541  
Analyzed: 20 Jul-17 14:35

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:50 (p 1 of 1)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 10-0357-9507	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:25	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		

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%)
Lab Copper Cont		Lab Control	0.6218	0.6218	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	-1.72%
Lab Copper Cont Negative Contr	58	2	60	0.9667	0.03333	0.0%

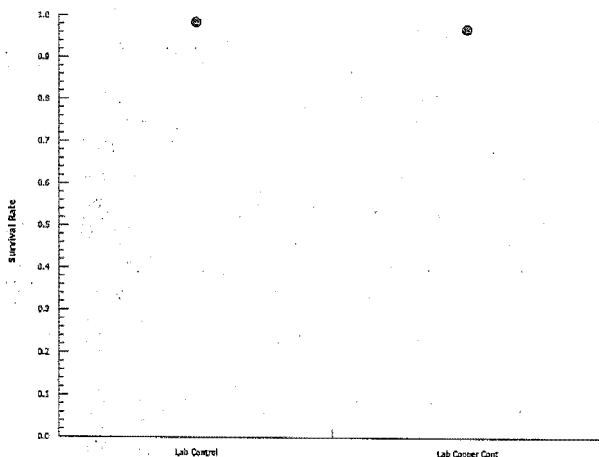
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	0.9333	1	1
Lab Copper Cont	1	0.8667	1	1

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	14/15	15/15	15/15
Lab Copper Cont	15/15	13/15	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:50 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 10-1686-2912	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:22	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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 Copper Cont		FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		FR_FRCP1	0.5	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_FR1	1.044E-06	<0.0001	Exact	Significant Effect
Lab Copper Cont		CM_MC2	0.2195	0.8780	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Copper Cont Negative Contr	58	2	60	0.9667	0.03333	0.0%
FR_UFR1	57	3	60	0.95	0.05	1.72%
GH_ER2	57	3	60	0.95	0.05	1.72%
FR_FRCP1	57	3	60	0.95	0.05	1.72%
GH_FR1	37	23	60	0.6167	0.3833	36.21%
CM_MC2	55	5	60	0.9167	0.08333	5.17%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	1	0.8667	1	1
FR_UFR1	0.8667	0.9333	1	1
GH_ER2	0.9333	0.9333	0.9333	1
FR_FRCP1	0.9333	1	1	0.8667
GH_FR1	0.5333	0.9333	0.4667	0.5333
CM_MC2	0.9333	0.9333	0.8667	0.9333

Fathead Minnow 32-d Survival and Growth Test

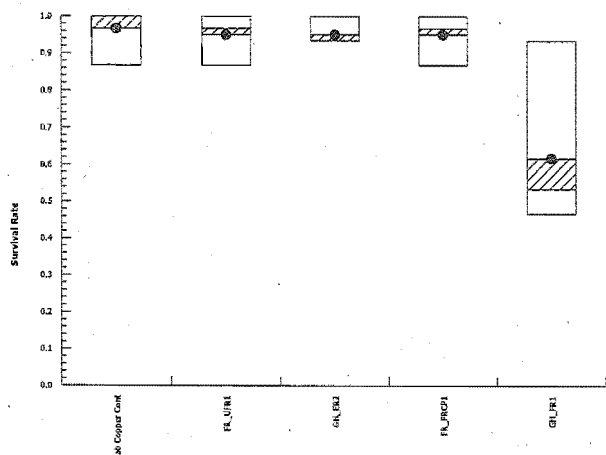
Nautilus Environmental

Analysis ID: 10-1686-2912      Endpoint: Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 20 Jul-17 14:22      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	15/15	13/15	15/15	15/15
FR_UFR1	13/15	14/15	15/15	15/15
GH_ER2	14/15	14/15	14/15	15/15
FR_FRCP1	14/15	15/15	15/15	13/15
GH_FR1	8/15	14/15	7/15	8/15
CM_MC2	14/15	14/15	13/15	14/15

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:50 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-3142-9386	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:30	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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	0.6603	1.0000	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.6603	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	5.685E-06	<0.0001	Exact	Significant Effect
FR_UFR1		CM_MC2	0.3585	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	57	3	60	0.95	0.05	0.0%
GH_ER2	57	3	60	0.95	0.05	0.0%
FR_FRCP1	57	3	60	0.95	0.05	0.0%
GH_FR1	37	23	60	0.6167	0.3833	35.09%
CM_MC2	55	5	60	0.9167	0.08333	3.51%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.8667	0.9333	1	1
GH_ER2	0.9333	0.9333	0.9333	1
FR_FRCP1	0.9333	1	1	0.8667
GH_FR1	0.5333	0.9333	0.4667	0.5333
CM_MC2	0.9333	0.9333	0.8667	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	13/15	14/15	15/15	15/15
GH_ER2	14/15	14/15	14/15	15/15
FR_FRCP1	14/15	15/15	15/15	13/15
GH_FR1	8/15	14/15	7/15	8/15
CM_MC2	14/15	14/15	13/15	14/15

CETIS Analytical Report

Report Date: 20 Jul-17 14:50 (p 2 of 2)  
 Test Code: 170362 | 04-3243-4745

Fathead Minnow 32-d Survival and Growth Test

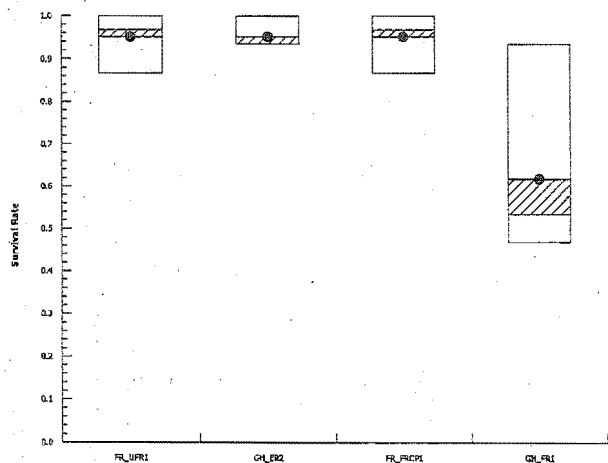
Nautilus Environmental

Analysis ID: 07-3142-9386  
 Analyzed: 20 Jul-17 14:30

Endpoint: Survival Rate  
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:51 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 20-8595-2171	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:35	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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	0.6603	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.6603	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	5.685E-06	<0.0001	Exact	Significant Effect
GH_ER2		CM_MC2	0.3585	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
FR_UFR1	57	3	60	0.95	0.05	0.0%	
GH_ER2	Receiving Wate	57	3	60	0.95	0.05	0.0%
FR_FRCP1	57	3	60	0.95	0.05	0.0%	
GH_FR1	37	23	60	0.6167	0.3833	35.09%	
CM_MC2	55	5	60	0.9167	0.08333	3.51%	

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.8667	0.9333	1	1
GH_ER2	0.9333	0.9333	0.9333	1
FR_FRCP1	0.9333	1	1	0.8667
GH_FR1	0.5333	0.9333	0.4667	0.5333
CM_MC2	0.9333	0.9333	0.8667	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	13/15	14/15	15/15	15/15
GH_ER2	14/15	14/15	14/15	15/15
FR_FRCP1	14/15	15/15	15/15	13/15
GH_FR1	8/15	14/15	7/15	8/15
CM_MC2	14/15	14/15	13/15	14/15

Fathead Minnow 32-d Survival and Growth Test

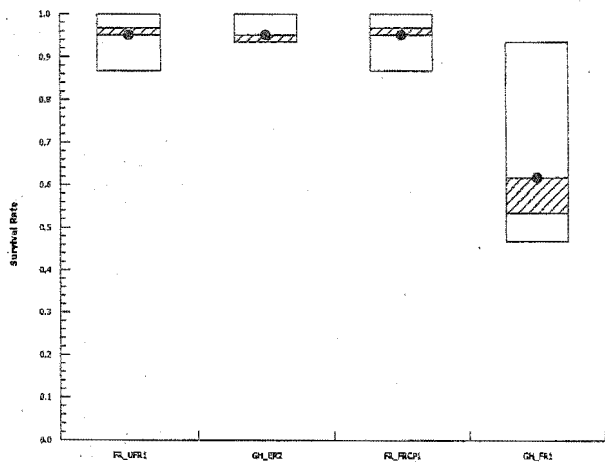
Nautilus Environmental

Analysis ID: 20-8595-2171  
Analyzed: 20 Jul-17 14:35

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 20 Jul-17 14:49 (p 1 of 1)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 16-5544-9155	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:29	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		

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%)
Lab Copper Cont		Lab Control	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	0	59	1	0	0.0%
Lab Copper Cont Negative Contr	58	0	58	1	0	0.0%

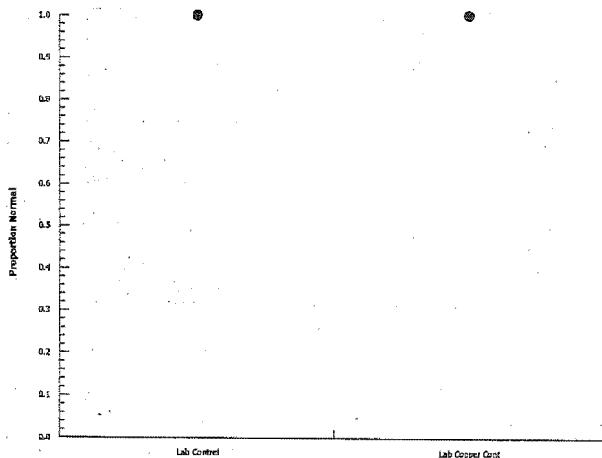
**Proportion Normal Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	1
Lab Copper Cont	1	1	1	1

**Proportion Normal Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	14/14	15/15	15/15
Lab Copper Cont	15/15	13/13	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:49 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 17-4057-6454      Endpoint: Proportion Normal      CETIS Version: CETISv1.8.7  
 Analyzed: 20 Jul-17 14:29      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

Batch ID: 07-2611-2218      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Apr-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 30 May-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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 Copper Cont		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_ER2	0.4957	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		FR_FRCP1	0.4957	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Lab Copper Cont		CM_MC2	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Copper Cont	Negative Contr	58	0	58	1	0.0%
FR_UFR1		57	0	57	1	0.0%
GH_ER2		56	1	57	0.9825	0.01754 1.75%
FR_FRCP1		56	1	57	0.9825	0.01754 1.75%
GH_FR1		37	0	37	1	0.0%
CM_MC2		55	0	55	1	0.0%

**Proportion Normal Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	1	1	1	1
FR_UFR1	1	1	1	1
GH_ER2	0.9286	1	1	1
FR_FRCP1	0.9286	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

# CETIS Analytical Report

Report Date: 20 Jul-17 14:49 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-4057-6454  
Analyzed: 20 Jul-17 14:29

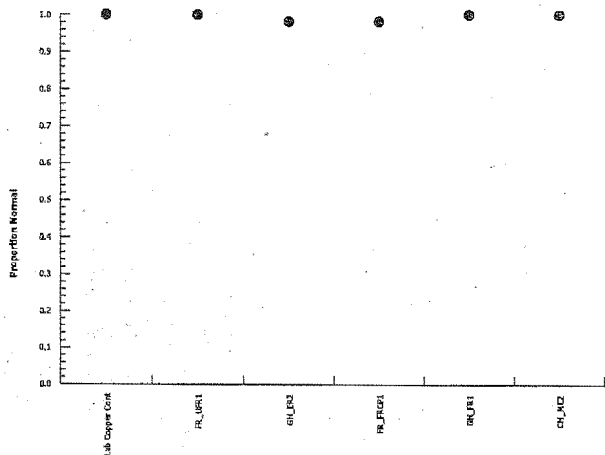
Endpoint: Proportion Normal  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Proportion Normal Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	15/15	13/13	15/15	15/15
FR_UFR1	13/13	14/14	15/15	
GH_ER2	13/14	14/14	14/14	15/15
FR_FRCP1	13/14	15/15	15/15	13/13
GH_FR1	8/8	14/14	7/7	8/8
CM_MC2	14/14	14/14	13/13	14/14

### Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:49 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 13-2549-5780	<b>Endpoint:</b> Proportion Normal	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:31	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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		FR_FRCP1	0.5	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**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	57	0	57	1	0	0.0%
GH_ER2	56	1	57	0.9825	0.01754	1.75%
FR_FRCP1	56	1	57	0.9825	0.01754	1.75%
GH_FR1	37	0	37	1	0	0.0%
CM_MC2	55	0	55	1	0	0.0%

**Proportion Normal Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1	1	1	1
GH_ER2	0.9286	1	1	1
FR_FRCP1	0.9286	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

**Proportion Normal Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	13/13	14/14	15/15	
GH_ER2	13/14	14/14	14/14	15/15
FR_FRCP1	13/14	15/15	15/15	13/13
GH_FR1	8/8	14/14	7/7	8/8
CM_MC2	14/14	14/14	13/13	14/14

**CETIS Analytical Report**

Report Date: 20 Jul-17 14:49 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

Fathead Minnow 32-d Survival and Growth Test

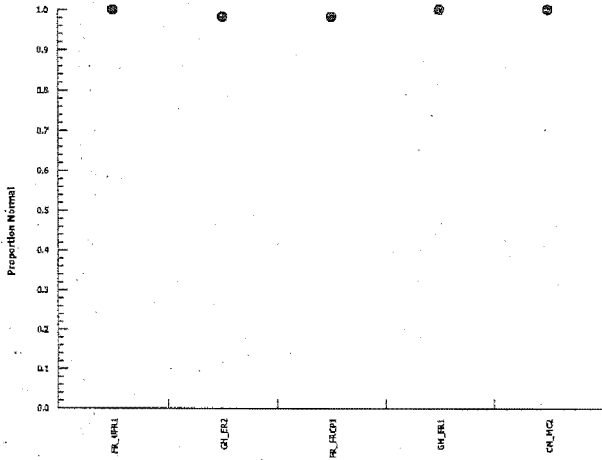
Nautilus Environmental

Analysis ID: 13-2549-5780  
Analyzed: 20 Jul-17 14:31

Endpoint: Proportion Normal  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:50 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 15-7711-0301	Endpoint: Proportion Normal	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:36	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_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		FR_FRCP1	0.7522	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
FR_UFR1	42	0	42	1	0	-1.79%
GH_ER2	Receiving Wate 56	1	57	0.9825	0.01754	0.0%
FR_FRCP1	56	1	57	0.9825	0.01754	0.0%
GH_FR1	37	0	37	1	0	-1.79%
CM_MC2	55	0	55	1	0	-1.79%

**Proportion Normal Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1	1	1	
GH_ER2	0.9286	1	1	1
FR_FRCP1	0.9286	1	1	1
GH_FR1	1	1	1	1
CM_MC2	1	1	1	1

**Proportion Normal Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	13/13	14/14	15/15	
GH_ER2	13/14	14/14	14/14	15/15
FR_FRCP1	13/14	15/15	15/15	13/13
GH_FR1	8/8	14/14	7/7	8/8
CM_MC2	14/14	14/14	13/13	14/14

# CETIS Analytical Report

Report Date: 20 Jul-17 14:50 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

## Fathead Minnow 32-d Survival and Growth Test

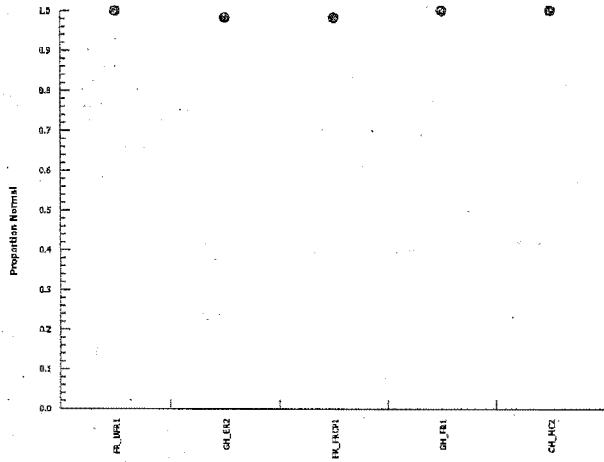
Nautilus Environmental

Analysis ID: 15-7711-0301  
Analyzed: 20 Jul-17 14:36

Endpoint: Proportion Normal  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:48 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test** **Nautilus Environmental**

Analysis ID: 16-4484-1410	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:28	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C <> T	NA	NA	18.8%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Copper Cont		Lab Control	0.5118	2.447	0.143	6	0.6271	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.001799732	0.001799732	1	0.262	0.6271	Non-Significant Effect
Error	0.04121841	0.006869736	6			
Total	0.04301815		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	13.56	47.47	0.0598	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8987	0.6451	0.2810	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	0.7345	0.5545	0.9145	0.6993	0.6493	0.89	0.05656	15.4%	0.0%
Lab Copper Cont	4	0.7645	0.7156	0.8134	0.7597	0.738	0.8007	0.01536	4.02%	-4.08%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.7467	0.652	0.6493	0.89
Lab Copper Cont	0.8007	0.7793	0.738	0.74



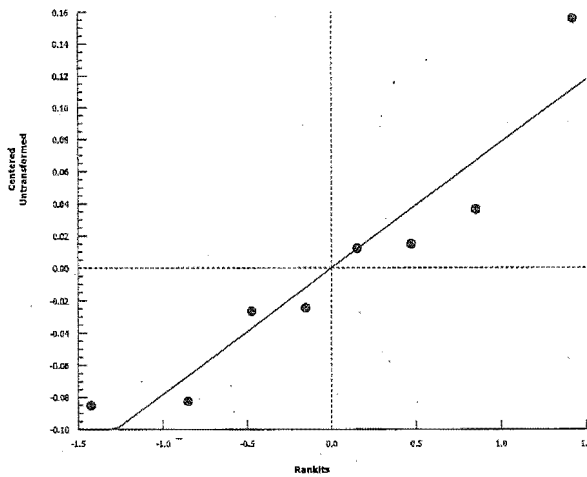
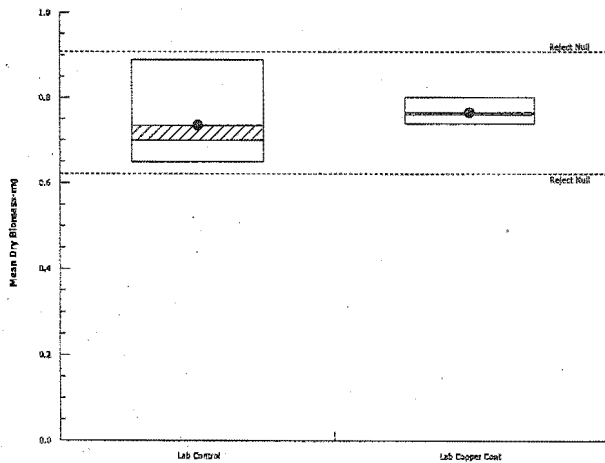
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-4484-1410      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Jul-17 14:28      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:47 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 16-5252-8630	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:27	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.0%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Copper Cont		FR_UFR1	-2.075	2.407	0.091	6	0.9993	CDF	Non-Significant Effect
		GH_ER2	-0.9696	2.407	0.091	6	0.9813	CDF	Non-Significant Effect
		FR_FRCP1	0.544	2.407	0.091	6	0.6282	CDF	Non-Significant Effect
		GH_FR1	3.216	2.407	0.091	6	0.0098	CDF	Significant Effect
		CM_MC2	-1.974	2.407	0.091	6	0.9990	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1126677	0.02253354	5	7.808	0.0005	Significant Effect
Error	0.05194803	0.002886001	18			
Total	0.1646157		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.802	15.09	0.5782	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9626	0.884	0.4931	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Copper Cont	4	0.7645	0.7156	0.8134	0.7597	0.738	0.8007	0.01536	4.02%	0.0%
FR_UFR1	4	0.8433	0.7203	0.9664	0.8513	0.7593	0.9113	0.03866	9.17%	-10.31%
GH_ER2	4	0.8013	0.7531	0.8495	0.807	0.76	0.8313	0.01515	3.78%	-4.82%
FR_FRCP1	4	0.7438	0.6692	0.8185	0.7473	0.6847	0.796	0.02346	6.31%	2.7%
GH_FR1	4	0.6423	0.5333	0.7514	0.661	0.5447	0.7027	0.03427	10.67%	15.98%
CM_MC2	4	0.8395	0.7587	0.9203	0.8313	0.788	0.9073	0.0254	6.05%	-9.81%

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

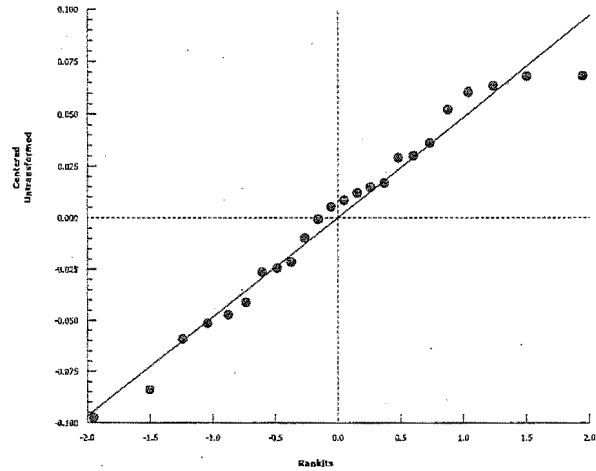
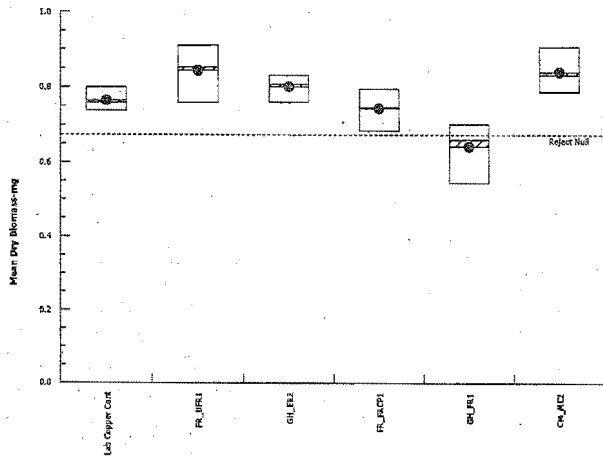
Analysis ID: 16-5252-8630      Endpoint: Mean Dry Biomass-mg  
 Analyzed: 20 Jul-17 14:27      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	0.8007	0.7793	0.738	0.74
FR_UFR1	0.9067	0.796	0.9113	0.7593
GH_ER2	0.8007	0.8313	0.76	0.8133
FR_FRCP1	0.7607	0.734	0.6847	0.796
GH_FR1	0.5447	0.7027	0.6713	0.6507
CM_MC2	0.9073	0.818	0.788	0.8447

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:48 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-3739-0772	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:31	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.3%	

**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	1.038	2.356	0.095	6	0.3674	CDF	Non-Significant Effect
		FR_FRCP1	2.459	2.356	0.095	6	0.0414	CDF	Significant Effect
		GH_FR1	4.968	2.356	0.095	6	0.0003	CDF	Significant Effect
		CM_MC2	0.0947	2.356	0.095	6	0.7680	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1123626	0.02809066	4	8.579	0.0008	Significant Effect
Error	0.04911737	0.003274491	15			
Total	0.16148		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.502	13.28	0.6443	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9481	0.866	0.3394	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	0.8433	0.7203	0.9664	0.8513	0.7593	0.9113	0.03866	9.17%	0.0%
GH_ER2	4	0.8013	0.7531	0.8495	0.807	0.76	0.8313	0.01515	3.78%	4.98%
FR_FRCP1	4	0.7438	0.6692	0.8185	0.7473	0.6847	0.796	0.02346	6.31%	11.8%
GH_FR1	4	0.6423	0.5333	0.7514	0.661	0.5447	0.7027	0.03427	10.67%	23.83%
CM_MC2	4	0.8395	0.7587	0.9203	0.8313	0.788	0.9073	0.0254	6.05%	0.45%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9067	0.796	0.9113	0.7593
GH_ER2	0.8007	0.8313	0.76	0.8133
FR_FRCP1	0.7607	0.734	0.6847	0.796
GH_FR1	0.5447	0.7027	0.6713	0.6507
CM_MC2	0.9073	0.818	0.788	0.8447

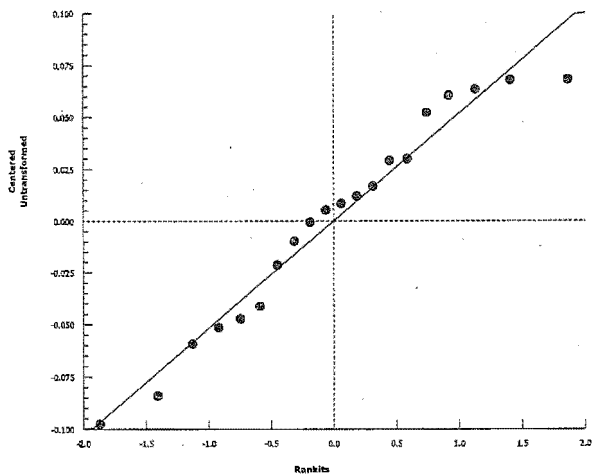
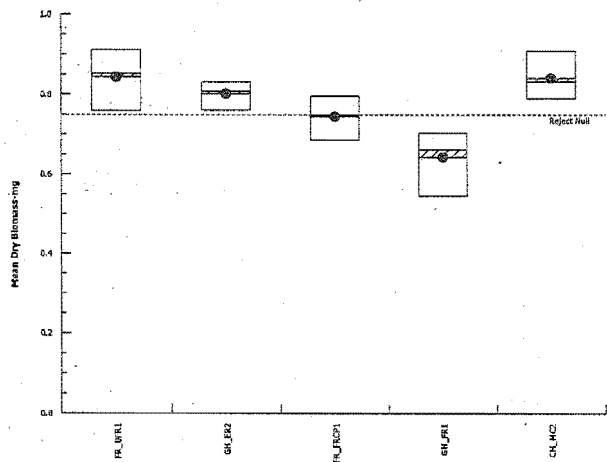
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-3739-0772      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Jul-17 14:31      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:48 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 15-2059-7880	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:36	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

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%)
GH_ER2		FR_UFR1	-1.038	2.356	0.095	6	0.9773	CDF	Non-Significant Effect
		FR_FRCP1	1.421	2.356	0.095	6	0.2275	CDF	Non-Significant Effect
		GH_FR1	3.929	2.356	0.095	6	0.0023	CDF	Significant Effect
		CM_MC2	-0.9433	2.356	0.095	6	0.9714	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1123626	0.02809066	4	8.579	0.0008	Significant Effect
Error	0.04911737	0.003274491	15			
Total	0.16148		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.502	13.28	0.6443	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9481	0.866	0.3394	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	0.8433	0.7203	0.9664	0.8513	0.7593	0.9113	0.03866	9.17%	0.0%
GH_ER2	4	0.8013	0.7531	0.8495	0.807	0.76	0.8313	0.01515	3.78%	4.98%
FR_FRCP1	4	0.7438	0.6692	0.8185	0.7473	0.6847	0.796	0.02346	6.31%	11.8%
GH_FR1	4	0.6423	0.5333	0.7514	0.661	0.5447	0.7027	0.03427	10.67%	23.83%
CM_MC2	4	0.8395	0.7587	0.9203	0.8313	0.788	0.9073	0.0254	6.05%	0.45%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9067	0.796	0.9113	0.7593
GH_ER2	0.8007	0.8313	0.76	0.8133
FR_FRCP1	0.7607	0.734	0.6847	0.796
GH_FR1	0.5447	0.7027	0.6713	0.6507
CM_MC2	0.9073	0.818	0.788	0.8447

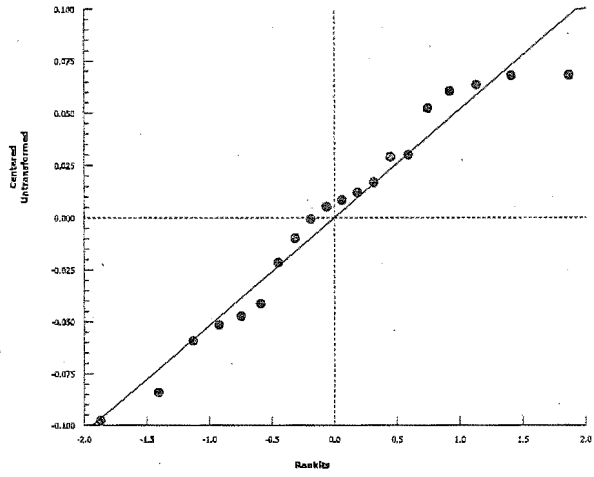
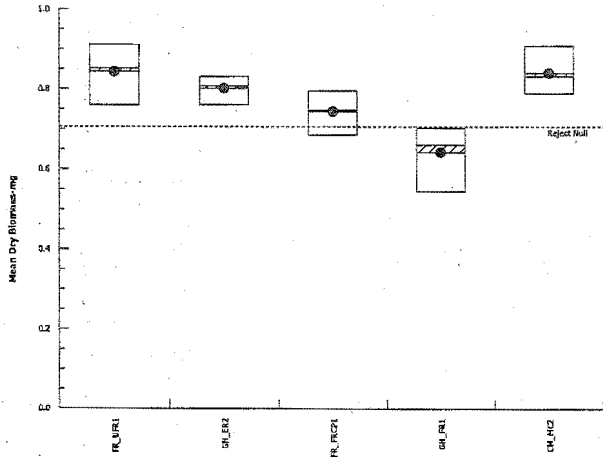
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 15-2059-7880      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Jul-17 14:36      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:46 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 01-0125-5568	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:28	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-3512-5029	28 Apr-17	28 Apr-17	NA	Teck Coal	
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Lab Control	Lab Control	Lab Control		
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C <> T	NA	NA	4.46%	

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Copper Cont		Lab Control	2.048	2.447	0.376	6	0.0865	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1974354	0.1974354	1	4.193	0.0865	Non-Significant Effect
Error	0.2825401	0.04709002	6			
Total	0.4799755		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	23.09	47.47	0.0284	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8706	0.6451	0.1526	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	8.101	7.623	8.579	8.002	7.867	8.533	0.1502	3.71%	0.0%
Lab Copper Cont	4	8.415	8.316	8.515	8.431	8.333	8.467	0.03127	0.74%	-3.88%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	7.933	8.071	7.867	8.533
Lab Copper Cont	8.467	8.462	8.4	8.333



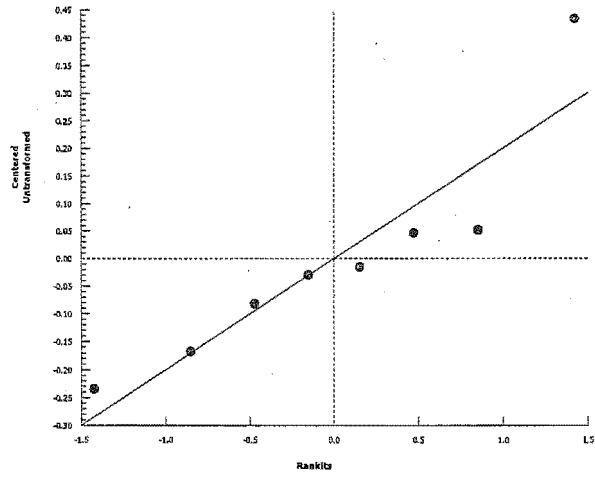
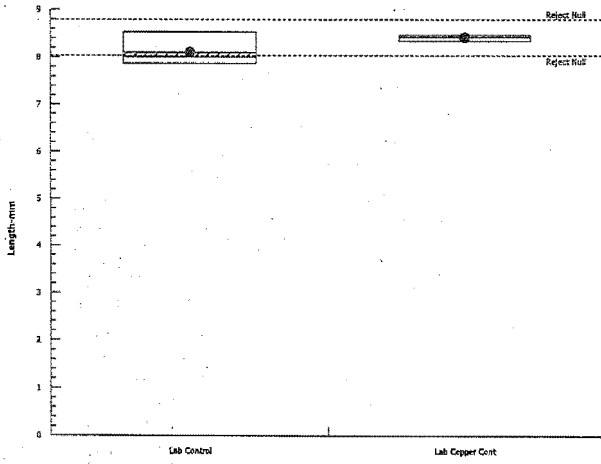
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0125-5568      Endpoint: Length-mm  
Analyzed: 20 Jul-17 14:28      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:47 (p 1 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-6100-1806	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:28	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Copper Cont	15-3067-1528	28 Apr-17	28 Apr-17	NA	Teck Coal	
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)		
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Copper Cont	Lab Copper Control	Lab Copper Control	Lab Copper Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.01%	

**Dunnett Multiple Comparison Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Copper Cont	FR_UFR1	0.9399	2.407	0.506	6	0.4486	CDF	Non-Significant Effect
	GH_ER2	0.2317	2.407	0.506	6	0.7562	CDF	Non-Significant Effect
	FR_FRCP1	0.7644	2.407	0.506	6	0.5285	CDF	Non-Significant Effect
	GH_FR1	-2.462	2.407	0.506	6	0.9998	CDF	Non-Significant Effect
	CM_MC2	-0.01699	2.407	0.506	6	0.8383	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.332235	0.2664469	5	3.014	0.0378	Significant Effect
Error	1.591306	0.08840589	18			
Total	2.923541		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.34	15.09	0.0136	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8961	0.884	0.0178	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Copper Cont	4	8.415	8.316	8.515	8.431	8.333	8.467	0.03127	0.74%	0.0%
FR_UFR1	4	8.218	7.785	8.65	8.271	7.867	8.462	0.1359	3.31%	2.35%
GH_ER2	4	8.367	8.19	8.544	8.393	8.214	8.467	0.05564	1.33%	0.58%
FR_FRCP1	4	8.255	7.891	8.618	8.312	7.933	8.462	0.1143	2.77%	1.91%
GH_FR1	4	8.933	7.984	9.882	9.143	8.071	9.375	0.2981	6.68%	-6.15%
CM_MC2	4	8.419	8.132	8.706	8.409	8.214	8.643	0.09021	2.14%	-0.04%

**CETIS Analytical Report**

Report Date: 20 Jul-17 14:47 (p 2 of 2)  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

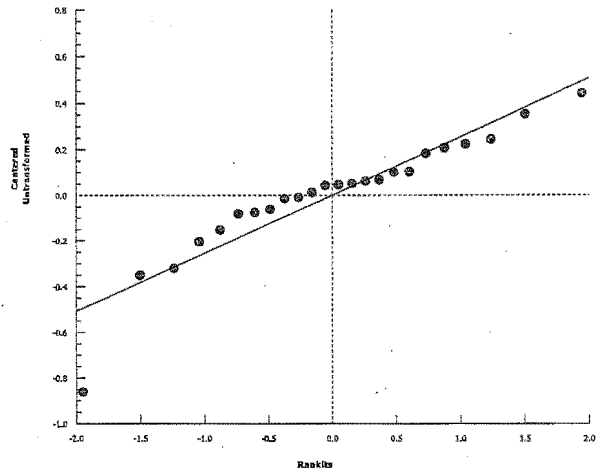
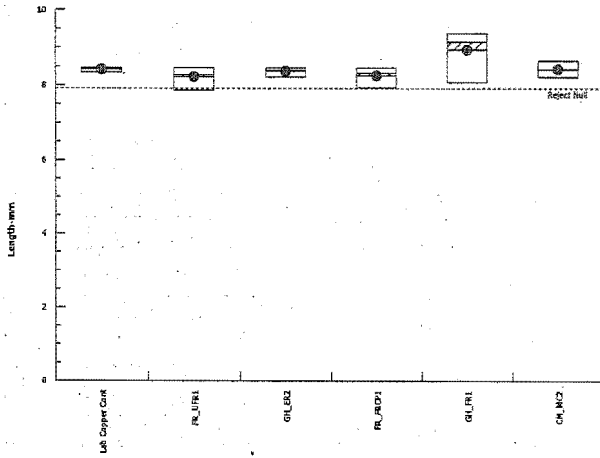
Analysis ID: 08-6100-1806      Endpoint: Length-mm  
 Analyzed: 20 Jul-17 14:28      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Copper Cont	8.467	8.462	8.4	8.333
FR_UFR1	8.462	8.143	8.4	7.867
GH_ER2	8.214	8.357	8.429	8.467
FR_FRCP1	8.357	8.267	7.933	8.462
GH_FR1	9	8.071	9.286	9.375
CM_MC2	8.643	8.214	8.462	8.357

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Jul-17 14:46 (p 1 of 2)-  
 Test Code: 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 02-4217-3989	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 20 Jul-17 14:31	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 07-2611-2218	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Apr-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 30 May-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_URF1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.58%	

**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	-0.6489	2.356	0.541	6	0.9430	CDF	Non-Significant Effect
		FR_FRCP1	-0.1608	2.356	0.541	6	0.8478	CDF	Non-Significant Effect
		GH_FR1	-3.117	2.356	0.541	6	0.9999	CDF	Non-Significant Effect
		CM_MC2	-0.8768	2.356	0.541	6	0.9663	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.330497	0.3326242	4	3.159	0.0453	Significant Effect
Error	1.579577	0.1053051	15			
Total	2.910074		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.349	13.28	0.0796	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.866	0.0652	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	8.218	7.785	8.65	8.271	7.867	8.462	0.1359	3.31%	0.0%
GH_ER2	4	8.367	8.19	8.544	8.393	8.214	8.467	0.05564	1.33%	-1.81%
FR_FRCP1	4	8.255	7.891	8.618	8.312	7.933	8.462	0.1143	2.77%	-0.45%
GH_FR1	4	8.933	7.984	9.882	9.143	8.071	9.375	0.2981	6.68%	-8.7%
CM_MC2	4	8.419	8.132	8.706	8.409	8.214	8.643	0.09021	2.14%	-2.45%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	8.462	8.143	8.4	7.867
GH_ER2	8.214	8.357	8.429	8.467
FR_FRCP1	8.357	8.267	7.933	8.462
GH_FR1	9	8.071	9.286	9.375
CM_MC2	8.643	8.214	8.462	8.357

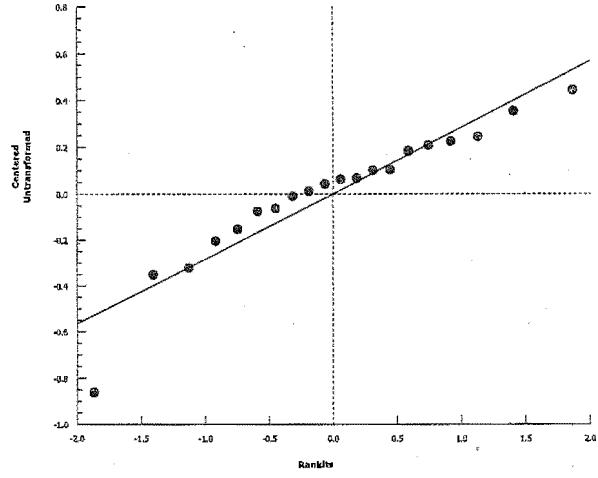
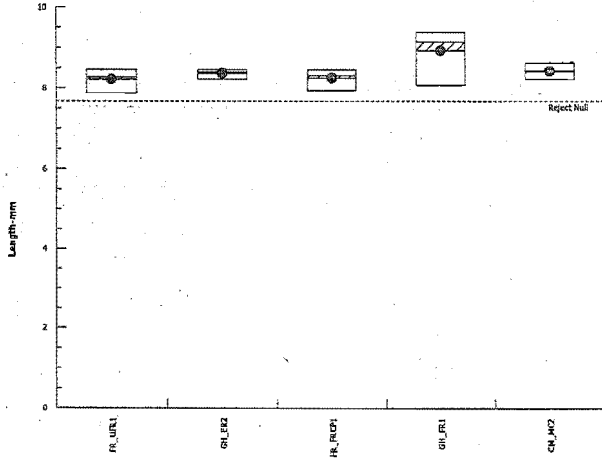
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-4217-3989      Endpoint: Length-mm  
Analyzed: 20 Jul-17 14:31      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

**Report Date:** 20 Jul-17 14:46 (p 1 of 2)  
**Test Code:** 170362 | 04-3243-4745

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 14-4015-6034	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Jul-17 14:36	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 07-2611-2218	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Apr-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 30 May-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	15-5756-3483	24 Apr-17 09:14	25 Apr-17 09:00	87h (8 °C)	Teck Coal	
GH_ER2	17-9724-6204	24 Apr-17 12:00	25 Apr-17 09:00	84h (5.5 °C)		
FR_FRCP1	08-5533-9331	24 Apr-17 10:55	25 Apr-17 09:00	85h (6.5 °C)		
GH_FR1	04-8480-9268	24 Apr-17 10:00	25 Apr-17 09:00	86h (4.5 °C)		
CM_MC2	01-4030-9503	24 Apr-17 12:00	25 Apr-17 09:00	84h (4.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-04-24_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-04-24_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170424_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.46%	

**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	0.6489	2.356	0.541	6	0.5379	CDF	Non-Significant Effect
	FR_FRCP1	0.4881	2.356	0.541	6	0.6097	CDF	Non-Significant Effect
	GH_FR1	-2.468	2.356	0.541	6	0.9995	CDF	Non-Significant Effect
	CM_MC2	-0.2279	2.356	0.541	6	0.8652	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.330497	0.3326242	4	3.159	0.0453	Significant Effect
Error	1.579577	0.1053052	15			
Total	2.910074		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.349	13.28	0.0796	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.866	0.0652	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	8.218	7.785	8.65	8.271	7.867	8.462	0.1359	3.31%	0.0%
GH_ER2	4	8.367	8.19	8.544	8.393	8.214	8.467	0.05564	1.33%	-1.81%
FR_FRCP1	4	8.255	7.891	8.618	8.312	7.933	8.462	0.1143	2.77%	-0.45%
GH_FR1	4	8.933	7.984	9.882	9.143	8.071	9.375	0.2981	6.68%	-8.7%
CM_MC2	4	8.419	8.132	8.706	8.409	8.214	8.643	0.09021	2.14%	-2.45%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	8.462	8.143	8.4	7.867
GH_ER2	8.214	8.357	8.429	8.467
FR_FRCP1	8.357	8.267	7.933	8.462
GH_FR1	9	8.071	9.286	9.375
CM_MC2	8.643	8.214	8.462	8.357

# CETIS Analytical Report

Report Date: 20 Jul-17 14:46 (p 2 of 2)  
Test Code: 170362 | 04-3243-4745

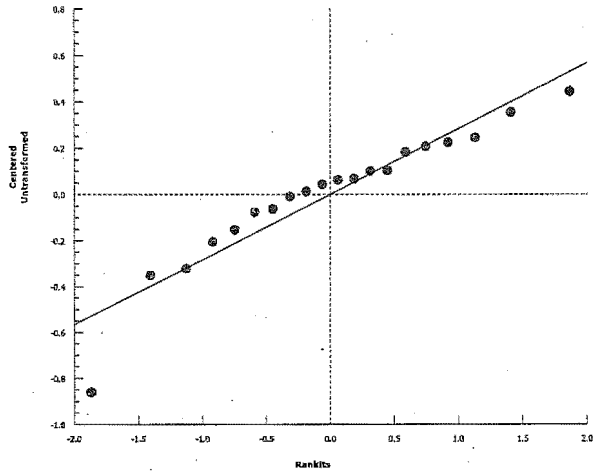
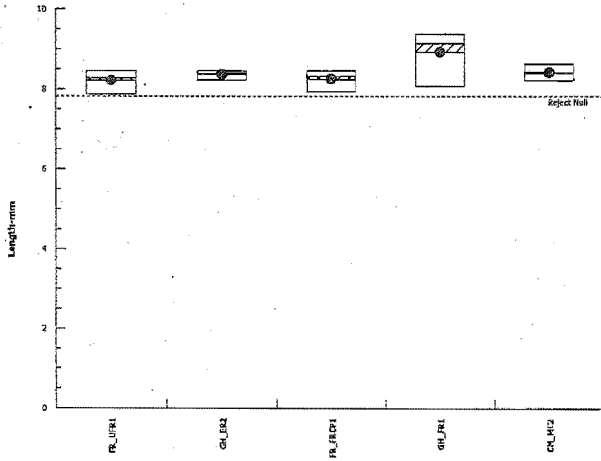
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-4015-6034      Endpoint: Length-mm  
Analyzed: 20 Jul-17 14:36      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**APPENDIX E – *Oncorhynchus mykiss* (rainbow trout) Toxicity Test Data**

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### Embryo-Alevin Test Summary Sheet

Client: Teck Test Date: May 10 - June 9, 2017  
 Work Order No.: 170360 Test Species: Oncorhynchus mykiss

**Sample Information:**

Sample ID: Various - see table below  
 Sample Date: May 9, May 16, May 23, May 30, June 6, 2017  
 Date Received: May 10, May 17, May 24, May 26 (just for CM\_MC2), May 31, June 7, 2017  
 Sample Volume: (3 - 9) x 20 L per refresh

**Dilution Water:**

Type: Dechlorinated Tap Water  
 Hardness (mg/L CaCO3): 14 - 16  
 Alkalinity (mg/L CaCO3): 12 - 16

**Test Organism Information:**

Batch No: 051017  
 Source: Trout Lodge Fish Farm Number male broodstock used: 4  
 Loading Density: 0.94 g/L Number female broodstock used: 6

**SDS Reference Toxicant Results:**

Reference Toxicant ID: RTE26(TL)  
 Stock Solution ID: 17SO1 (1000 mg/L)  
 Date Initiated: May 10, 2017  
 7-d EC50 (95% CL): 3.8 (2.9 - 4.4) mg/L SDS

Reference Toxicant Mean and Range: 3.8 (2.4 - 6.0) mg/L SDS  
 Reference Toxicant CV (%): 26

**Test Results:**

Sample ID	Survival (%) (Mean ± SD)	Viability (%) (Mean ± SD)	Length (mm) (Mean ± SD)	Wet weight (mg) (Mean ± SD)
Control	78.5 ± 10.4	67.6 ± 10.1	17.4 ± 0.5	72.1 ± 6.0
FR_UFR1	62.2 ± 17.1 *§	58.9 ± 16.3	19.2 ± 0.8	80.3 ± 6.7
GH_ER2	78.8 ± 12.0	71.4 ± 13.2	17.9 ± 0.4 †	78.0 ± 4.0
FR_FRCP1	63.8 ± 14.4 *§	58.8 ± 11.6	18.8 ± 0.7	81.2 ± 7.1
GH_FR1	71.7 ± 10.9	67.8 ± 12.6	20.4 ± 0.8	91.7 ± 5.5
GH_ERC	49.6 ± 23.7 *§	46.8 ± 23.3 *§	20.0 ± 0.8	88.7 ± 8.1
EV_HC1	80.5 ± 8.3	70.5 ± 10.2	18.5 ± 0.9	82.8 ± 8.5
EV_MC2	79.8 ± 17.1	73.1 ± 14.6	19.1 ± 0.8	86.1 ± 7.2
CM_MC2	76.2 ± 5.2	62.9 ± 11.6	18.5 ± 0.9	84.3 ± 7.0
LC_LCDSSLCC	77.9 ± 6.5	63.1 ± 12.5	18.6 ± 1.0	90.5 ± 7.3

\* Indicates results that were significantly lower relative to laboratory control  
 † Indicates results that were significantly lower relative to site control FR\_UFR1  
 § Indicates results that were significantly lower relative to site control GH\_ER2

Reviewed by: 

Date reviewed: June 27, 2017

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 1405h  
 Stop Date & Time: June 9/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

Concentration <i>Control</i>	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	13.0	14.0	13.0	13.0 <sup>5</sup>	13.0	14.0	13.0	14.0	13.5	13.5	13.0	13.5
DO (mg/L)	10.3	10.5	10.3	10.5	10.2	10.7	10.1	10.7	10.1	10.3	10.0	10.5	10.1
pH	7.0	6.9	7.2	6.9	6.9	6.8	6.9	6.8	7.0	7.0	7.0	7.0	7.0
Cond. (µS/cm)	37	38		38		38		38		38		38	
Initials	KL	KL		KL		A		A		K		K	

Concentration <i>100 ① FE FEPI</i>	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	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.3	10.1	10.3	10.2	10.7	10.1	10.2	10.2	10.0	10.1	10.1
pH	7.9	7.9	7.9	7.8	7.9	7.9	8.1	7.9	8.2	<del>8.0</del> 8.0	8.0	8.0	8.0
Cond. (µS/cm)	242	243		242		247		243		243		243	
Initials	KL	KL		KL		A		A		K		K	

Concentration <i>100 ② FH ERZ</i>	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	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.3	10.1	10.2	10.2	10.1	10.1	10.2	10.2	10.0	10.0	10.1
pH	7.9	7.9	7.9	7.9	8.0	7.9	8.2	7.9	8.3	7.9	8.0 <sup>5</sup>	8.1	8.2
Cond. (µS/cm)	304	305		305		306		308		305		306	
Initials	KL	KL		KL		A		A		K		K	

Concentration <i>100 ③ FE FEPI</i>	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	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.3	10.3	10.1	10.2	10.2	10.1	10.2	10.2	10.1	10.0	10.1	10.1
pH	7.9	7.9	7.9	7.9	8.0	7.9	8.2	7.9	8.3	8.0	8.1	8.1	8.2
Cond. (µS/cm)	585	586		583		588		586		584		584	
Initials	KL	KL		KL		A		A		K		K	

Thermometer: Temp-9 DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	FE/FEPI	FH/ERZ	FE/FEPI
Hardness*	16	136	164	330
Alkalinity*	16	126	162	168

Analysts: KL, AKO

Reviewed by: [Signature]  
 Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description:

②: clear, redness, odorous, some brown particulates

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 1900h  
 Stop Date & Time: June 01/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

Concentration <u>2.5K FL1</u>	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	13.5	13.7	14.0	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.3	10.2	10.2	10.3	10.1	10.3	10.2	10.1	10.0	10.0	10.1	
pH	7.9	7.9	7.9	7.9	8.1	8.2	8.2	8.0	8.3	8.0	8.1	8.0	8.3	
Cond. (µS/cm)	527		526		526		535		528		528		527	
Initials	KL		KL		KL		AK		A		K		K	

Concentration <u>2.5K FL2</u>	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	13.5	13.0	14.2	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.3	10.3	10.2	10.3	10.1	10.2	10.2	10.1	10.0	10.0	10.1	
pH	7.9	7.9	7.9	7.9	8.1	8.0	8.3	8.0	8.3	8.0	8.1	8.0	8.2	
Cond. (µS/cm)	340		343		342		343		342		343		343	
Initials	KL		KL		KL		A		A		K		K	

Concentration <u>2.5K FL3</u>	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	14.0	14.0	14.0	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.3	10.3	10.2	10.3	10.1	10.2	10.1	10.0	10.0	10.1	10.1	
pH	8.0	8.0	8.0	7.9	8.2	8.0	8.3	8.0	8.3	8.0	8.0	8.0	8.2	
Cond. (µS/cm)	489		489		488		491		492		490		490	
Initials	KL		KL		KL		A		A		K		K	

Concentration <u>2.5K FL4</u>	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	14.0	14.0	14.0	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.2	10.3	10.3	10.3	10.3	10.1	10.3	10.2	10.0	10.0	10.1	10.2	
pH	7.8	7.8	8.0	8.0	8.0	8.0	8.1	8.0	8.2	7.8	8.0	7.9	8.0	
Cond. (µS/cm)	319		319		320		321		323		320		320	
Initials	KL		KL		KL		A		A		K		K	

Thermometer: Temp DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	GH-FL1	EV-FL1	EV-FL2
Hardness*	300	182	284	166
Alkalinity*	162	172	202	124

Analysts: KL, AK

Reviewed by: [Signature]  
 Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: (4)(5)(6): clear, colorless, odorless, some brown particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECH  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 1405h  
 Stop Date & Time: June 9/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

① 100 Concentration ① 100 mL MCZ	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	14.0	14.0	14.0	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.3	10.3	10.3	10.3	10.3	10.1	10.3	10.2	10.0	10.0	10.1	10.2	
pH	7.9	7.9	8.0	8.0	8.1	8.0	8.2	8.0	8.2	7.9	8.1	8.0	8.1	
Cond. (µS/cm)	620	620		621		626		625		621		621		
Initials	KL		KL		KL		A		A		K		K	

② 100 Concentration ② 100 mL CONTROL	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	14.0	14.0	14.0	13.5	13.0	14.0	13.0	14.0	13.5	13.5	14.0	13.5	
DO (mg/L)	10.3	10.2	10.3	10.3	10.3	10.1	10.1	10.3	10.2	10.0	10.0	10.1	10.2	
pH	7.9	7.9	8.0	7.9	8.1	8.0	8.2	8.0	8.3	7.9	8.1	7.9	8.1	
Cond. (µS/cm)	596	597		596		601		603		598		598		
Initials	KL		KL		KL		A		A		K		K	

Concentration	Days												
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)													
DO (mg/L)													
pH													
Cond. (µS/cm)													
Initials													

Concentration	Days												
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)													
DO (mg/L)													
pH													
Cond. (µS/cm)													
Initials													

Thermometer: Temp cel 9 DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	CM MCZ	CONTROL
Hardness*	16	310	310
Alkalinity*	16	176	172

Analysts: KL, AO

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO<sub>3</sub>

Sample Description: ①②: clear, colorless, odorless, some brown particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: PO360

Start Date & Time: May 10/17 @ 19:05h  
 Stop Date & Time: June 9/17 @ 12:00h  
 Test Species: Oncorhynchus mykiss

% (V/V) Concentration Control	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	13.5	13.5	13.5	13.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.0	14.0
DO (mg/L)	10.5	10.3	10.2	10.0	10.3	10.0	10.2	10.2	10.2	10.1	10.1	10.0	10.2	10.1
pH	7.0	7.1	7.2	7.2	7.0	7.0	7.1	7.2	7.1	7.3	7.0	7.0	7.0	7.1
Cond. (µS/cm)	38		38		38		38		35		37		38	
Initials	K		K		K		K/AWD		A		JW		K	

100 Concentration ① PR-UFPI	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	13.5	13.5	13.5	14.5	14.0	13.0	14.0	13.0	14.0	13.5	14.0	15.0 <sup>15.5</sup>	14.0
DO (mg/L)	10.0	10.3	10.3	10.0	10.1	10.0	10.2	10.2	10.1	10.0	10.1	10.0	10.0	10.1
pH	8.0	8.1	8.2	8.0	8.1	8.0	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.1
Cond. (µS/cm)	244		231		234		233		234		231		234	
Initials	K		K		K		K/AWD		A		JW		K	

100 Concentration ② AHERZ	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	13.5	13.5	13.5	14.5	14.0	13.0	14.0	13.0	14.0	13.5	14.0	15.0 <sup>15.5</sup>	14.0
DO (mg/L)	10.0	10.3	10.3	10.0	10.1	10.0	10.1	10.2	10.2	10.1	10.1	10.0	9.9	10.0
pH	8.1	8.2	8.1	8.2	8.0	8.1	8.2	8.3 <sup>8.3</sup>	8.2	8.2	8.1	8.2	8.0	8.2
Cond. (µS/cm)	307		300		299		297		298		301		298	
Initials	K		K		K		K/AWD		A		JW		K	

100 Concentration ③ PR-FRCP1	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	13.5	13.5	13.5	14.5	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.1	10.3	10.3	10.0	10.1	10.0	10.1	10.2	10.1	10.0	10.0	10.1	9.9	10.0
pH	8.0	8.2	8.1	8.2	8.0	8.2	8.2	8.2	8.2	8.1	8.0	8.2	8.1	8.2
Cond. (µS/cm)	587		642		647		640		641		592		641	
Initials	K		K		K		K/AWD		A		JW		K	

Thermometer: CE29    DO meter: DO-2    pH meter: pH-Z<sup>1</sup>    Conductivity meter: C-2

	Control	PR-UFPI	AHERZ	PR-FRCP1
Hardness*	16	122	156	360
Alkalinity*	15	124	156	174

Analysts: AWD, JW, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO<sub>3</sub>

Sample Description: ①: Clear, colorless, odorless, brown particulates - ②: Slightly turbid, brownish, odorless, brown particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TecX  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17 C 1905h  
 Stop Date & Time: June 9/17 E 1200h  
 Test Species: Oncorhynchus mykiss

Concentration (4) AL.FF1	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	13.5	13.0	13.5	14.5	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.0	10.3	10.4	10.0	10.1	10.1	10.1	10.2	10.0	10.2	10.0	10.1	9.9	10.0
pH	8.1	8.2	8.1	8.2	8.0	8.2	8.2	8.3	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	527		545		555 545		543		545		539		540	
Initials	K		K		K		K/AND		A		JW		K	

Concentration (5) AL.FFC	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	13.5	13.0	13.5	14.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.1	10.3	10.4	10.0	10.2	10.1	10.1	10.2	10.1	10.2	10.0	10.1	9.8	10.0
pH	8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.3	8.1	8.2	8.1	8.2	8.0	8.2
Cond. (µS/cm)	344		330		333		330		331		332		330	
Initials	K		K		K		K/AND		A		JW		K	

Concentration (6) EV.HCC	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	13.5	13.0	13.5	14.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.0	10.3	10.4	10.0	10.1	10.0	10.1	10.2	10.1	10.1	10.1	10.1	9.8	10.0
pH	8.1	8.1	8.2	8.2	8.1	8.2	8.0	8.3	8.1	8.2	8.1	8.1	8.1	8.2
Cond. (µS/cm)	492		518		517		515		516		518		517	
Initials	K		K		K		K/AND		A		JW		K	

Concentration (7) EV.MCC	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	13.5	13.0	13.5	14.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.4	10.3	10.4	10.0	10.0	10.0	10.0	10.2	10.1	10.2	10.1	10.2	9.8	10.0
pH	7.9	8.2	7.9	8.1	7.8	8.1	7.9	8.1	8.0	8.1	8.0	8.1	7.8	8.1
Cond. (µS/cm)	321		360		358		359		360		342		360	
Initials	K		K		K		K/AND		A		JW		K	

Thermometer: CE-9 DO meter: DO-2 pH meter: PH-1 Conductivity meter: C-2

	Control K	AL.FFC	EV.HCC	EV.MCC
Hardness*	330	174	278	180
Alkalinity*	166	158	186	130

Analysts: AND, JW, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: (4)(5)(6)(7) - slightly turbid, slightly greenish, odorous, brown particulates

Comments: \_\_\_\_\_

09/06/15

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECO  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17/15 19:51  
 Stop Date & Time: June 9/17/15 12:00h  
 Test Species: Oncorhynchus mykiss

C(W) Concentration ⑧ CM.MCZ	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	13.5	13.0	13.5	14.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.1	10.3	10.5	10.0	10.1	10.1	10.1	10.2	10.2	10.2	10.1	10.1	9.8	10.0
pH	8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.0	8.2	8.1	8.2
Cond. (µS/cm)	622		630		628		627		628		620		628	
Initials	K		K		K		K		K		JW		K	

LOD Concentration ⑨ LC.LOSSICE	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	13.5	13.0	13.5	14.0	14.0	13.0	14.0	13.0	14.0	13.5	14.0	14.5	14.0
DO (mg/L)	10.1	10.3	10.5	10.0	10.2	10.1	10.1	10.2	10.1	10.1	10.0	10.0	9.8	10.0
pH	8.1	8.2	8.1	8.2	8.0	8.2	8.0	8.2	8.1	8.2	8.1	8.2	8.0	8.2
Cond. (µS/cm)	599		522		522		522		521		530		521	
Initials	K		K		K		K		K		JW		K	

Concentration	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: CE-9 DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	CM.MCZ	LC.LOSSICE
Hardness*	16	340	330
Alkalinity*	15	164	156

Analysts: AWO, JW, K

Reviewed by: [Signature]  
 Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: ⑧ slightly turbid, slightly grey-brown, odorless, some brown particulates; ⑨ clear, colorless, odorless, white particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Tock  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: Apr 10/17e 1905h  
 Stop Date & Time: June 9/17 e 1200h  
 Test Species: Oncorhynchus mykiss

% (w/w) Concentration (control)	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	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
DO (mg/L)	10.1	10.1	10.1	10.1	10.2	9.8	9.8	9.8	9.9	9.7	10.2	10.0	10.2	10.1
pH	7.1	7.1	6.7	6.7	6.7	6.8	7.3	7.1	7.2	7.1	7.2	7.2	7.1	7.1
Cond. (µS/cm)	39		39		40		39		40		40		40	
Initials	K		K		K		K		K		K		K	

100 Concentration ① PRUFRI	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	13.4
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.8	9.9	9.8	9.8	9.7	10.3	10.0	10.0	10.0
pH	8.1	8.0	7.9	7.9	8.0	8.0	8.0	8.0	8.0	8.1	8.1	8.2	8.1	8.2
Cond. (µS/cm)	236		213		213		214		220		215		213	
Initials	K		K		K		K		K		K		K	

100 Concentration ② CH-EZ	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.9	9.9	9.9	9.8	9.8	10.3	10.0	10.0	10.0
pH	8.1	8.1	7.9	8.1	8.0	8.1	8.0	8.1	8.0	8.1	8.2	8.2	8.1	8.3
Cond. (µS/cm)	303		284		284		283		294		284		283	
Initials	K		K		K		K		K		K		K	

100 Concentration ③ CH-MCI	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	K												
DO (mg/L)														
pH														
Cond. (µS/cm)	446													
Initials	K													

Thermometer: CER-9 DO meter: DO-2 pH meter: PH-1 Conductivity meter: C-2

	Control	PRUFRI (100%)	CH-EZ (100%)	CH-MCI (100%)
Hardness*	15	114	154	
Alkalinity*	12	112	146	

Analysts: AWO, JH

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO<sub>3</sub>

Sample Description: ①: clear, colourless, odourless, some brown particulates.

Comments: \_\_\_\_\_



## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: AD360

Start Date & Time: Apr 12<sup>th</sup> May 19<sup>th</sup> 1905h  
 Stop Date & Time: June 9<sup>th</sup> 1200h  
 Test Species: Oncorhynchus mykiss

Concentration ① FL-FRCP1	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.9	10.0	9.9	9.8	9.8	10.3	10.0	10.0	10.0
pH	8.1	8.1	7.9	8.1	7.9	8.2	8.0	8.1	8.0	8.2	8.1	8.3	8.1	8.3
Cond. (µS/cm)	646		522		520		518		514		521		519	
Initials	K		K		K		A		A		K		K	

Concentration ② GH-FR3	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.9	10.0	9.8	9.8	9.8	10.3	10.0	10.0	10.0
pH	8.1	8.2	7.9	8.2	8.0	8.2	8.0	8.2	8.0	8.1	8.2	8.2	8.2	8.3
Cond. (µS/cm)	548		504		504		509		503		506		503	
Initials	K		K		K		A		A		K		K	

Concentration ③ GH-FRC	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.9	9.8	9.8	9.8	9.8	10.1	10.0	10.0	10.0
pH	8.1	8.1	7.9	8.2	8.0	8.2	8.0	8.2	8.0	8.1	8.2	8.3	8.1	8.3
Cond. (µS/cm)	332		307		307		306		310		308		307	
Initials	K		K		K		A		A		K		K	

Concentration ④ GH-FRC	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.2	9.9	9.8	9.9	9.9	9.9	10.1	10.0	10.0	10.0
pH	8.2	8.2	8.0	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.2	8.3	8.2	8.3
Cond. (µS/cm)	526		454		454		453		450		454		453	
Initials	K		K		K		A		A		K		K	

Thermometer: CE-9 DO meter: DO-2 pH meter: PH-1 Conductivity meter: C-2

	Control	GH-FR3 (100%)	GH-FRC (100%)	GH-FRC (100%)
Hardness*	300	280	166	288
Alkalinity*	150	160	154	172

Analysts: AJD, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

Sample Description: ① Clear, colorless, odorless, some brown particulates; ②-④: Slightly turbid, slightly grey-brown, odorless, brown particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (See below)  
 Work Order #: H0360

Start Date & Time: Apr 17<sup>th</sup> May 10/17 @ 19:05h  
 Stop Date & Time: June 9/17 @ 12:00h  
 Test Species: Oncorhynchus mykiss

Concentration ④ EV-MCZ	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.1	9.9	9.9	9.9	9.8	9.6	10.1	10.0	10.0	10.0	10.0
pH	7.9	8.2	7.7	8.0	7.8	8.0	7.9	7.9	7.9	8.0	8.0	8.0	8.1	8.1	8.1
Cond. (µS/cm)	368		249		248		248		249		255		250		
Initials	K		K		K		A		A		K		K		

Concentration ⑤ CM-MCZ	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.1	9.9	9.9	9.8	9.9	9.7	10.1	10.0	10.0	10.0
pH	8.1	8.1	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.1	8.2	8.2	8.1	8.2
Cond. (µS/cm)	633		505		504		502		506		506		503	
Initials	K		K		K		A		A		K		K	

Concentration ⑥ LLSLCC	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	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5	14.0
DO (mg/L)	9.8	10.1	10.2	10.1	10.1	9.9	9.8	9.9	9.9	9.8	10.1	10.0	10.0	10.0
pH	8.1	8.1	7.9	8.1	8.0	8.1	8.0	8.2	8.0	8.1	8.2	8.2	8.2	8.2
Cond. (µS/cm)	524		487		487		486		485		488		486	
Initials	K		K		K		A		A		K		K	

Concentration	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: CE-9 DO meter: DO-2 pH meter: PH-1 Conductivity meter: C-2

	Control	EV-MCZ (002)	CM-MCZ (002)	LLSSLCC (002)
Hardness*		134	270	270
Alkalinity*		102	138	152

Analysts: RWD, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO<sub>3</sub>

Sample Description: ⑦ ⑧: slightly turbid, also slightly grey-brown, odourless, some brown particulates; ⑨: clear, colourless, odourless, some black particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECL  
 Sample ID: Various (see below)  
 Work Order #: PT0360

Start Date & Time: Apr 17 e May 10/17 e 1905h  
 Stop Date & Time: June 9/17 e 1200h  
 Test Species: Oncorhynchus mykiss

Concentration (Control)	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.65	13.65	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	14.0	13.5
DO (mg/L)	10.3	10.4	10.1	9.8	10.2	9.8	10.3	9.8	10.3	9.6	10.2	9.9	10.2	10.2
pH	7.0	7.0	7.0	7.1	6.8	6.9	7.1	7.3	7.1	7.2	7.2	7.2	6.9	6.8
Cond. (µS/cm)	39		39		39		39		39		35		35	
Initials	K		K		K		A		A		K		K	

Concentration ① PEUPF1	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	13.5	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	13.5	13.5	14.0	13.5
DO (mg/L)	10.3	10.1	9.8	9.8	9.8	9.8	10.1	9.9	10.1	9.6	10.0	9.9	10.2	10.2
pH	8.0	8.0	7.9	7.9	8.0	7.9	8.0	8.0	8.0	8.1	7.9	8.0	7.9	7.8
Cond. (µS/cm)	213		205		204		205		204		206		206	
Initials	K		K		K		A		A		K		K	

Concentration ② GHER2	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	13.5	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.3	10.1	9.8	9.8	9.8	9.8	10.3	9.8	10.0	9.7	9.9	9.9	10.2	10.2
pH	8.1	8.0	7.9	7.9	8.0	8.0	8.1	8.1	8.1	8.1	7.9	8.1	7.9	7.9
Cond. (µS/cm)	282		264		261		262		263		265		264	
Initials	K		K		K		A		A		K		K	

Concentration ③ OUMCI	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials	K													

Thermometer: CER-9    DO meter: DO-2    pH meter: PH-1    Conductivity meter: C-2

	Control	PEUPF1(100%)	GHER2(100%)	OUMCI(100%)
Hardness*	14	110	150	
Alkalinity*	12	102	152	

Analysts: AW, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description:

① clean, odorless, odorless, some brown ~~water~~ particulates; ② slightly turbid, slightly brown-grey, odorless, brown particulates; ③ clean, odorless, odorless, brown particulates.

Comments:

03/1/15

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Tecx  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: Apr 17e May 10/17 C Mosh  
 Stop Date & Time: June 9/17 C 1200h  
 Test Species: Oncorhynchus mykiss

EWN 100 ⑤ Concentration ④ PE-FPCPE	Days														
	21		22		23		24		25		26		27		
	new	old	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	13.5	13.5	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	13.5	13.0	13.5
DO (mg/L)	10.2	10.1	9.9	9.8	9.8	9.8	10.0	9.8	10.0	9.6	9.9	9.9	10.2	10.2	
pH	8.1	8.0	7.9	7.8	8.0	7.9	8.0	8.0	8.0	8.0	8.0	8.1	7.9	8.0	
Cond. (µS/cm)	518		492		491		489		492		493		493		
Initials	K		K		K		A		A		K		K		

100 ④ Concentration ② K GH-FPI	Days														
	21		22		23		24		25		26		27		
	new	old	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.1	10.1	9.9	9.8	9.8	9.8	10.0	9.7	10.0	9.7	9.9	10.0	10.2	10.2	
pH	8.1	8.1	8.0	8.0	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.1	7.9	8.0	
Cond. (µS/cm)	502		445		444		443		445		448		446		
Initials	K		K		K		A		A		K		K		

100 ⑤ Concentration ② K GH-FPI	Days														
	21		22		23		24		25		26		27		
	new	old	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.0	10.1	9.9	9.8	9.8	9.8	10.0	9.7	10.0	9.6	9.8	10.0	10.2	10.2	
pH	8.1	8.0	7.9	7.8	8.0	8.1	8.0	8.2	8.0	8.1	8.0	8.1	7.9	8.0	
Cond. (µS/cm)	305		292		290		291		292		291		290		
Initials	K		K		K		A		A		K		K		

100 ⑥ Concentration ② K EV-HCI	Days														
	21		22		23		24		25		26		27		
	new	old	new	old	new	old	new	old	new	old	new	old	new	old	
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.0	10.0	9.9	9.8	9.8	9.8	10.0	9.8	10.0	9.7	9.8	9.8	10.2	10.2	
pH	8.1	8.1	8.0	8.1	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.0	7.8	
Cond. (µS/cm)	451		420		468		422		419		420		421		
Initials	K		K		K		A		A		K		K		

Thermometer: CE-9 DO meter: DO-2 pH meter: PH-1 Conductivity meter: C-2

	PE-FPCPE(100)	GH-FPI(100)	GH-FPI(100A)	EV-HCI(100)
Hardness*	260	260	152	204
Alkalinity*	146	148	152	166

Analysts: Awo, K

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: ③④⑤: clear slightly turbid, brown-grey, odourless, brown particulates; ⑥: clear, odourless, odourless, brown particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: H0360

Start Date & Time: Apr 17<sup>th</sup> 08:00h  
 Stop Date & Time: June 29<sup>th</sup> 12:00h  
 Test Species: Oncorhynchus mykiss

⑦ Concentration ⑧ <u>ELMCL</u>	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.0	10.0	9.9	9.8	9.8	9.8	10.0	9.8	10.0	9.6	9.8	9.8	10.2	10.2
pH	7.9	7.8	7.9	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.9	8.0	7.8	7.9
Cond. (µS/cm)	254		234		234		235		234		237		237	
Initials	K		K		K		A		A		K		K	

⑧ Concentration ⑨ <u>ELMCL</u>	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.0	10.0	9.9	9.8	9.8	9.8	10.0	9.7	10.0	9.7	9.9	10.0	10.2	10.2
pH	8.1	8.0	8.0	8.0	8.0	8.0	7.9	8.1	7.9	8.0	8.0	8.1	7.9	7.9
Cond. (µS/cm)	501		460		460		459		460		460		461	
Initials	K		K		K		A		A		K		K	

⑨ Concentration ⑩ <u>ELMCL</u>	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.5	13.5	14.0	14.0	14.0	13.5	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.5
DO (mg/L)	10.0	10.0	9.9	9.8	9.8	9.8	10.0	9.7	10.0	9.8	9.9	10.0	10.2	10.2
pH	8.0	8.0	7.9	8.0	7.9	8.1	7.9	8.0	8.0	8.0	8.0	8.1	7.9	7.9
Cond. (µS/cm)	483		428		428		429		429		429		430	
Initials	K		K		K		A		A		K		K	

Concentration	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: CER-9 DO meter: D-2 pH meter: PH-1 Conductivity meter: C-2

	Control <u>K</u>	ELMCL (100%)	ELMCL (100%)	ELMCLSSCLL (100%)
Hardness*		116	200	220
Alkalinity*		98	136	136

Analysts: AWO, W

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO<sub>3</sub>

Sample Description: ⑦⑧: 2L slightly turbid, slightly grey-brown, odourless, brown particulates. ⑨: clear, colourless, odourless, some brown/black particulates

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Vermus (see below)  
 Work Order #: AD360

Start Date & Time: Apr 17<sup>th</sup> 2008  
 Stop Date & Time: June 9<sup>th</sup> 2008  
 Test Species: Oncorhynchus mykiss

% (v/v) $\mu$ h Concentration Control	Days													
	28		29		30 Final		<del>31</del>		<del>32</del>					
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.0	14.0	13.5	/	13.5								
DO (mg/L)	10.1	10.0	10.0	9.6	/	10.1								
pH	7.1	7.1	7.0	7.0	/	7.1								
Cond. ( $\mu$ S/cm)	34		36		38									
Initials	K		K		K									

100 Concentration ① PEUFFI	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	/	13.5								
DO (mg/L)	10.5	9.9	9.8	9.6	/	10.1								
pH	<del>8.0</del> 7.9	7.9	7.9	7.7	/	7.9								
Cond. ( $\mu$ S/cm)	206		221		219									
Initials	K		K		K									

100 Concentration ② CHEEZ	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	/	13.5								
DO (mg/L)	10.5	9.9	9.8	9.6	/	10.3								
pH	7.9	8.0	7.9	8.0	/	8.1								
Cond. ( $\mu$ S/cm)	265		262		267									
Initials	K		K		K									

100 Concentration ③ CM MLI	Days													
	28		29		30									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0												
DO (mg/L)														
pH														
Cond. ( $\mu$ S/cm)	494													
Initials	K													

Thermometer: CE2-9    DO meter: DO-2    pH meter: PH-1    Conductivity meter: C-2

	Control	PEUFFI (100%)	CHEEZ (100%)	CM MLI (100%)
Hardness*	14	118	140	/
Alkalinity*	12	112	130	/

Analysts: K  
 Reviewed by: [Signature]  
 Date reviewed: June 26, 2008

\* mg/L as CaCO3

Sample Description: ① clear, colourless, odourless some brown particulates; ② slightly turbid, brown-grey, odourless, brown particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TecX  
 Sample ID: Various (see below)  
 Work Order #: FD360

Start Date & Time: Apr 11<sup>th</sup> May 10/17e 1905h  
 Stop Date & Time: June 10<sup>th</sup> 9/17e noon  
 Test Species: Oncorhynchus mykiss

③ Concentration ① PR-FPCP1	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	13.5									
DO (mg/L)	10.5	9.9	9.8	9.6	10.3									
pH	7.9	8.0	7.7	8.0	8.1									
Cond. (µS/cm)	494	448 <sup>h</sup>	527		521									
Initials	K		K		K									

④ Concentration ② CHL-FPS	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	13.5									
DO (mg/L)	10.5	9.9	9.8	9.6	10.4 <sup>h</sup>									
pH	7.9	8.0	8.0	8.0	8.1									
Cond. (µS/cm)	448	291 <sup>h</sup>	517		495									
Initials	K		K		K									

⑤ Concentration ③ CHL-ERC	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	13.5									
DO (mg/L)	10.5	9.9	9.8	9.6	10.4									
pH	7.9	8.1	7.9	8.0	8.1									
Cond. (µS/cm)	K	427	291 <sup>h</sup>	288	293									
Initials	K		K		K									

⑥ Concentration ④ CHL-ERC	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	13.5									
DO (mg/L)	10.5	9.9	9.8	9.6	10.4									
pH	8.0	8.0	8.0	7.9	8.1									
Cond. (µS/cm)	421	236 <sup>h</sup>	448		441									
Initials	K		K		K									

Thermometer: CE-9 DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	PR-FPCP1 (001)	CHL-FPS (002)	CHL-ERC (001)
Hardness*		260	240	158
Alkalinity*		160	158	146

Analysts: K  
 Reviewed by: [Signature]  
 Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: ③④⑥: clear, colourless, odourless, some brown particulates; ⑤ slightly turbid, staining brown-grey, odourless, brown particulates.

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: various (see below)  
 Work Order #: 170360

Start Date & Time: Apr 17<sup>th</sup> May 10/17 @ 1905h  
 Stop Date & Time: June 9/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

① Concentration EVMCZ	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	/	13.5								
DO (mg/L)	10.5	9.9	9.9	9.6	/	10.4								
pH	7.8	7.8	7.7	7.8	/	7.9								
Cond. (µS/cm)	238	460 <sup>u</sup>		285		269								
Initials		u		u		u								

② Concentration u CM-MCZ	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	/	13.5								
DO (mg/L)	10.5	9.9	10.0	9.6	/	10.4								
pH	7.9	8.0	7.9	7.8 <sup>u</sup>	/	8.0								
Cond. (µS/cm)		460		468 <sup>u</sup>		467								
Initials		u		u		u								

③ Concentration u LCSSLC	Days													
	28		29		30 Final									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	13.0	14.0	13.5	13.5	/	13.5								
DO (mg/L)	10.5	9.9	9.8	9.6	/	10.4								
pH	8.0	8.0	7.9	7.8	/	8.0								
Cond. (µS/cm)		430		498		472								
Initials		u		u		u								

Concentration	Days													
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: EE29 DO meter: DO-2 pH meter: pH-1 Conductivity meter: C-2

	Control	EVMCZ (100%)	CM-MCZ (100%)	LCSSLC (100%)
Hardness*	/	u 242 136	220 136 <sup>u</sup>	260 220 <sup>u</sup>
Alkalinity*		u 166 98	138 98 <sup>u</sup>	148

Analysts: u

Reviewed by: [Signature]

Date reviewed: June 26, 2017

\* mg/L as CaCO3

Sample Description: ①②: slightly turbid, brown-grey, slightly colorless, brown particulates; ③: clear, colorless, colorless, some brown particulates

Comments: \_\_\_\_\_




## Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: PRO360

Start Date & Time: May 10/17 @ 1905h  
 Stop Date & Time: June 9/17 @ 1200h  
 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	1	0	0	0	0	0	0	0	1
	2	1				0	1	0	0	0	0			2 <sup>m</sup> 2
	3	0				0	0	0	0	0	0			0
	4					1	3	0	0	0	0			4
FR-UFFR1 K (100)	1					0	0	0	1	0	0	2	0	3
	2					0	1	2	0	1	2	0		6
	3					1	0	0	1	2	4 <sup>m</sup> 2			8
	4				↓	0	0	0	2	0	0		↓	2
GH-GRZ (100)	1			↓	1	0	0	0	0	0	0		0	1
	2			1	0	0	0	0		0	0			1
	3			0	0	0	0	1		3	3			7
	4				1	0	1			0	0		↓	2
FR-FRCP1 (100)	1					1	0	1		0	0		0	2
	2					2	0	1		0	0			3
	3					0	4	0	↓	1	1	3		9
	4					1	2	0	1	0	0	0	↓	4
GH-FR1 (100)	1					0	0	0	0	0			0	0
	2					1	5	1		0				7
	3					0	0	0		0				0
	4					0	2	0	↓	0	↓		↓	2
GH-EPG (100)	1				↓	0	0	0	1	2	0	1	0	4
	2				1	1	2	0	0	0	0	1		5
	3				0	0	3	6	1	5	4	1		20
	4				1	1	1	0	1	0	0	1	↓	4
EV-HC1 (100)	1					0	1	0	0	0		0	0	1
	2						1	0		0				1
	3						1	0		0				1
	4						1	0	↓	0			↓	1
EV-MG2 (100)	1					↓	0		0	0			0	0
	2			↓		1	1		0	2 <sup>m</sup> 0				2
	3			1		0	0		0	2 <sup>m</sup> 2				3
	4	↓	↓	0	↓	0	0	↓	1	0	↓	↓	↓	1
Tech Initials		K	K	K	K	K	K	K	K	K	K	K	K	K

Comments: Start to crack at eyed stage

Reviewed by: 

Date reviewed: June 26, 2017


## Embryo-Alevin Toxicity Test Daily Mortality

Client: TecE  
 Sample ID: various (see below)  
 Work Order #: 10360

Start Date & Time: May 10/17 1905h.  
 Stop Date & Time: June 9/17 1200h.  
 Test Species: Oncorhynchus mykiss

Concentration % (w/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	15	0	0	0	0	0	0	0	0	0	2	0	0	3
	26	0	0	0	0	0	0	0	0	0	0	0	0	1
	3													
	4													
FR-UFF4 (100)	15	0	0	0	0	0	0	1	5	9	0	0	0	15
	26	0	0	0	0	1	1	3	3	2	2	0	0	14
	3													
	4													
AHLER2 (100)	15	0	0	0	0	1	1	0	0	1	1	0	0	4
	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	3													
	4													
FR-FR01 (100)	15	0	0	0	0	0	1	0	0	1	2	0	0	4
	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	3													
	4													
AHLFR1 (100)	15	0	0	0	1	0	0	1	0	0	0	0	0	2
	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	3													
	4													
AHLERC (100)	15	0	0	0	0	2	1	0	1	15	2	0	0	11
	26	0	0	0	0	2	2	0	3	81	1	0	0	7
	3													
	4													
EV-HC1 (100)	15	0	0	0	0	0	0	2	0	1	1	0	0	4
	26	0	0	0	0	0	0	1	2	0	0	0	0	3
	3													
	4													
EV-MQ (100)	15	0	0	0	0	0	1	1	1	0	1	2	0	6
	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	3													
	4													
Tech Initials		K	K	K	P	M	K	K	K	K	K	A	JW	K

Comments: @at eyed stage

Reviewed by:  Date reviewed: June 26, 2017

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tecx  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17c 1905h  
 Stop Date & Time: June 9/17c 1900h  
 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	
0.1 MCL (100)	1	0	0	0	0	0	1	0	0	0	0	0	0	1
	2	↓	↓	↓	↓	3	2	0	1	↓	↓	↓	↓	6
	3	↓	↓	↓	↓	0	1	2	0	↓	↓	↓	↓	3
	4	↓	↓	↓	↓	↓	2	2	0	↓	↓	↓	↓	4
1.0 MCL (100)	1	↓	↓	↓	↓	↓	0	0	↓	↓	0	↓	0	0
	2	↓	↓	1	↓	↓	2	0	↓	↓	1	↓	↓	4
	3	↓	↓	0	1	↓	0	0	↓	↓	0	↓	↓	1
	4	↓	↓	0	0	↓	2	1	↓	1	0	↓	↓	4
1														
2														
3														
4														
0.1 MCL 100	1/5	0	0	0	0	0	0	0	1	0	0	0	0	1
	2/6	0	0	0	0	0	2	1	0	1	0	0	0	4
	3													
	4													
1.0 MCL 100	1/5	0	0	0	0	0	0	0	0	0	1	0	0	1
	2/6	0	0	0	0	0	1	1	0	1	0	0	0	3
	3													
	4													
1														
2														
3														
4														
1														
2														
3														
4														
Tech Initials		K	K	K	A	K	K	K	K	K	K	A	JW	K

Comments: Out eyed stage

Reviewed by: [Signature] Date reviewed: June 26, 2017

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tech  
 Sample ID: Vandus (see below)  
 Work Order #: FD360

Start Date & Time: <sup>May 10</sup> Apr 17<sup>th</sup> 1905h  
 Stop Date & Time: June 9<sup>th</sup> 17<sup>th</sup> 1200h  
 Test Species: Oncorhynchus mykiss

Concentration	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		13	14	15	16	17	18	19	20	21	22	23	24	
Control	1	0	0	0	0	0	2	2	1	2	0	0	0	5
	2	0	0	0	0	0	0	0	0	10	0	0	1	
	3	0	0	0	0	0	0	0	0	32	2	0	7	
	4	0	0	0	0	0	0	2	2	0	0	10	5	
PRUFES (100)	1	1	0	0	0	0	0	2	0	2	0	1	6	
	2	2	0	1	0	0	0	1	0	0	0	1	3	
	3	0	0	0	0	0	0	0	1	0	0	0	1	
	4	0	0	0	1	1	0	2	0	0	0	0	4	
GH-EPZ (100)	1	1	0	0	0	0	0	0	0	0	0	0	1	
	2	0	0	1	0	1	0	1	0	1	0	0	6	
	3	0	0	0	0	0	1	0	0	2	0	0	3	
	4	0	0	1	0	0	0	0	0	0	0	0	1	
GH-MCI (100)	1	0	0	0	0	0	0	0	0	0	0	0	-	
	2	0	0	0	0	0	0	0	0	0	0	0	-	
	3	0	0	0	0	0	0	0	0	0	0	0	-	
	4	0	0	0	0	0	0	0	0	0	0	0	-	
PR-FPC91 (100)	1	1	0	1	0	0	0	0	0	4	1	1	8	
	2	0	0	1	0	0	0	0	0	4	0	0	7	
	3	0	0	1	0	0	0	0	0	1	1	0	6	
	4	0	0	0	0	0	0	0	0	2	0	0	2	
GH-FP1 (100)	1	0	2	0	0	0	0	0	3	0	0	0	5	
	2	0	1	1	0	0	0	1	0	0	0	0	4	
	3	0	0	4	0	0	0	3	1	2	0	0	6	
	4	0	0	0	0	0	0	0	0	0	0	0	0	
GH-EPG (100)	1	1	0	0	0	0	0	1	1	2	0	0	5	
	2	1	0	0	0	1	0	0	2	1	2	0	7	
	3	0	2	1	0	0	0	0	0	1	0	0	4	
	4	0	0	0	1	0	0	0	0	2	2	0	5	
EV-Hed (100)	1	0	0	0	0	0	0	0	0	2	0	0	2	
	2	0	1	0	0	0	1	1	1	1	0	2	7	
	3	0	0	1	1	0	1	0	0	0	0	0	3	
	4	0	0	0	0	0	0	0	0	0	2	0	2	
Tech Initials		K	K	K	K	K	K	K	K	K	K	0	K	

Comments: Start to hatch @ 50% hatched

Reviewed by: [Signature] Date reviewed: June 26, 2017  
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 1905h  
 Stop Date & Time: June 9/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

Concentration % (w/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		13	14	15	16	17	18	19	20	21	22	23	24	
Control	1/5	0	0	0	0	0	0	2	0	10	0	0	0	3
	2/6	0	0	0	0	0	0	0	0	0	10	10	0	2
	3													
	4													
FRUPP1 (100)	1/5	0	1	0	0	0	0	1	0	0	2	0	0	4
	2/6	0	0	0	0	0	0	1	0	0	0	0	0	1
	3													
	4													
<del>CH-EP2</del> (100)	1/5	1	0	0	0	0	1	1	1	0	2	0	0	6
	2/6	0	0	0	0	0	1	0	0	0	3	0	0	4
	3													
	4													
<del>FRUPP1</del> (100)	1/5	0	1	1	0	0	1	0	0	1	3	0	0	7
	2/6	1	0	1	2	0	0	1	0	0	0	0	0	5
	3													
	4													
CH-EP1 (100)	1/5	0	1	0	0	0	1	0	1	1	1	0	0	5
	2/6	0	0	0	2	0	2	5	0	0	1	1	0	10
	3													
	4													
CH-EP2 (100)	1/5	0	0	1	2	0	3	3	1	1	0	0	0	11
	2/6	2	0	0	0	0	0	0	0	1	2	0	0	5
	3													
	4													
EV-HC1 (100)	1/5	0	0	0	0	0	1	0	2	1	1	0	0	5
	2/6	0	0	0	0	0	0	0	0	0	0	2	0	2
	3													
	4													
EV-MQ2 (100)	1/5	2	1	1	0	0	0	0	2	0	2	0	0	8
	2/6	5	0	0	0	0	0	0	0	0	1	0	0	6
	3													
	4													
Tech Initials		K	K	K	K	A	A	K	K	K	K	K	K	K

Comments: ① Start to hatch    ② >50% hatched

Reviewed by: [Signature]  
 Version 1.1 issued October 6, 2015

Date reviewed: June 26, 2017  
 Nautilus Environmental Company Inc.

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Task  
 Sample ID: Vinnus (see below)  
 Work Order #: A0360

Start Date & Time: MMJ Apr 10 / AE 1905h  
 Stop Date & Time: June 9 / AE 1200h  
 Test Species: Oncorhynchus mykiss

Concentration	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/Alevins
		13	14	15	16	17	18	19	20	21	22	23	24	
EV_ML2 (100)	1	0	0	0	0	1	0	0	0	0	0	0	0	1
	2	1	0	0	0	0	2	0	0	0	0	0	0	3
	3	0	1	0	0	0	0	0	0	0	0	0	0	2
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
CM_ML2 (100)	1	0	0	0	0	0	1	0	1	0	0	0	0	5
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	2	0	0	0	1	4
	4	0	0	0	0	0	0	0	0	0	0	0	0	1
LC_LPSLCC (100)	1	0	0	0	0	0	0	0	2	0	0	0	0	5
	2	0	1	2	0	0	0	0	0	0	2	0	1	6
	3	0	1	0	0	0	0	0	0	2	0	1	0	5
	4	0	0	0	0	0	0	0	1	0	0	0	0	3
EV_mykiss (100)	1/5	0	0	0	0	0	0	0	0	0	0	0	0	-
	2/5	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	-
	4	0	0	0	0	0	0	0	0	0	0	0	0	-
CM_ML2 (100)	1/5	0	0	0	0	0	0	0	0	0	0	0	0	4
	2/5	2	0	1	1	0	1	0	0	0	0	0	0	5
	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
LC_LPSLCC (100)	1/5	1	0	0	0	0	2	0	0	0	0	0	0	3
	2/5	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	1													
	2													
	3													
	4													

Comments: ① start to hatch    ② >50% hatched

Reviewed by: [Signature] Date reviewed: June 26, 2017  
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tech  
 Sample ID: Various (See Below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 10:5h  
 Stop Date & Time: June 9/17 @ 12:00h  
 Test Species: Oncorhynchus mykiss

Concentration % (V/V)	Rep	Day of Test - No. of Mortalities						Total Dead Embryos/Alevins	Total Undeveloped/Unhatched (abnormal)	Total No. Alevins (normal)	Total Exposed Eggs
		25	26	27	28	29	30				
Control	1	0	0	0	0	1	0	7	5	20	32
	2	0	0	0	0	0	0	4	4	22	30
	3	0	0	0	0	0	0	7	5	19	31
	4	2	0	0	0	1	0	12	2	16	30
PR-VEPI (100)	1	0	0	0	0	0	0	10	0	20	30
	2	0	0	0	0	0	0	9	2	20	31
	3	0	0	0	0	0	0	9	3	18	30
	4	0	0	0	0	0	0	6	0	24	30
GH-ERZ (100)	1	0	0	0	0	0	0	2	1	26	29
	2	0	0	0	0	0	0	9	3	18	30
	3	0	0	0	0	0	0	10	1	20	31
	4	0	0	0	0	0	0	3	2	24	29
<del>REDACTED SECTION</del>											
PR-FEPI (100)	1	0	0	0	0	0	1	12	1	17	30
	2	0	0	0	0	0	0	11	3	17	31
	3	0	0	0	0	0	0	12	0	13	31
	4	0	0	0	0	0	0	6	1	23	30
GH-FRI (100)	1	0	0	0	0	0	0	5	0	25	30
	2	0	0	0	0	0	0	12	1	17	30
	3	0	0	0	0	0	0	11	2	17	30
	4	0	0	0	0	0	0	4	1	25	30
GH-FEC (100)	1	0	0	0	0	0	0	9	0	21	30
	2	0	0	0	0	0	0	13	1	17	31
	3	0	0	0	0	0	0	24	1	3	28
	4	0	0	0	0	0	0	9	2	19	30
EU-HCI (100)	1	0	0	0	0	0	0	3	2	23	28
	2	0	0	0	0	0	0	8	2	20	30
	3	0	0	0	0	0	0	4	7	15	26
	4	0	0	0	0	0	0	4	1	25	30
Tech Initials		A	K	K	K	K	K	K	K	K	K

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: 

Date reviewed: June 26, 2018

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck Start Date & Time: May 10/17 @ 1905h  
 Sample ID: Various (See Below) Stop Date & Time: June 9/17 @ 000h  
 Work Order #: 170360 Test Species: Oncorhynchus mykiss

Concentration % (J/J)	Rep	Day of Test - No. of Mortalities						Total Dead Embryos/Alevins	Total Undeveloped/Unhatched (abnormal)	Total No. Alevins (normal)	Total Exposed Eggs
		25	26	27	28	29	30				
Control	15	0	0	0	0	0	0	6	23 <sup>h</sup> 1	21	28
	26	0	0	0	0	0	0	3	13 <sup>h</sup> 3	24	30
	3										
	4										
FE_UCF1 (100)	15	0	0	0	0	0	0	19	0	9	28
	26	0	0	0	0	0	0	15	1	16	32
	3										
	4										
GH_FE2 (100)	15	0	0	0	0	0	0	10	9 <sup>h</sup> 3	17	30
	26	0	0	0	0	0	0	4	3	21	28
	3										
	4										
FE_FCF1 (100)	15	0	0	1	0	0	0	12	0	16	28
	26	0	0	0	1	0	0	6	4	19	29
	3										
	4										
GH_FCF1 (100)	15	0	0	1	0	0	0	8	1	18	27
	26	0	0	0	0	0	0	10	2	18	30
	3										
	4										
GH_FEC (100)	15	0	1	0	0	0	0	10 <sup>h</sup> 23	0	8	31
	26	0	1	0	0	0	0	6 <sup>h</sup> 13	1	18	32
	3										
	4										
EJ_HCI (100)	15	0	0	0	1	0	0	10	1	20	31
	26	0	0	1	0	0	0	6	4	22	32
	3										
	4										
EJ_MC2 (100)	15	0	0	0	0	0	0	14	0	14	28
	26	0	0	0	0	0	0	6	2	22	30
	3										
	4										
Tech Initials		A	K	K	K	K	K	K	K	K	K

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by:  Date reviewed: June 26, 2017



### Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck  
 Sample ID: Various (See Below)  
 Work Order #: 170360

Start Date & Time: May 10/17 @ 1905h  
 Stop Date & Time: June 9/17 @ 1200h  
 Test Species: Oncorhynchus mykiss

Concentration  % (J/J)	Rep	Day of Test - No. of Mortalities						Total Dead Embryos/Alevins	Total % Undeveloped/Unhatched (abnormal)	Total No. Alevins (normal)	Total Exposed Eggs
		25	26	27	28	29	30				
EU-mc2 (100)	1	0	0	0	0	0	0	1	1	30	32
	2	0	1	↓	1	↓	↓	7	3	21	31
	3	0	0	↓	1	↓	↓	7	2	23	32
	4	0	↓	↓	0	↓	↓	1	4	23	28
UM-mc2 (100)	1	1	↓	↓	0	↓	↓	7 <sup>h7</sup>	2	21	30
	2	0	↓	↓	1	↓	↓	7	5	17	29
	3	0	↓	↓	0	↓	↓	7	10	13	30
	4	1	↓	↓	0	↓	↓	6	4	23	33
LC-LC55LC (100)	1	0	↓	↓	1	1	↓	7	3	23	33
	2	0	↓	↓	0	0	↓	10	5	15	30
	3	0	↓	↓	0	0	↓	6	9	12	27
	4	0	↓	↓	0	0	↓	7	2	22	31
<del>LC-LC55LC (100)</del>	1										
	2										
	3										
	4										
UM-mc2 (100)	1	0	0	0	0	0	1	6	1	22	29
	2	0	0	1	0	0	0	10	2	18	30
	3										
	4										
LC-LC55LC (100)	1	0	2	0	0	0	0	6	2	22	30
	2	0	0	1	0	0	0	4	5	21	30
	3										
	4										
	1										
	2										
	3										
	4										
Tech Initials	1										
	2										
	3										
	4										

Comments:

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Reviewed by: 

Date reviewed: June 26, 2017

Alevin Test Data Sheet  
Deformities

Client: Teck  
Sample ID: Control  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control A	1	18.5	/			
	2	18.0	/			
	3	18.5	/			
	4	17.0	/			
	5	17.5	/			
	6	17.0	/			
	7	19.0	/			
	8	18.0	/			
	9	18.5	/			
	10	16.5	/			
	11	18.0	/			
	12	18.0	/			
	13	17.5	/			
	14	16.0	/			
	15	19.5	/			
	16	17.5	/			
	17	17.0	/			
	18	16.5			✓	Yolk sac edema
	19	16.5			✓	↓
	20	17.0			✓	
	21	16.0			✓	
	22	17.0			✓	
	23	16.5	/			
	24	16.5	/			
	25	16.5	/			
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						

Total Weight (pooled): 1.94 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 5/5

Initials: RML/K

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

192/60

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: Control

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control B	1	17.5	/			
	2	17.5	/			
	3	18.5	/			
	4	18.5	/			
	5	18.0	/			
	6	17.0	/			
	7	17.0	/			
	8	17.5	/			
	9	16.90	/			
	10	17.5	/			
	11	16.8	/			
	12	17.5	/			
	13	17.5	/			
	14	16.8	/			
	15	18.0	/			
	16	17.0	/			
	17	17.5	/			
	18	19.0	/			
	19	17.5	/			
	20	17.5	/			
	21	16.5	/			
	22	18.0	/			
	23	16.5			✓	Yolk sac edema, Abnormal Jaw
	24	17.0			✓	↓
	25	18.0			✓	Abnormal Jaw
	26	14.0			✓	Yolk sac edema
27						
28						
29						
30						
31						
32						
33						
34						
35						

Total Weight (pooled): 1.72 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 4/4

Initials: EMULM

Reviewed by: 


Date Reviewed: \_\_\_\_\_

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control C	1	16.5	/			
	2	16.0	/			
	3	17.5	/			
	4	19.5	/			
	5	17.5	/			
	6	19.0	/			
	7	17.5	/			
	8	17.0	/			
	9	16.85	/			
	10	17.0	/			
	11	20.0	/			
	12	17.5	/			
	13	17.0	/			
	14	16.5	/			
	15	18.0	/			
	16	19.0	/			
	17	17.5	/			
	18	17.5	/			
	19	17.0	/			
	20	17.0			/	Yolk sac edema Abnormal Jaw
	21	15.0			/	↓ ↓
	22	17.0			/	sac Abnormal Jaw
	23	15.0			/	Yolk edema
	24	15.0			/	↓
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.66 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 5/5  
 Initials: EQ, MHL, KL  
 Reviewed by: 

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control D	1	15.0	—			
	2	16.5	—			
	3	17.0	—			
	4	18.0	—			
	5	17.0	—			
	6	18.0	—			
	7	16.5	—			
	8	19.0	—			
	9	17.0	—			
	10	16.5	—			
	11	17.0	—			
	12	16.5	—			
	13	17.0	—			
	14	15.5	—			
	15	16.5	—			
	16	16.5	—			
	17	15.0		—	—	lordosis * Kyphosis
	18	15.5		—	—	abnormal jaw
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.31 g  
 Number of survivors: 18  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: EGM, M  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
Control E	1	18.0	/		
	2	18.0	/		
	3	18.5	/		
	4	17.5	/		
	5	18.5	/		
	6	18.5	/		
	7	18.0	/		
	8	17.0	/		
	9	20.0	/		
	10	19.0	/		
	11	16.5	/		
	12	17.5	/		
	13	18.0	/		
	14	17.5	/		
	15	18.0	/		
	16	16.5	/		
	17	19.5	/		
	18	16.5	/		
	19	18.0	/		
	20	18.5	/		
	21	15.0	/		
	22	14.0			/
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.46 g  
 Number of survivors: 22  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: ECML/v  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: Control

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control F	1	20.45	/			
	2	17.5	/			
	3	19.5	/			
	4	17.5	/			
	5	17.5	/			
	6	18.0	/			
	7	18.0	/			
	8	20.0	/			
	9	19.0	/			
	10	17.5	/			
	11	18.5	/			
	12	20.0	/			
	13	18.0	/			
	14	19.5	/			
	15	19.0	/			
	16	19.0	/			
	17	17.5	/			
	18	17.0	/			
	19	19.0	/			
	20	18.0	/			
	21	18.5	/			
	22	18.0	/			
	23	18.0	/			
	24	16.0	/			
	25	15.0			✓	Yolk sac edema
	26	16.0			✓	↓
	27	16.5			✓	
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.16 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 3/3

Initials: ECM/LH

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: FR\_UFR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 A	1	19.0	/		
	2	19.0	/		
	3	18.0	/		
	4	20.0	/		
	5	19.0	/		
	6	19.0	/		
	7	18.0	/		
	8	17.5	/		
	9	19.85	/		
	10	19.0	/		
	11	19.0	/		
	12	18.0	/		
	13	18.5	/		
	14	19.5	/		
	15	19.5	/		
	16	19.0	/		
	17	17.5	/		
	18	17.5	/		
	19	19.0	/		
	20	19.5	/		
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.18 1.45 g  
Number of survivors: 20  
Number of deformed/have difficulty swimming: 0/0  
Initials: EE YAL, M  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017



858/66

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_UFR1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 B	1	19.0	/		
	2	20.0	/		
	3	21.0	/		
	4	19.0	/		
	5	19.0	/		
	6	19.0	/		
	7	20.0	/		
	8	20.5	/		
	9	21.0	/		
	10	18.0	/		
	11	20.0	/		
	12	17.5	/		
	13	19.5	/		
	14	18.0	/		
	15	18.0	/		
	16	18.5	/		
	17	20.0	/		
	18	20.5	/		
	19	17.5	/		
	20	20.0 <sub>g</sub>	/		
21	17.80			✓	Yolk sac edema, Abnormal J and
22	16.0			✓	Yolk sac kelena
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.78 g

Number of survivors: 22

Number of deformed/have difficulty swimming: 2/2

Initials: EG MHL, M

Reviewed by: 

Date Reviewed: June 26, 2017

159/160

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: FR\_UFR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_UFR1 C	1	18.5	/			
	2	19.5	/			
	3	19.0	/			
	4	18.5	/			
	5	18.0	/			
	6	19.0	/			
	7	20.0	/			
	8	18.5	/			
	9	20.0	/			
	10	17.5	/			
	11	17.5	/			
	12	19.0	/			
	13	19.5	/			
	14	19.0	/			
	15	19.0	/			
	16	18.5	/			
	17	19.0	/			
	18	20.0	/			
	19	16.0			✓	Yolk sac retained
	20	18.5			✓	↓
	21	18.5			✓	
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.73 g  
Number of survivors: 21  
Number of deformed/have difficulty swimming: 3/3  
Initials: EGM, K  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

19 10/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_UFR1

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 D	1	19.0	/		
	2	20.0	/		
	3	19.5	/		
	4	19.5	/		
	5	20.0	/		
	6	<del>19.5</del>	/		
	7	19.0	/		
	8	19.0	/		
	9	18.5	/		
	10	18.5	/		
	11	16.5	/		
	12	19.0	/		
	13	19.5	/		
	14	17.0	/		
	15	<del>20.5</del>	/		
	16	20.5	/		
	17	19.5	/		
	18	18.0	/		
	19	17.0	/		
	20	18.5	/		
	21	20.5	/		
	22	19.5	/		
	23	19.0	/		
	24	19.0	/		
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 177 g

Number of survivors: 24

Number of deformed/have difficulty swimming: 0/0

Initials: EC, ML, M

Reviewed by: 

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_UFR1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_UFR1 E	1	20.0	/			
	2	20.0	/			
	3	20.0	/			
	4	21.0	/			
	5	20.0	/			
	6	19.5	/			
	7	19.5	/			
	8	21.0	/			
	9	20.0	/			
	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): 0.73 g

Number of survivors: 9

Number of deformed/have difficulty swimming: 0/0

Initials: ECM/MLN

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

12/16

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_UFR1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_UFR1 F	1	20.0	/			
	2	21.0	/			
	3	20.0	/			
	4	21.0	/			
	5	20.0	/			
	6	21.0	/			
	7	20.0	/			
	8	20.0	/			
	9	20.0	/			
	10	20.0	/			
	11	20.5	/			
	12	19.0	/			
	13	21.0	/			
	14	20.0	/			
	15	20.5	/			
	16	20.0	/			
	17	18.0		/		yellowish edema, abnormal fin
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.55 g

Number of survivors: 17

Number of deformed/have difficulty swimming: 1/1

Initials: ECMM, KL

Reviewed by: 

Date Reviewed: June 26, 2017

*pg 13/60*

**Alevin Test Data Sheet**  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ER2

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 A	1	19.0	/			
	2	18.0	/			
	3	18.5	/			
	4	16.5	/			
	5	17.0	/			
	6	17.0	/			
	7	19.0	/			
	8	17.0	/			
	9	17.0	/			
	10	17.0	/			
	11	17.0	/			
	12	17.0	/			
	13	17.0	/			
	14	17.5	/			
	15	18.0	/			
	16	17.0	/			
	17	19.0	/			
	18	18.0	/			
	19	18.0	/			
	20	19.0	/			
	21	18.0	/			
	22	16.5	/			
	23	17.5	/			
	24	18.0	/			
	25	18.5	/			
	26	20.0	/			
	27	15.5			/	Yolk sac edema
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.28 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 1/1

Initials: EG, YML, VL

Reviewed by: *EW*

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: GH\_ER2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 B	1	17.5	/			
	2	19.0	/			
	3	17.5	/			
	4	18.0	/			
	5	18.0	/			
	6	18.0	/			
	7	20.0	/			
	8	20.0	/			
	9	20.0	/			
	10	20.5	/			
	11	20.0	/			
	12	19.0	/			
	13	19.0	/			
	14	19.0	/			
	15	20.5	/			
	16	18.5	/			
	17	17.5	/			
	18	17.5	/			
	19	17.0			/	Yolk sac edema
	20	16.5			/	↓
	21	16.5			/	Abnormal jaw
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.68 g  
Number of survivors: 21  
Number of deformed/have difficulty swimming: 3/3  
Initials: EG, MML, M  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ER2

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 C	1	17.5	/			
	2	17.5	/			
	3	19.0	/			
	4	18.0	/			
	5	19.0	/			
	6	16.85	/			
	7	18.0	/			
	8	17.5	/			
	9	18.5	/			
	10	18.5	/			
	11	14.5	/			
	12	19.0	/			
	13	18.5	/			
	14	21.0	/			
	15	18.0	/			
	16	17.0	/			
	17	18.5	/			
	18	18.5	/			
	19	18.5	/			
	20	17.0	/			
	21	17.0			/	yellow sac edema
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.61 g

Number of survivors: 21

Number of deformed/have difficulty swimming: 1/1

Initials: EC, YL, W

Reviewed by: [Signature]

Date Reviewed: June 26, 2017



pg 16/60

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: GH\_ER2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 D	1	17.0	/			
	2	17.5	/			
	3	19.0	/			
	4	20.0	/			
	5	20.0	/			
	6	19.5	/			
	7	17.0	/			
	8	19.0	/			
	9	19.0	/			
	10	17.5	/			
	11	18.0	/			
	12	18.5	/			
	13	17.5	/			
	14	17.0	/			
	15	18.0	/			
	16	17.0	/			
	17	20.5	/			
	18	18.5	/			
	19	17.0	/			
	20	18.5	/			
	21	18.5	/			
	22	18.0	/			
	23	17.5	/			
	24	17.5	/			
	25	16.0			✓	Yolk sac edema
	26	16.0			✓	Abnormal Jaw
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.04 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 2/2

Initials: ECM/MLM

Reviewed by: 

Date Reviewed: June 26, 2017

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ER2

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 E	1	19.0	/			
	2	19.0	/			
	3	17.0	/			
	4	18.5	/			
	5	18.0	/			
	6	17.0	/			
	7	17.5	/			
	8	18.5	/			
	9	20.0	/			
	10	18.0	/			
	11	18.0	/			
	12	17.5	/			
	13	18.5	/			
	14	18.0	/			
	15	16.5	/			
	16	18.0	/			
	17	16.5	/			
	18	15.0			✓	Yolk sac edema
	19	15.5			✓	Abnormal Jaw
	20	15.5			✓	Yolk sac edema, Abnormal Jaw
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.45 g

Number of survivors: 20

Number of deformed/have difficulty swimming: 3/5

Initials: EG, VML, DL

Reviewed by: 

Date Reviewed: June 26, 2017

9518/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ER2

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 F	1	16.0	/			
	2	17.0	/			
	3	16.0	//			
	4	19.0	/			
	5	18.5	/			
	6	18.5	/			
	7	17.0	/			
	8	18.0	/			
	9	17.5	/			
	10	18.0	/			
	11	18.0	/			
	12	18.0	/			
	13	18.0	/			
	14	18.0	/			
	15	18.0	/			
	16	18.0	/			
	17	17.5	/			
	18	17.5	/			
	19	<del>17.5</del> 14.5			✓	Yolte sac edema
	20	<del>17.5</del> 16.0			✓	↓
	21	<del>17.5</del> 15.0			✓	
	22	17.5	/			
	23	17.5	/			
	24	17.5	/			
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.83 g

Number of survivors: 24

Number of deformed/have difficulty swimming: 3/3

Initials: EGMLK

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_FRCP1

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 A	1	18.0	/			
	2	20.0	/			
	3	20.0	/			
	4	20.0	/			
	5	20.0	/			
	6	19.0	/			
	7	18.0	/			
	8	19.0	/			
	9	19.0	/			
	10	16.0	/			
	11	<del>19.5</del>	/			
	12	17.5	/			
	13	19.0	/			
	14	18.0	/			
	15	18.5	/			
	16	18.0	/			
	17	19.0	/			
	18	17.0			✓	Kyphosis + lordosis
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.48 g

Number of survivors: 18

Number of deformed/have difficulty swimming: 1/1

Initials: EC, YHL, W

Reviewed by: 

Date Reviewed: June 26, 2017

10/20/10

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_FRCP1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 B	1	20.0	/			
	2	20.0	/			
	3	20.0	/			
	4	19.5	/			
	5	19.5	/			
	6	20.0	/			
	7	20.5	/			
	8	20.0	/			
	9	20.5	/			
	10	20.5	/			
	11	20.5	/			
	12	20.5	/			
	13	20.0	/			
	14	20.5	/			
	15	20.0	/			
	16	20.5	/			
	17	18.5	/			
	18	15.0			✓	gottle sev edema, Abnormal Jaw
	19	16.0			✓	↓
	20	17.0			✓	↓
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.75 g

Number of survivors: 31 <sup>20</sup>

Number of deformed/have difficulty swimming: 3/3

Initials: EL, YHL, K

Reviewed by: 

Date Reviewed: June 26, 2017

Page 21/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_FRCP1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 C	1	20.5	/			
	2	20.0	/			
	3	19.5	/			
	4	20.0	/			
	5	20.0	/			
	6	20.5	/			
	7	20.5	/			
	8	19.5	/			
	9	20.75	/			
	10	18.5 BS	/			
	11	19.0	/			
	12	19.0	/			
	13	19.0	/			
	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): 1.13 g

Number of survivors: 13

Number of deformed/have difficulty swimming: 0/0

Initials: ECYML, W

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: FR\_FRCP1  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 D	1	19.0	/			
	2	18.0	/			
	3	17.0	/			
	4	17.5	/			
	5	<del>17.0</del> 17.0	/			
	6	20.0	/			
	7	16.0	/			
	8	18.5	/			
	9	18.5	/			
	10	18.5	/			
	11	18.0	/			
	12	20.0	/			
	13	18.0	/			
	14	19.5	/			
	15	19.0	/			
	16	20.0	/			
	17	19.0	/			
	18	19.0	/			
	19	21.0	/			
	20	<del>19.0</del> 19.0	/			
	21	19.0	/			
	22	20.0	/			
	23	19.5	/			
	24	18.0			✓	yolk sac edema
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.76 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: EC, MHL, K  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_FRCP1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_FRCP1 E	1	19.0	—		
	2	19.5	—		
	3	19.0	—		
	4	19.0	—		
	5	19.5	—		
	6	19.0	—		
	7	17.0	—		
	8	18.0	—		
	9	19.5	—		
	10	17.5	✓		
	11	18.5	—		
	12	18.0	—		
	13	19.0	—		
	14	17.5	—		
	15	18.5	—		
	16	16.5	—		
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.14 g

Number of survivors: 16

Number of deformed/have difficulty swimming: 0/0

Initials: EC, M, W

Reviewed by: 

Date Reviewed: June 26, 2017



### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: FR\_FRCP1

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 F	1	18.5	/			
	2	20.0	/			
	3	18.0	/			
	4	18.0	/			
	5	18.0	/			
	6	19.0	/			
	7	18.0	/			
	8	19.0	/			
	9	19.0	/			
	10	19.0	/			
	11	18.0	/			
	12	19.0	/			
	13	19.0	/			
	14	19.5	/			
	15	19.0	/			
	16	19.5	/			
	17	19.0	/			
	18	17.5	/			
	19	18.5	/			
	20	18.0			✓	yolk sac edema
	21	15.5			✓	↓ ex
	22	17.0			✓	
	23	15.0			✓	Extra <del>body</del> growth, yolk sac edema
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.97 g

Number of survivors: 23

Number of deformed/have difficulty swimming: 4/4

Initials: EGM/LL

Reviewed by: 

Date Reviewed: June 26, 2017

1925/10

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: GH\_FR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
GH_FR1 A	1	21.5	/		
	2	22.0	/		
	3	21.0	/		
	4	20.5	/		
	5	21.0	/		
	6	20.5	/		
	7	21.0	/		
	8	20.0	/		
	9	20.0	/		
	10	20.5	/		
	11	21.0	/		
	12	22.0	/		
	13	20.0	/		
	14	21.0	/		
	15	21.0	/		
	16	21.0	/		
	17	21.5	/		
	18	20.5	/		
	19	21.5	/		
	20	21.5	/		
	21	22.0	/		
	22	21.0	/		
	23	20.5	/		
	24	21.0	/		
	25	<del>20.5</del> 22.0	/		
26	<del>22.0</del>				
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.36 g  
Number of survivors: 25  
Number of deformed/have difficulty swimming: 0/0  
Initials: EC, VML, K  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

09/26/16

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: GH\_FR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_FR1 B	1	20.5	/			
	2	21.0	/			
	3	21.5	/			
	4	21.5	/			
	5	21.5	/			
	6	22.0	/			
	7	22.5	/			
	8	21.5	/			
	9	21.0	/			
	10	22.0	/			
	11	22.0	/			
	12	19.5	/			
	13	21.0	/			
	14	19.0	/			
	15	21.0	/			
	16	21.5	/			
	17	20.5	/			
	18	17.0			/	yellow sac edema, Abnormal Jaw
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.76 g  
Number of survivors: 18  
Number of deformed/have difficulty swimming: 1/1  
Initials: EMH, VL  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

PS 2/160

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_FR1

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_FR1 C	1	21.0	/			
	2	19.0	/			
	3	21.0	/			
	4	19.0	/			
	5	21.0	/			
	6	21.5	/			
	7	17.0	/			
	8	19.0	/			
	9	20.5	/			
	10	19.5	/			
	11	20.0	/			
	12	19.0	/			
	13	20.0	/			
	14	22.0	/			
	15	20.0	/			
	16	18.0	/			
	17	19.0	/			
	18	17.5			✓	Yolk sac edema,
	19	16.5			✓	Yolk sac edema, abnormal Jaw
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.55 g

Number of survivors: 19

Number of deformed/have difficulty swimming: 2/2

Initials: ECYMLH

Reviewed by: 

Date Reviewed: June 26, 2017

P328/60

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: GH\_FR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
GH_FR1 D	1	20.5	/		
	2	21.5	/		
	3	20.5	/		
	4	21.0	/		
	5	20.0	/		
	6	21.5	/		
	7	19.5	/		
	8	21.0	/		
	9	21.5	/		
	10	21.5	/		
	11	21.5	/		
	12	21.0	/		
	13	21.5	/		
	14	20.0	/		
	15	21.0	/		
	16	21.5	/		
	17	20.5	/		
	18	20.5	/		
	19	20.0	/		
	20	20.5	/		
	21	19.0	/		
	22	21.0	/		
	23	21.0	/		
	24	21.5	/		
	25	21.5	/		
	26	16.5			/
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.42 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 1/1

Initials: EGH/LM

Reviewed by: 

Date Reviewed: June 26, 2017

09/29/16

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_FR1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_FR1 E	1	22.0	/			
	2	21.0	/			
	3	21.85	/			
	4	21.5	/			
	5	21.0	/			
	6	21.0	/			
	7	21.5	/			
	8	21.5	/			
	9	21.0	/			
	10	21.0	/			
	11	21.5	/			
	12	20.5	/			
	13	20.0	/			
	14	22.0	/			
	15	20.0	/			
	16	21.5	/			
	17	21.0	/			
	18	22.0	/			
	19	16.5			/	Abnormal large yolk sac edema
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.75 g

Number of survivors: 19

Number of deformed/have difficulty swimming: 1/19

Initials: EL, YKL, W

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

8930/60

### Alevin Test Data Sheet Deformities


Client: Teck  
Sample ID: GH\_FR1  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_FR1 F	1	20.0	/			
	2	20.0	/			
	3	20.0	/			
	4	19.5	/			
	5	20.0	/			
	6	19.0	/			
	7	19.5	/			
	8	19.5	/			
	9	19.0	/			
	10	20.0	/			
	11	20.0	/			
	12	20.0	/			
	13	20.0	/			
	14	19.5	/			
	15	19.0	/			
	16	18.0	/			
	17	20.0	/			
	18	19.0	/			
	19	15.0			/	Yolk sac edema
	20	18.0			/	Lordosis, Scoliosis, Yolk sac edema.
	21					Hyphosis, scoliosis
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.83 g  
Number of survivors: 20  
Number of deformed/have difficulty swimming: 2/2

Initials: ELYLLW

Reviewed by: 

Date Reviewed: June 26, 2017

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
GH_ERC A	1	21.0	/		
	2	21.5	/		
	3	20.0	/		
	4	20.5	/		
	5	20.0	/		
	6	20.0	/		
	7	20.0	/		
	8	20.0	/		
	9	20.0	/		
	10	20.5	/		
	11	20.0	/		
	12	20.0	/		
	13	18.0	/		
	14	20.0	/		
	15	19.0	/		
	16	20.0	/		
	17	20.5	/		
	18	21.0	/		
	19	19.5	/		
	20	20.0	/		
	21	18.0	✓		XEN
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.74 g

Number of survivors: 21

Number of deformed/have difficulty swimming: 0/0

Initials: EC, YL, K

Reviewed by: 

Date Reviewed: June 26, 2017



8532/160

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC B	1	20.0	/			
	2	21.0	/			
	3	20.5	/			
	4	21.0	/			
	5	20.5	/			
	6	21.0	/			
	7	20.5	/			
	8	20.5	/			
	9	19.5	/			
	10	20.0	/			
	11	19.0	/			
	12	21.0	/			
	13	20.0	/			
	14	20.0	/			
	15	18.5	/			
	16	20.0	/			
	17	20.5	/			
	18	19.0			/	Yolk sac Edema
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.54 g

Number of survivors: 18

Number of deformed/have difficulty swimming: 1/1

Initials: EG, MML, ML

Reviewed by: 

Date Reviewed: June 26, 2017

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
GH_ERC C	1	19.0	✓		
	2	20.0	✓		
	3	19.0	✓		
	4	16.0		✓	Yolk sac edema
	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): 0.31 g

Number of survivors: 3/4

Number of deformed/have difficulty swimming: 1/1

Initials: K, M, L, E

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

1934/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC D	1	21.0	/			
	2	21.5	/			
	3	20.5	/			
	4	<del>20.7</del> 21.5	/			
	5	21.5	/			
	6	22.0	/			
	7	21.0	/			
	8	21.0	/			
	9	20.0	/			
	10	21.0	/			
	11	21.0	/			
	12	21.5	/			
	13	21.0	/			
	14	21.0	/			
	15	21.0	/			
	16	20.0	/			
	17	21.5	/			
	18	21.5	/			
	19	20.5	/			
	20	19.0			✓	Yolk sac edema
	21	18.0			✓	↓
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.95 g

Number of survivors: 21

Number of deformed/have difficulty swimming: 2/2

Initials: ECMYLN

Reviewed by: 

Date Reviewed: June 26, 2017

0935160

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC E	1	21.0	/			
	2	19.0	/			
	3	21.0	/			
	4	21.0	/			
	5	20.5	/			
	6	21.0	/			
	7	20.0	/			
	8	21.5	/			
	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): 0.75 g

Number of survivors: 8

Number of deformed/have difficulty swimming: 0/0

Initials: ELMHL/h

Reviewed by: 

Date Reviewed: June 26, 2017

8936/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: GH\_ERC

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC F	1	21.0	—			
	2	21.5	—			
	3	21.0	—			
	4	18.0	—			
	5	20.5	—			
	6	20.5	—			
	7	19.0	—			
	8	20.0	—			
	9	20.5	—			
	10	20.5	—			
	11	21.0	—			
	12	21.5	—			
	13	ca 19.5	—			
	14	21.0	—			
	15	21.85	—			
	16	21.0	—			
	17	21.0	—			
	18	19.0	—			
	19	17.0			✓	yellow sur edema
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.89 g

Number of survivors: 19

Number of deformed/have difficulty swimming: 1/1

Initials: EL, YVL, W

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_HC1  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 A	1	17.5	/			
	2	18.0	/			
	3	19.0	/			
	4	18.0	/			
	5	18.5	/			
	6	19.0	/			
	7	16.0	/			
	8	18.0	/			
	9	17.5	/			
	10	17.0	/			
	11	18.0	/			
	12	18.0	/			
	13	18.0	/			
	14	17.0	/			
	15	18.0	/			
	16	19.0	/			
	17	18.5	/			
	18	17.5	/			
	19	17.5	/			
	20	16.5	/			
	21	19.0	/			
	22	17.5	/			
	23	17.5	/			
	24	17.0			✓	Yolk sac edema, Abnormal Tail, Extra growth
	25	17.0			✓	Defecation, scoliosis, Yolk sac edema, extra growth
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.93 g  
 Number of survivors: 25  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: EC, MHL, W  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

pg 38/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: EV\_HC1

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 B	1	19.5	/			
	2	18.5	/			
	3	19.0	/			
	4	19.0	/			
	5	18.5	/			
	6	17.0	/			
	7	19.0	/			
	8	19.0	/			
	9	19.0	/			
	10	19.0	/			
	11	19.0	/			
	12	19.0	/			
	13	19.0	/			
	14	19.5	/			
	15	19.5	/			
	16	18.0	/			
	17	19.5	/			
	18	20.0	/			
	19	19.5	/			
	20	20.0	/			
	21	17.0			/	Lordosis & kyphosis
	22	17.5			/	Yolk sac edema.
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.86 g

Number of survivors: 22

Number of deformed/have difficulty swimming: 2/2

Initials: EC, YML, W

Reviewed by: 

Date Reviewed: June 26, 2017

03/31/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: EV\_HC1

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 C	1	18.0	/			
	2	18.5	/			
	3	20.0	/			
	4	18.0	/			
	5	18.0	/			
	6	18.5	/			
	7	19.0	/			
	8	17.0	/			
	9	19.0	/			
	10	21.0	/			
	11	19.0	/			
	12	17.5	/			
	13	19.0	/			
	14	19.0	/			
	15	17.0	/			
	16	17.0			✓	yolk sac edema, Abnormal Jaw
	17	17.0			✓	yolk sac edema
	18	17.0			✓	yolk sac edema
	19	17.5			✓	yolk sac edema
	20	16.0			✓	yolk sac edema
	21	16.0			✓	yolk sac edema
	22	17.0			✓	yolk sac edema, Abnormal Jaw
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.69 g

Number of survivors: 22

Number of deformed/have difficulty swimming: 7/7

Initials: ECYV, W

Reviewed by: [Signature]

Date Reviewed: June 26, 2017



194  
1940/60

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_HC1  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 D	1	16.0	/			
	2	19.5	/			
	3	19.0	/			
	4	20.0	/			
	5	19.5	/			
	6	16.5	/			
	7	18.5	/			
	8	20.0	/			
	9	20.0	/			
	10	19.0	/			
	11	18.5	/			
	12	20.0	/			
	13	20.0	/			
	14	20.0	/			
	15	17.0	/			
	16	19.0	/			
	17	18.0	/			
	18	20.0	/			
	19	18.5	/			
	20	20.0	/			
	21	19.0	/			
	22	19.0	/			
	23	18.5	/			
	24	20.0	/			
	25	18.5	/			
	26	15.0			✓	Scoliosis w scoliosis
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.17 g  
 Number of survivors: 26  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: KRC,MYL  
 Reviewed by: [Signature]


Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_HC1  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 E	1	17.5	/			
	2	19.0	/			
	3	17.0	/			
	4	17.0	/			
	5	18.0	/			
	6	17.0	/			
	7	18.5	/			
	8	18.0	/			
	9	17.5	/			
	10	18.0	/			
	11	18.5	/			
	12	17.5 <sup>40</sup>	/			
	13	16.5	/			
	14	17.0	/			
	15	18.5	/			
	16	17.0	/			
	17	17.0	/			
	18	18.0 <sup>5</sup>	/			
	19	17.5	/			
	20	18.5	/			
	21	15.5			/	Yolk sac edema, Abnormal Jaw
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.60 g  
 Number of survivors: 21  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: EC, VHL, M  
 Reviewed by: 

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_HC1  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 F	1	20.0	/			
	2	21.0	/			
	3	21.5	/			
	4	20.5	/			
	5	19.0	/			
	6	20.5	/			
	7	20.0	/			
	8	21.0	/			
	9	21.5	/			
	10	21.5	/			
	11	22.0	/			
	12	21.0	/			
	13	20.0	/			
	14	20.5	/			
	15	19.5	/			
	16	19.5	/			
	17	20.0	/			
	18	20.5	/			
	19	20.0	/			
	20	20.5	/			
	21	20.0	/			
	22	18.0	/			
	23	16.5			✓	Yollic sac edema
	24	19.0			✓	Yollic sac edema, abnormal jaw
	25	17.0			✓	abnormal jaw
	26	17.0			✓	Loose <del>teeth</del> <sup>in</sup> expression.
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.56 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 4/4

Initials: ELM/MLM

Reviewed by: 

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_MC2  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
EV_MC2 A	1	20.0	/		
	2	19.0	/		
	3	19.5	/		
	4	19.0	/		
	5	18.5	/		
	6	19.5	/		
	7	20.0	/		
	8	18.5	/		
	9	18.5	/		
	10	20.0	/		
	11	20.5	/		
	12	19.0	/		
	13	19.0	/		
	14	19.5	/		
	15	19.0	/		
	16	18.5	/		
	17	16.0	/		
	18	19.0	/		
	19	18.0	/		
	20	17.0	/		
	21	20.5	/		
	22	19.5	/		
	23	19.0	/		
	24	20.0	/		
	25	18.0	/		
	26	20.0	/		
	27	18.0	/		
	28	18.0	/		
	29	19.5	/		
	30	20.5	/		
	31	17.0	/	/	Yolk sac edema
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.55 g  
 Number of survivors: 31  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: ECM/LK  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: EV\_MC2

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_MC2 B	1	18.5	/			
	2	20.0	/			
	3	20.0	/			
	4	19.5	/			
	5	20.0	/			
	6	20.0	/			
	7	20.0	/			
	8	17.5	/			
	9	19.0	/			
	10	19.5	/			
	11	20.75	/			
	12	20.5	/			
	13	20.0	/			
	14	20.0	/			
	15	Ev/19.5	/			
	16	19.75	/			
	17	19.5	/			
	18	20.0	/			
	19	20.5	/			
	20	20.0	/			
	21	20.0	/			
	22	17.5			/	Yollic sac edema
	23	17.5			/	↓
	24	18.5			/	Yollic sac edema, Abnormal jaw
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.14 g

Number of survivors: 24

Number of deformed/have difficulty swimming: 3B

Initials: EC, YL, M

Reviewed by: 

Date Reviewed: June 26, 2017

D945/60

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: EV\_MC2

Termination Date: June 9, 2017

Work Order No.: 170360

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
EV_MC2 C	1	18.5	/		
	2	19.0	/		
	3	18.5	/		
	4	19.0	/		
	5	18.5	/		
	6	19.5	/		
	7	19.5	/		
	8	19.0	/		
	9	18.5	/		
	10	<del>20</del> 21.0	/		
	11	21.0	/		
	12	20.0	/		
	13	19.0	/		
	14	18.0	/		
	15	21.0	/		
	16	21.0	/		
	17	18.5	/		
	18	19.0	/		
	19	20.0	/		
	20	<del>21</del> 22.0	/		
	21	21.0	/		
	22	20.0	/		
	23	19.0	/		
	24	13.0			✓ yellow sac edema
	25	17.5			✓ yellow sac edema, Abnormal Jaw
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 2.39 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 2/2

Initials: ESYML/KL

Reviewed by: 

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck

Start Date: May 10, 2017

Sample ID: EV\_MC2

Termination Date: June 9, 2017

Work Order No.: 170360


Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_MC2 D	1	18.5				
	2	18.5				
	3	18.0				
	4	19.0				
	5	19.0				
	6	18.0				
	7	18.0				
	8	18.0				
	9	19.0				
	10	17.0				
	11	18.0				
	12	19.0				
	13	19.0				
	14	19.0				
	15	17.0				
	16	18.0				
	17	18.5				
	18	18.80				
	19	18.0				
	20	17.0				
	21	17.0				
	22	17.5				
	23	19.0				
	24	15.0			✓	Yolk sac edema, Abnormal Jaw
	25	16.0			✓	↓
	26	15.0			✓	Yolk sac edema
	27	15.5			✓	↓
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.03 g

Number of survivors: 27

Number of deformed/have difficulty swimming: 4/4

Initials: EC, YL, K

Reviewed by: 

Date Reviewed: June 26, 2017

Alevin Test Data Sheet  
Deformities

Client: Teck  
Sample ID: EV\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
EV_MC2 E	1	20.0	/		
	2	20.5	/		
	3	20.0	/		
	4	19.5	/		
	5	19.5	/		
	6	20.5	/		
	7	20.0	/		
	8	19.5	/		
	9	20.5	/		
	10	20.5	/		
	11	20.0	/		
	12	20.21.0	/		
	13	20.5	/		
	14	21.0	/		
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.17 g  
Number of survivors: 14  
Number of deformed/have difficulty swimming: 0/0  
Initials: EG, YML, W  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017



### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: EV\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_MC2 F	1	18.0	/			
	2	18.5	/			
	3	19.0	/			
	4	18.5	/			
	5	19.5	/			
	6	20.0	/			
	7	18.5	/			
	8	19.0	/			
	9	18.5	/			
	10	18.5	/			
	11	18.5	/			
	12	18.0	/			
	13	19.0	/			
	14	18.0	/			
	15	19.0	/			
	16	17.0	/			
	17	20.0	/			
	18	18.0	/			
	19	18.0	/			
	20	19.0	/			
	21	18.5	/			
	22	18.5	/			
	23	17.5			/	Yolk sac edema
	24	18.5			/	↓
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.18 g  
Number of survivors: 24  
Number of deformed/have difficulty swimming: 2/2  
Initials: ECVML, k  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: CM\_MC2  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 A	1	18.0	/			
	2	18.0	/			
	3	18.5	/			
	4	17.0	/			
	5	18.0	/			
	6	20.0	/			
	7	20.0	/			
	8	18.0	/			
	9	18.5	/			
	10	19.0	/			
	11	19.0	/			
	12	19.0	/			
	13	18.5	/			
	14	17.0	/			
	15	17.5	/			
	16	17.5	/			
	17	18.0	/			
	18	17.5	/			
	19	17.5	/			
	20	18.0	/			
	21	17.5	/			
	22	16.0			✓	yo Abnormal Jaw
	23	16.0			✓	Yolk sac retained, Abnormal Jaw
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.94 g

Number of survivors: 23

Number of deformed/have difficulty swimming: 2/2

Initials: ECYMLK

Reviewed by: 

Date Reviewed: June 26, 2017

8/50/100

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: CM\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 B	1	20.0	/			
	2	20.5	/			
	3	20.0	/			
	4	19.0	/			
	5	20.0	/			
	6	21.0	/			
	7	20.0	/			
	8	21.0	/			
	9	20.0	/			
	10	19.0	/			
	11	21.0	/			
	12	21.0	/			
	13	21.0	/			
	14	19.0	/			
	15	19.5	/			
	16	21.0	/			
	17	19.5	/			
	18	17.5			✓	Yolk sac edema
	19	18.5			✓	Yolk sac edema, abnormal jaw
	20	17.0			✓	↓
	21	15.5			✓	Yolk sac edema, facial deformity
	22	17.5			✓	Yolk sac edema, jaw no anal fin, abnormal fin jaw.
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.04 g  
Number of survivors: 22  
Number of deformed/have difficulty swimming: 5/5  
Initials: EMML/v  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: CM\_MC2  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 C	1	17.5	/			
	2	18.0	/			
	3	18.5	/			
	4	17.0	/			
	5	17.0	/			
	6	17.0	/			
	7	19.5	/			
	8	18.5	/			
	9	17.5	/			
	10	17.5	/			
	11	18.5	/			
	12	17.5	/			
	13	17.0	/			
	14	16.0			✓	yolk sac edema
	15	17.0			✓	yolk sac edema
	16	17.0			✓	yolk sac edema
	17	16.0			✓	yolk sac edema, abnormal jaw
	18	15.5			✓	yolk sac edema
	19	16.5			✓	yolk sac edema, set abnormal jaw
	20	15.0			✓	↓
	21	15.5			✓	↓
	22	15.0			✓	yolk sac edema
	23	16.0			✓	yolk sac edema
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.74 g

Number of survivors: 23

Number of deformed/have difficulty swimming: 10/60

Initials: E, ML, M

Reviewed by: [Signature]

Date Reviewed: June 26, 2017

Dg52/60

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: CM\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 D	1	19.5	/			
	2	17.5	/			
	3	19.0	/			
	4	19.0	/			
	5	19.0	/			
	6	18.5	/			
	7	19.0	/			
	8	19.0	/			
	9	19.0	/			
	10	18.5	/			
	11	17.5	/			
	12	20.0	/			
	13	19.0	/			
	14	19.5	/			
	15	19.0	/			
	16	17.5	/			
	17	18.5	/			
	18	18.0	/			
	19	18.5	/			
	20	19.0	/			
	21	19.5	/			
	22	18.5	/			
	23	19.5	/			
	24	17.0			✓	Yolk sac edema
	25	17.0			✓	↓
	26	17.5			✓	
	27	15.0			✓	2 bodies on a yolk sac
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.19 g  
Number of survivors: 27  
Number of deformed/have difficulty swimming: 44  
Initials: ECML/KL  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: CM\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 E	1	19.5	/			
	2	17.0	/			
	3	18.5	/			
	4	19.5	/			
	5	20.0	/			
	6	219.0	/			
	7	19.0	/			
	8	19.5	/			
	9	19.0	/			
	10	19.5	/			
	11	19.0	/			
	12	20.0	/			
	13	19.0	/			
	14	16.0	/			
	15	20.0	/			
	16	20.0	/			
	17	19.0	/			
	18	19.0	/			
	19	18.5	/			
	20	19.5	/			
	21	19.5	/			
	22	12.5	/			
	23	16.5			✓	Yolk sac edema, Abnormal Jaw
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.83 g  
Number of survivors: 23  
Number of deformed/have difficulty swimming: 1/1  
Initials: EGMLW  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: CM\_MC2  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 F	1	20.0	/			
	2	20.0	/			
	3	19.0	/			
	4	20.0	/			
	5	19.0	/			
	6	20.0	/			
	7	19.5	/			
	8	19.0	/			
	9	19.0	/			
	10	20.0	/			
	11	18.5	/			
	12	20.0	/			
	13	19.5	/			
	14	20.0	/			
	15	20.0	/			
	16	18.5	/			
	17	21.0	/			
	18	20.0	/			
	19	17.0			/	Abnormal jaw
	20	17.0			/	Yolk sac edema, abnormal jaw.
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.85 g  
Number of survivors: 20  
Number of deformed/have difficulty swimming: 2/2  
Initials: EQM/ML  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: LC\_LCDSSLCC  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC A	1	18.0	/			
	2	18.0	/			
	3	17.0	/			
	4	18.5	/			
	5	19.0	/			
	6	18.0	/			
	7	19.0	/			
	8	18.0	/			
	9	18.5	/			
	10	17.0	/			
	11	17.5	/			
	12	18.5	/			
	13	18.5	/			
	14	18.5	/			
	15	16.0	/			
	16	17.0	/			
	17	17.0	/			
	18	17.5	/			
	19	18.5	/			
	20	16.5	/			
	21	17.5	/			
	22	18.0	/			
	23	18.0	/			
	24	17.0			✓	Yolk sac edema
	25	18.0			✓	Yolk sac edema
	26	15.0			✓	Yolk sac edema, Abnormal Jaw
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.38 g  
Number of survivors: 26  
Number of deformed/have difficulty swimming: 3/3  
Initials: ELM, M  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017



**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: LC\_LCDSSLCC  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC B	1	20.0	/			
	2	20.0	/			
	3	20.0	/			
	4	18.0	/			
	5	19.0	/			
	6	19.0	/			
	7	18.0	/			
	8	19.5	/			
	9	20.0	/			
	10	19.0	/			
	11	20.0	/			
	12	20.5	/			
	13	19.5	/			
	14	19.5	/			
	15	17.5	/			
	16	17.5			✓	yolk sac edema
	17	17.80			✓	yolk sac edema Abnormal jaw
	18	16.5			✓	yolk sac edema
	19	17.0			✓	yolk sac edema
	20	17.0			✓	yolk sac edema Abnormal jaw
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.79 g  
 Number of survivors: 20  
 Number of deformed/have difficulty swimming: 5/5  
 Initials: KE, ESM  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: LC\_LCDSSLCC  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC C	1	18.0	/			
	2	19.0	/			
	3	18.5	/			
	4	18.0	/			
	5	18.0	/			
	6	18.5	/			
	7	17.5	/			
	8	17.0	/			
	9	17.0	/			
	10	18.0	/			
	11	16.0	/			
	12	19.0	/			
	13	16.5		X	✓	yolk sac edema Abnormal Jaw
	14	16.0		✓		↓
	15	18.0		✓		Partial deformity ↓
	16	15.0		✓		yolk sac edema, Abnormal Jaw ↓
	17	15.5		✓		↓
	18	EX 16.0		✓		↓
	19	16.0		✓		yolk sac edema ↓
	20	15.5		✓		yolk sac edema, Abnormal Jaw ↓
	21	16.5		✓		↓
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.63 g  
 Number of survivors: 21  
 Number of deformed/have difficulty swimming: 9/9  
 Initials: EGMLM  
 Reviewed by: [Signature]

Date Reviewed: June 26, 2017

0658/60

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: LC\_LCDSSLCC  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC D	1	20.5	/			
	2	19.0	/			
	3	19.5	/			
	4	19.5	/			
	5	20.2-0	/			
	6	19.5	/			
	7	20.0	/			
	8	20.0	/			
	9	20.0	/			
	10	20.0	/			
	11	18.0	/			
	12	19.0	/			
	13	19.0	/			
	14	21.0	/			
	15	20.0	/			
	16	20.0	/			
	17	19.05	/			
	18	20.0	/			
	19	20.0	/			
	20	20.0	/			
	21	19.0	/			
	22	18.0	/			
	23	18.0			✓	Yolk sac edema, Abnormal jaw
	24	18.0			✓	Yolk sac edema
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.18 g  
Number of survivors: 24  
Number of deformed/have difficulty swimming: 2/2  
Initials: EC, YHL, M  
Reviewed by: [Signature]


Date Reviewed: June 26, 2017

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: LC\_LCDSSLCC  
 Work Order No.: 170360

Start Date: May 10, 2017  
 Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC E	1	20.5	/			
	2	20.5	/			
	3	20.0	/			
	4	20.0	/			
	5	21.0	/			
	6	20.0	/			
	7	20.0	/			
	8	20.0	/			
	9	20.0	/			
	10	20.5	/			
	11	20.0	/			
	12	20.5	/			
	13	19.0	/			
	14	<del>20.0</del> 21.0	/			
	15	20.0	/			
	16	20.0	/			
	17	20.0	/			
	18	20.0	/			
	19	18.0	/			
	20	20.0	/			
	21	19.0	/			
	22	<del>20.0</del> 20.0	/			
	23	16.0			✓	Yolk sac edema, Abnormal Jaw
	24	16.5			✓	↓ ↓
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						

Total Weight (pooled): 2.24 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: EG, MML, K  
 Reviewed by: 

Date Reviewed: June 26, 2017

8960/60

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: LC\_LCDSSLCC  
Work Order No.: 170360

Start Date: May 10, 2017  
Termination Date: June 9, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC F	1	20.5	/			
	2	19.0	/			
	3	19.0	/			
	4	19.5	/			
	5	19.0	/			
	6	19.0	/			
	7	18.0	/			
	8	19.0	/			
	9	20.0	/			
	10	19.0	/			
	11	20.0	/			
	12	19.0	/			
	13	19.0	/			
	14	19.0	/			
	15	19.0	/			
	16	20.0	/			
	17	20.0	/			
	18	20.5	/			
	19	20.0	/			
	20	19.0	/			
	21	20.0	/			
	22	16.5			/	Headfeet attached on 1 yolk sac.
	23	18.0			/	yolk sac edema w/ extra growth.
	24	18.0			/	Yolk sac edema and jaw deformity.
	25	16.5			/	Bent tail edema w/ lordosis
	26	16.0			/	went tail, jaw deformity and yolk sac edema
	27					edema.
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 260 g  
Number of survivors: 26  
Number of deformed/have difficulty swimming: 5/5  
Initials: ECML, W  
Reviewed by: [Signature]

Date Reviewed: June 26, 2017

# CETIS Summary Report

Report Date: 19 Jun-17 18:41 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Batch ID: 14-5381-5617      Test Type: Survival-Development      Analyst: Kania Lywe  
 Start Date: 10 May-17 19:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 09 Jun-17 12:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 29d 17h      Source: Trout Lodge Fish Farm      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
① FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
① GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

① FR\_UFR1 and GH\_ER2 are reference sites controls

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

### Proportion Normal Summary (Mortality)

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	6	0.6758	0.5697	0.7818	0.5333	0.8	0.04126	0.1011	14.96%	0.0%
① FR_UFR1	6	0.5889	0.4175	0.7603	0.3214	0.8	0.06667	0.1633	27.73%	12.86%
① GH_ER2	6	0.7143	0.5759	0.8527	0.5667	0.8966	0.05384	0.1319	18.46%	-5.71%
FR_FRCP1	6	0.5879	0.4663	0.7096	0.4194	0.7667	0.04732	0.1159	19.71%	13.0%
GH_FR1	6	0.6778	0.5456	0.8099	0.5667	0.8333	0.0514	0.1259	18.58%	-0.3%
GH_ERC	6	0.4682	0.224	0.7125	0.1071	0.7	0.09502	0.2327	49.71%	30.71%
EV_HC1	6	0.7052	0.5984	0.812	0.5769	0.8333	0.04155	0.1018	14.43%	-4.35%
EV_MC2	6	0.7314	0.5777	0.8851	0.5	0.9375	0.05978	0.1464	20.02%	-8.23%
CM_MC2	6	0.6292	0.5073	0.751	0.4333	0.7586	0.04741	0.1161	18.46%	6.89%
LC_LCDSSLCC	6	0.6307	0.4999	0.7616	0.4444	0.7333	0.0509	0.1247	19.77%	6.66%

### Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	6	0.7846	0.6753	0.894	0.6	0.9	0.04252	0.1042	13.28%	0.0%
① FR_UFR1	6	0.6215	0.4422	0.8008	0.3214	0.8	0.06977	0.1709	27.5%	20.79%
① GH_ER2	6	0.7881	0.6625	0.9138	0.6667	0.931	0.04889	0.1198	15.2%	-0.45%
FR_FRCP1	6	0.6382	0.4868	0.7896	0.4194	0.8	0.05889	0.1442	22.6%	18.67%
GH_FR1	6	0.7173	0.603	0.8316	0.6	0.8667	0.04447	0.1089	15.19%	8.58%
GH_ERC	6	0.4959	0.247	0.7448	0.1429	0.7	0.09683	0.2372	47.83%	36.8%
EV_HC1	6	0.8048	0.7174	0.8922	0.6774	0.8929	0.034	0.08329	10.35%	-2.57%
EV_MC2	6	0.7981	0.6185	0.9777	0.5	0.9688	0.06987	0.1712	21.45%	-1.71%
CM_MC2	6	0.7617	0.7076	0.8157	0.6667	0.8182	0.02103	0.05151	6.76%	2.93%
LC_LCDSSLCC	6	0.7789	0.7111	0.8466	0.6667	0.8667	0.02636	0.06457	8.29%	0.74%

# CETIS Summary Report

Report Date: 19 Jun-17 18:41 (p 2 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

### Proportion Normal Detail (Viability)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	0.625	0.7333	0.6129	0.5333	0.75	0.8
① FR_UFR1	0.6667	0.6452	0.6	0.8	0.3214	0.5
① GH_ER2	0.8966	0.6	0.6452	0.8276	0.5667	0.75
FR_FRCP1	0.5667	0.5484	0.4194	0.7667	0.5714	0.6552
GH_FR1	0.8333	0.5667	0.5667	0.8333	0.6667	0.6
GH_ERC	0.7	0.5484	0.1071	0.6333	0.2581	0.5625
EV_HC1	0.8214	0.6667	0.5769	0.8333	0.6452	0.6875
EV_MC2	0.9375	0.6774	0.7188	0.8214	0.5	0.7333
CM_MC2	0.7	0.5862	0.4333	0.697	0.7586	0.6
LC_LCDSSLCC	0.697	0.5	0.4444	0.7097	0.7333	0.7

① FR\_UFR1 and GH\_ER2 are reference sites for this test.

### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	0.7813	0.8667	0.7742	0.6	0.7857	0.9
① FR_UFR1	0.6667	0.7097	0.7	0.8	0.3214	0.5313
① GH_ER2	0.931	0.7	0.6774	0.8966	0.6667	0.8571
FR_FRCP1	0.6	0.6452	0.4194	0.8	0.5714	0.7931
GH_FR1	0.8333	0.6	0.6333	0.8667	0.7037	0.6667
GH_ERC	0.7	0.5806	0.1429	0.7	0.2581	0.5938
EV_HC1	0.8929	0.7333	0.8462	0.8667	0.6774	0.8125
EV_MC2	0.9688	0.7742	0.7813	0.9643	0.5	0.8
CM_MC2	0.7667	0.7586	0.7667	0.8182	0.7931	0.6667
LC_LCDSSLCC	0.7879	0.6667	0.7778	0.7742	0.8	0.8667

### Proportion Normal Binomials (Viability)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	20/32	22/30	19/31	16/30	21/28	24/30
① FR_UFR1	20/30	20/31	18/30	24/30	9/28	16/32
① GH_ER2	26/29	18/30	20/31	24/29	17/30	21/28
FR_FRCP1	17/30	17/31	13/31	23/30	16/28	19/29
GH_FR1	25/30	17/30	17/30	25/30	18/27	18/30
GH_ERC	21/30	17/31	3/28	19/30	8/31	18/32
EV_HC1	23/28	20/30	15/26	25/30	20/31	22/32
EV_MC2	30/32	21/31	23/32	23/28	14/28	22/30
CM_MC2	21/30	17/29	13/30	23/33	22/29	18/30
LC_LCDSSLCC	23/33	15/30	12/27	22/31	22/30	21/30

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	25/32	26/30	24/31	18/30	22/28	27/30
① FR_UFR1	20/30	22/31	21/30	24/30	9/28	17/32
① GH_ER2	27/29	21/30	21/31	26/29	20/30	24/28
FR_FRCP1	18/30	20/31	13/31	24/30	16/28	23/29
GH_FR1	25/30	18/30	19/30	26/30	19/27	20/30
GH_ERC	21/30	18/31	4/28	21/30	8/31	19/32
EV_HC1	25/28	22/30	22/26	26/30	21/31	26/32
EV_MC2	31/32	24/31	25/32	27/28	14/28	24/30
CM_MC2	23/30	22/29	23/30	27/33	23/29	20/30
LC_LCDSSLCC	26/33	20/30	21/27	24/31	24/30	26/30

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 June 27/17

# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

<b>Analysis ID:</b> 03-1427-9387	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 19 Jun-17 18:30	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-5381-5617	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 10 May-17 19:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 09 Jun-17 12:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 29d 17h	<b>Source:</b> Trout Lodge Fish Farm	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
① FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
① GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		① FR_UFR1 and GH_ER2 are reference sites controls
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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	0.0006018	0.0048	Exact	Significant Effect
Control	① GH_ER2	1	1.0000	Exact	Non-Significant Effect
Control	FR_FRCP1	0.001423	0.0100	Exact	Significant Effect
Control	GH_FR1	0.08933	0.5360	Exact	Non-Significant Effect
Control	GH_ERC	0	<0.0001	Exact	Significant Effect
Control	EV_HC1	1	1.0000	Exact	Non-Significant Effect
Control	EV_MC2	1	1.0000	Exact	Non-Significant Effect
Control	CM_MC2	0.3533	1.0000	Exact	Non-Significant Effect
Control	LC_LCDSSLCC	0.5	1.0000	Exact	Non-Significant Effect

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	142	39	181	0.7845	0.2155	0.0%
① FR_UFR1	113	68	181	0.6243	0.3757	20.42%
① GH_ER2	139	38	177	0.7853	0.2147	-0.1%
FR_FRCP1	114	65	179	0.6369	0.3631	18.82%
GH_FR1	127	50	177	0.7175	0.2825	8.54%
GH_ERC	91	91	182	0.5	0.5	36.27%
EV_HC1	142	35	177	0.8023	0.1977	-2.26%
EV_MC2	145	36	181	0.8011	0.1989	-2.11%
CM_MC2	138	43	181	0.7624	0.2376	2.82%
LC_LCDSSLCC	141	40	181	0.779	0.221	0.7%

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# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 2 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 03-1427-9387      Endpoint: Survival Rate  
 Analyzed: 19 Jun-17 18:30      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

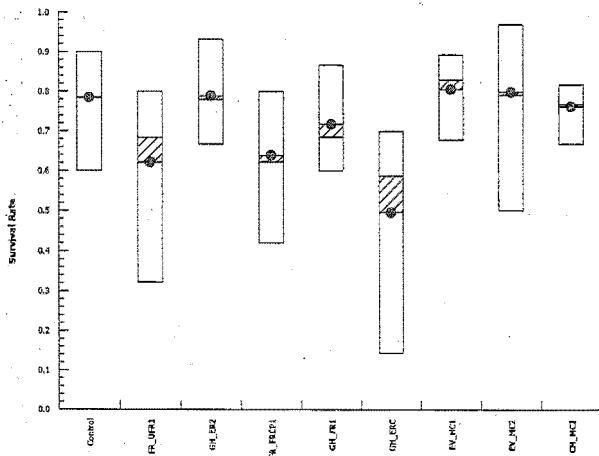
### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	0.7813	0.8667	0.7742	0.6	0.7857	0.9
① FR_UFR1	0.6667	0.7097	0.7	0.8	0.3214	0.5313
① GH_ER2	0.931	0.7	0.6774	0.8966	0.6667	0.8571
FR_FRCP1	0.6	0.6452	0.4194	0.8	0.5714	0.7931
GH_FR1	0.8333	0.6	0.6333	0.8667	0.7037	0.6667
GH_ERC	0.7	0.5806	0.1429	0.7	0.2581	0.5938
EV_HC1	0.8929	0.7333	0.8462	0.8667	0.6774	0.8125
EV_MC2	0.9688	0.7742	0.7813	0.9643	0.5	0.8
CM_MC2	0.7667	0.7586	0.7667	0.8182	0.7931	0.6667
LC_LCDSSLCC	0.7879	0.6667	0.7778	0.7742	0.8	0.8667

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	25/32	26/30	24/31	18/30	22/28	27/30
① FR_UFR1	20/30	22/31	21/30	24/30	9/28	17/32
① GH_ER2	27/29	21/30	21/31	26/29	20/30	24/28
FR_FRCP1	18/30	20/31	13/31	24/30	16/28	23/29
GH_FR1	25/30	18/30	19/30	26/30	19/27	20/30
GH_ERC	21/30	18/31	4/28	21/30	8/31	19/32
EV_HC1	25/28	22/30	22/26	26/30	21/31	26/32
EV_MC2	31/32	24/31	25/32	27/28	14/28	24/30
CM_MC2	23/30	22/29	23/30	27/33	23/29	20/30
LC_LCDSSLCC	26/33	20/30	21/27	24/31	24/30	26/30

### Graphics



① FR\_UFR1 and GH\_ER2 are reference sites controls in

*[Signature]*  
 June 27/17

**CETIS Analytical Report**

Report Date: 19 Jun-17 18:42 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 00-6617-8902	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 19 Jun-17 18:36	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-5381-5617	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
①FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
①GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

①FR\_UFR1 and GH\_ER2 are reference sites for this test.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
①FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
①GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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%)
①FR_UFR1		①GH_ER2	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	0.0112	0.0896	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_MC2	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

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
①FR_UFR1 Upstream Contr	113	68	181	0.6243	0.3757	0.0%
①GH_ER2	139	38	177	0.7853	0.2147	-25.79%
FR_FRCP1	114	65	179	0.6369	0.3631	-2.01%
GH_FR1	127	50	177	0.7175	0.2825	-14.93%
GH_ERC	91	91	182	0.5	0.5	19.91%
EV_HC1	142	35	177	0.8023	0.1977	-28.5%
EV_MC2	145	36	181	0.8011	0.1989	-28.32%
CM_MC2	138	43	181	0.7624	0.2376	-22.12%
LC_LCDSSLCC	141	40	181	0.779	0.221	-24.78%

*[Signature]*  
 June 27/17

# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 2 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 00-6617-8902

Endpoint: Survival Rate

CETIS Version: CETISv1.8.7

Analyzed: 19 Jun-17 18:36

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

### Survival Rate Detail

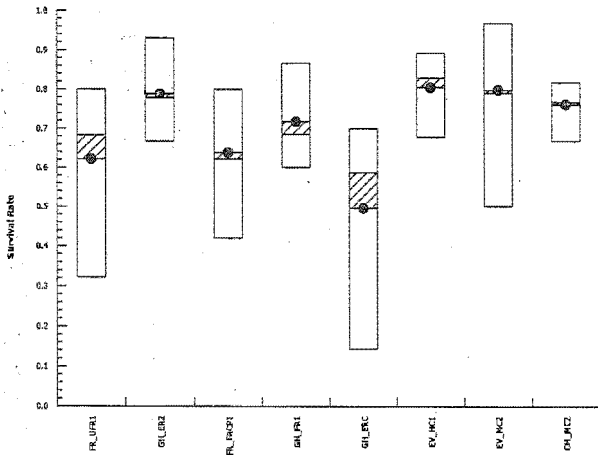
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	0.6667	0.7097	0.7	0.8	0.3214	0.5313
GH_ER2	0.931	0.7	0.6774	0.8966	0.6667	0.8571
FR_FRCP1	0.6	0.6452	0.4194	0.8	0.5714	0.7931
GH_FR1	0.8333	0.6	0.6333	0.8667	0.7037	0.6667
GH_ERC	0.7	0.5806	0.1429	0.7	0.2581	0.5938
EV_HC1	0.8929	0.7333	0.8462	0.8667	0.6774	0.8125
EV_MC2	0.9688	0.7742	0.7813	0.9643	0.5	0.8
CM_MC2	0.7667	0.7586	0.7667	0.8182	0.7931	0.6667
LC_LCDSSLCC	0.7879	0.6667	0.7778	0.7742	0.8	0.8667

FR\_UFR1 and GH\_ER2 are SIKS controls & reference

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	20/30	22/31	21/30	24/30	9/28	17/32
GH_ER2	27/29	21/30	21/31	26/29	20/30	24/28
FR_FRCP1	18/30	20/31	13/31	24/30	16/28	23/29
GH_FR1	25/30	18/30	19/30	26/30	19/27	20/30
GH_ERC	21/30	18/31	4/28	21/30	8/31	19/32
EV_HC1	25/28	22/30	22/26	26/30	21/31	26/32
EV_MC2	31/32	24/31	25/32	27/28	14/28	24/30
CM_MC2	23/30	22/29	23/30	27/33	23/29	20/30
LC_LCDSSLCC	26/33	20/30	21/27	24/31	24/30	26/30

### Graphics



*W*  
 June 27/17

**CETIS Analytical Report**

Report Date: 19 Jun-17 18:42 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 14-8717-1759	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 19 Jun-17 18:41	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-5381-5617	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
① GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*GH ER2, UFR1 and GH ER2 are sites controls reference*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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	0.0006082	0.0043	Exact	Significant Effect
GH_ER2	FR_FRCP1	0.00143	0.0086	Exact	Significant Effect
GH_ER2	GH_FR1	0.08797	0.4399	Exact	Non-Significant Effect
GH_ER2	GH_ERC	0	<0.0001	Exact	Significant Effect
GH_ER2	EV_HC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2	EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2	CM_MC2	0.3481	1.0000	Exact	Non-Significant Effect
GH_ER2	LC_LCDSSLCC	0.4935	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	113	68	181	0.6243	0.3757	20.5%
① GH_ER2	Receiving Water 139	38	177	0.7853	0.2147	0.0%
FR_FRCP1	114	65	179	0.6369	0.3631	18.9%
GH_FR1	127	50	177	0.7175	0.2825	8.63%
GH_ERC	91	91	182	0.5	0.5	36.33%
EV_HC1	142	35	177	0.8023	0.1977	-2.16%
EV_MC2	145	36	181	0.8011	0.1989	-2.01%
CM_MC2	138	43	181	0.7624	0.2376	2.91%
LC_LCDSSLCC	141	40	181	0.779	0.221	0.8%

*June 27/17*

# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 2 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 14-8717-1759      Endpoint: Survival Rate  
 Analyzed: 19 Jun-17 18:41      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Survival Rate Detail

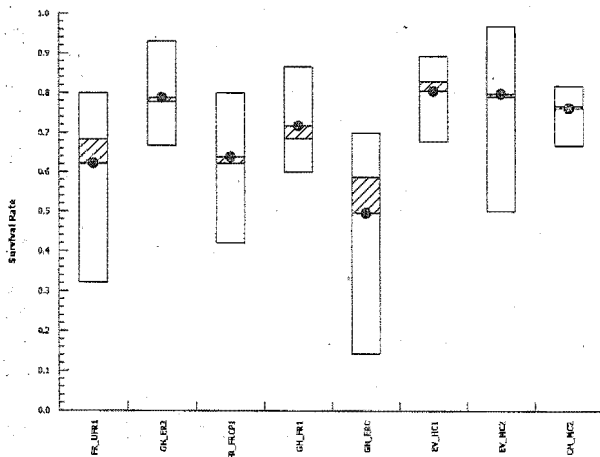
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	0.6667	0.7097	0.7	0.8	0.3214	0.5313
GH_ER2	0.931	0.7	0.6774	0.8966	0.6667	0.8571
FR_FRCP1	0.6	0.6452	0.4194	0.8	0.5714	0.7931
GH_FR1	0.8333	0.6	0.6333	0.8667	0.7037	0.6667
GH_ERC	0.7	0.5806	0.1429	0.7	0.2581	0.5938
EV_HC1	0.8929	0.7333	0.8462	0.8667	0.6774	0.8125
EV_MC2	0.9688	0.7742	0.7813	0.9643	0.5	0.8
CM_MC2	0.7667	0.7586	0.7667	0.8182	0.7931	0.6667
LC_LCDSSLCC	0.7879	0.6667	0.7778	0.7742	0.8	0.8667

*FR\_UFR1 and GH\_ER2  
are fish controls &  
reference*

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	20/30	22/31	21/30	24/30	9/28	17/32
GH_ER2	27/29	21/30	21/31	26/29	20/30	24/28
FR_FRCP1	18/30	20/31	13/31	24/30	16/28	23/29
GH_FR1	25/30	18/30	19/30	26/30	19/27	20/30
GH_ERC	21/30	18/31	4/28	21/30	8/31	19/32
EV_HC1	25/28	22/30	22/26	26/30	21/31	26/32
EV_MC2	31/32	24/31	25/32	27/28	14/28	24/30
CM_MC2	23/30	22/29	23/30	27/33	23/29	20/30
LC_LCDSSLCC	26/33	20/30	21/27	24/31	24/30	26/30

### Graphics



*June 27/17*

**CETIS Analytical Report**

Report Date: 19 Jun-17 18:42 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 01-2662-6442	Endpoint: Proportion Normal (Mortality)	CETIS Version: CETISv1.8.7
Analyzed: 19 Jun-17 18:30	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-5381-5617	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
①FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
①GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

①FR\_UFR1 and GH\_ER2 are reference STP controls.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
①FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
①GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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	①FR_UFR1	0.06339	0.4438	Exact	Non-Significant Effect
Control	①GH_ER2	1	1.0000	Exact	Non-Significant Effect
Control	FR_FRCP1	0.05368	0.4295	Exact	Non-Significant Effect
Control	GH_FR1	1	1.0000	Exact	Non-Significant Effect
Control	GH_ERC	7.607E-05	0.0007	Exact	Significant Effect
Control	EV_HC1	1	1.0000	Exact	Non-Significant Effect
Control	EV_MC2	1	1.0000	Exact	Non-Significant Effect
Control	CM_MC2	0.22	1.0000	Exact	Non-Significant Effect
Control	LC_LCDSSLCC	0.2536	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	122	59	181	0.674	0.326	0.0%
①FR_UFR1	107	74	181	0.5912	0.4088	12.3%
①GH_ER2	126	51	177	0.7119	0.2881	-5.61%
FR_FRCP1	105	74	179	0.5866	0.4134	12.97%
GH_FR1	120	57	177	0.678	0.322	-0.58%
GH_ERC	86	96	182	0.4725	0.5275	29.9%
EV_HC1	125	52	177	0.7062	0.2938	-4.77%
EV_MC2	133	48	181	0.7348	0.2652	-9.02%
CM_MC2	114	67	181	0.6298	0.3702	6.56%
LC_LCDSSLCC	115	66	181	0.6354	0.3646	5.74%

*[Handwritten signature]*  
 June 27/17

# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 2 of 2)

Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 01-2662-6442      Endpoint: Proportion Normal (viability)  
 Analyzed: 19 Jun-17 18:30      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Proportion Normal Detail (viability)

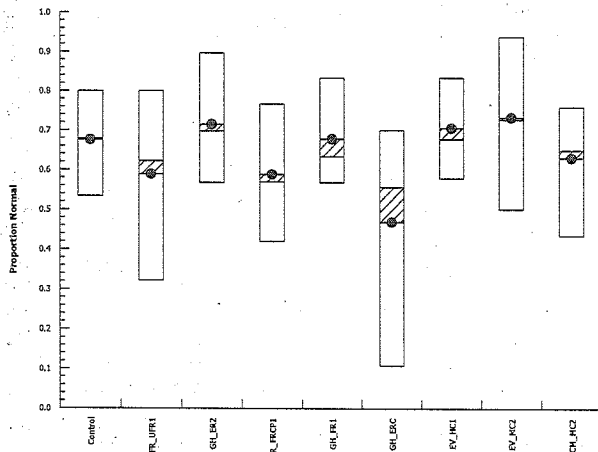
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	0.625	0.7333	0.6129	0.5333	0.75	0.8
① FR_UFR1	0.6667	0.6452	0.6	0.8	0.3214	0.5
① GH_ER2	0.8966	0.6	0.6452	0.8276	0.5667	0.75
FR_FRCP1	0.5667	0.5484	0.4194	0.7667	0.5714	0.6552
GH_FR1	0.8333	0.5667	0.5667	0.8333	0.6667	0.6
GH_ERC	0.7	0.5484	0.1071	0.6333	0.2581	0.5625
EV_HC1	0.8214	0.6667	0.5769	0.8333	0.6452	0.6875
EV_MC2	0.9375	0.6774	0.7188	0.8214	0.5	0.7333
CM_MC2	0.7	0.5862	0.4333	0.697	0.7586	0.6
LC_LCDSSLCC	0.697	0.5	0.4444	0.7097	0.7333	0.7

① FR\_UFR1 and GH\_ER2 are ~~the~~ sites compared to reference

### Proportion Normal Binomials (viability)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	20/32	22/30	19/31	16/30	21/28	24/30
① FR_UFR1	20/30	20/31	18/30	24/30	9/28	16/32
① GH_ER2	26/29	18/30	20/31	24/29	17/30	21/28
FR_FRCP1	17/30	17/31	13/31	23/30	16/28	19/29
GH_FR1	25/30	17/30	17/30	25/30	18/27	18/30
GH_ERC	21/30	17/31	3/28	19/30	8/31	18/32
EV_HC1	23/28	20/30	15/26	25/30	20/31	22/32
EV_MC2	30/32	21/31	23/32	23/28	14/28	22/30
CM_MC2	21/30	17/29	13/30	23/33	22/29	18/30
LC_LCDSSLCC	23/33	15/30	12/27	22/31	22/30	21/30

### Graphics



*[Signature]*  
 June 27/17

# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 1 of 2)

Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 04-1140-6099	Endpoint: Proportion Normal ( <i>Survival</i> )	CETIS Version: CETISv1.8.7
Analyzed: 19 Jun-17 18:37	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-5381-5617	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*FR\_UFR1 and GH\_ER2 are STP controls in reference*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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	1	1.0000	Exact	Non-Significant Effect
FR_UFR1	FR_FRCP1	0.5076	1.0000	Exact	Non-Significant Effect
FR_UFR1	GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1	GH_ERC	0.01533	0.1226	Exact	Non-Significant Effect
FR_UFR1	EV_HC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1	EV_MC2	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

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Upstream Contr	107	74	181	0.5912	0.4088	0.0%
GH_ER2	126	51	177	0.7119	0.2881	-20.42%
FR_FRCP1	105	74	179	0.5866	0.4134	0.77%
GH_FR1	120	57	177	0.678	0.322	-14.68%
GH_ERC	86	96	182	0.4725	0.5275	20.07%
EV_HC1	125	52	177	0.7062	0.2938	-19.46%
EV_MC2	133	48	181	0.7348	0.2652	-24.3%
CM_MC2	114	67	181	0.6298	0.3702	-6.54%
LC_LCDSSLCC	115	66	181	0.6354	0.3646	-7.48%

*June 27/17*



# CETIS Analytical Report

Report Date: 19 Jun-17 18:42 (p 2 of 2)  
 Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 04-1140-6099 Endpoint: Proportion Normal (Wabifrey)  
 Analyzed: 19 Jun-17 18:37 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Proportion Normal Detail (Wabifrey)

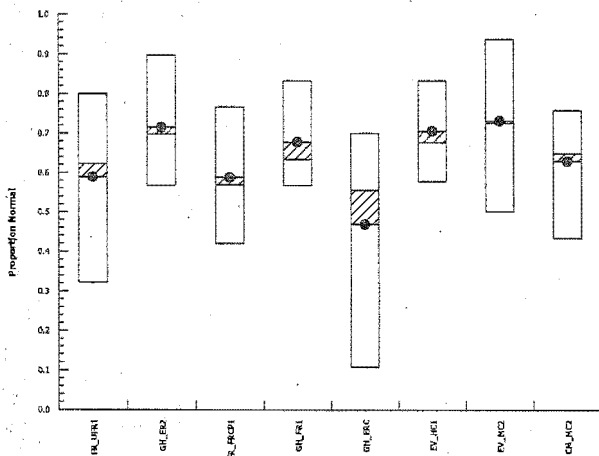
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	0.6667	0.6452	0.6	0.8	0.3214	0.5
GH_ER2	0.8966	0.6	0.6452	0.8276	0.5667	0.75
FR_FRCP1	0.5667	0.5484	0.4194	0.7667	0.5714	0.6552
GH_FR1	0.8333	0.5667	0.5667	0.8333	0.6667	0.6
GH_ERC	0.7	0.5484	0.1071	0.6333	0.2581	0.5625
EV_HC1	0.8214	0.6667	0.5769	0.8333	0.6452	0.6875
EV_MC2	0.9375	0.6774	0.7188	0.8214	0.5	0.7333
CM_MC2	0.7	0.5862	0.4333	0.697	0.7586	0.6
LC_LCDSSLCC	0.697	0.5	0.4444	0.7097	0.7333	0.7

FR\_UFR1 and GH\_ER2 are reference sites

### Proportion Normal Binomials (Wabifrey)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	20/30	20/31	18/30	24/30	9/28	16/32
GH_ER2	26/29	18/30	20/31	24/29	17/30	21/28
FR_FRCP1	17/30	17/31	13/31	23/30	16/28	19/29
GH_FR1	25/30	17/30	17/30	25/30	18/27	18/30
GH_ERC	21/30	17/31	3/28	19/30	8/31	18/32
EV_HC1	23/28	20/30	15/26	25/30	20/31	22/32
EV_MC2	30/32	21/31	23/32	23/28	14/28	22/30
CM_MC2	21/30	17/29	13/30	23/33	22/29	18/30
LC_LCDSSLCC	23/33	15/30	12/27	22/31	22/30	21/30

### Graphics



*[Signature]*  
 June 27/17

**CETIS Analytical Report**

Report Date: 19 Jun-17 18:43 (p 1 of 2)  
 Test Code: 170360a | 15-3314-3576

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 12-0743-2940	Endpoint: Proportion Normal (Viability)	CETIS Version: CETISv1.8.7
Analyzed: 19 Jun-17 18:41	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-5381-5617	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
① GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

① FR\_UFR1 and GH\_ER2 are reference sites.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

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	0.01107	0.0664	Exact	Non-Significant Effect
GH_ER2	FR_FRCP1	0.008925	0.0625	Exact	Non-Significant Effect
GH_ER2	GH_FR1	0.282	0.8459	Exact	Non-Significant Effect
GH_ER2	GH_ERC	2.969E-06	<0.0001	Exact	Significant Effect
GH_ER2	EV_HC1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2	EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2	CM_MC2	0.06187	0.3093	Exact	Non-Significant Effect
GH_ER2	LC_LCDSSLCC	0.07622	0.3049	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
① FR_UFR1	107	74	181	0.5912	0.4088	16.96%	
① GH_ER2	Receiving Wate	126	51	177	0.7119	0.2881	0.0%
FR_FRCP1		105	74	179	0.5866	0.4134	17.6%
GH_FR1		120	57	177	0.678	0.322	4.76%
GH_ERC		86	96	182	0.4725	0.5275	33.62%
EV_HC1		125	52	177	0.7062	0.2938	0.79%
EV_MC2		133	48	181	0.7348	0.2652	-3.22%
CM_MC2		114	67	181	0.6298	0.3702	11.52%
LC_LCDSSLCC		115	66	181	0.6354	0.3646	10.75%

*ECU*  
 June 27/17

# CETIS Analytical Report

Report Date: 19 Jun-17 18:43 (p 2 of 2)

Test Code: 170360a | 15-3314-3576

## Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 12-0743-2940      Endpoint: Proportion Normal (Nautilus)  
 Analyzed: 19 Jun-17 18:41      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Proportion Normal Detail (Nautilus)

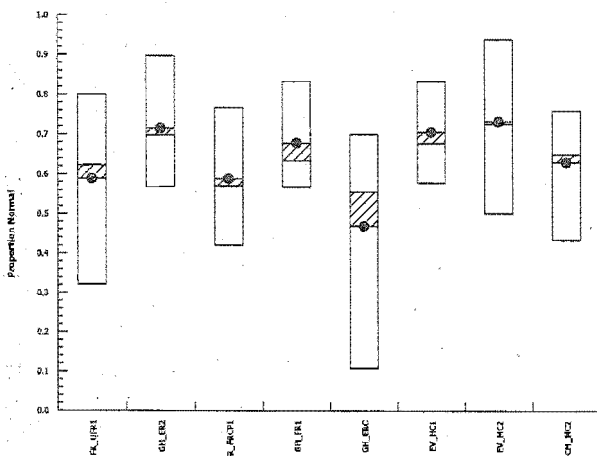
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	0.6667	0.6452	0.6	0.8	0.3214	0.5
GH_ER2	0.8966	0.6	0.6452	0.8276	0.5667	0.75
FR_FRCP1	0.5667	0.5484	0.4194	0.7667	0.5714	0.6552
GH_FR1	0.8333	0.5667	0.5667	0.8333	0.6667	0.6
GH_ERC	0.7	0.5484	0.1071	0.6333	0.2581	0.5625
EV_HC1	0.8214	0.6667	0.5769	0.8333	0.6452	0.6875
EV_MC2	0.9375	0.6774	0.7188	0.8214	0.5	0.7333
CM_MC2	0.7	0.5862	0.4333	0.697	0.7586	0.6
LC_LCDSSLCC	0.697	0.5	0.4444	0.7097	0.7333	0.7

FR\_UFR1 and GH\_ER2  
 are reference sites.

### Proportion Normal Binomials (Nautilus)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	20/30	20/31	18/30	24/30	9/28	16/32
GH_ER2	26/29	18/30	20/31	24/29	17/30	21/28
FR_FRCP1	17/30	17/31	13/31	23/30	16/28	19/29
GH_FR1	25/30	17/30	17/30	25/30	18/27	18/30
GH_ERC	21/30	17/31	3/28	19/30	8/31	18/32
EV_HC1	23/28	20/30	15/26	25/30	20/31	22/32
EV_MC2	30/32	21/31	23/32	23/28	14/28	22/30
CM_MC2	21/30	17/29	13/30	23/33	22/29	18/30
LC_LCDSSLCC	23/33	15/30	12/27	22/31	22/30	21/30

### Graphics



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 June 27/17

# CETIS Summary Report

Report Date: 21 Jun-17 16:42 (p 1 of 2)  
 Test Code: 170360b | 06-6811-5570

## Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Batch ID: 19-4340-2590      Test Type: Survival-Development-Growth      Analyst: Kania Lywe  
 Start Date: 10 May-17 19:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 09 Jun-17 12:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 29d 17h      Source: Trout Lodge Fish Farm      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
①FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
①GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*FR\_UFR1 and GH\_ER2 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
①FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
①GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	6	17.41	16.88	17.94	16.67	18.09	0.2043	0.5004	2.87%	0.0%
①FR_UFR1	6	19.23	18.44	20.03	18.29	20.18	0.3092	0.7573	3.94%	-10.47%
①GH_ER2	6	17.91	17.45	18.37	17.35	18.55	0.1808	0.4428	2.47%	-2.87%
FR_FRCP1	6	18.8	18.1	19.5	18	19.73	0.272	0.6663	3.55%	-7.97%
GH_FR1	6	20.38	19.53	21.23	19.25	21.02	0.3298	0.808	3.96%	-17.06%
GH_ERC	6	20.04	19.18	20.9	18.5	20.81	0.335	0.8205	4.09%	-15.13%
EV_HC1	6	18.49	17.57	19.4	17.57	19.9	0.3567	0.8738	4.73%	-6.18%
EV_MC2	6	19.07	18.19	19.95	17.76	20.21	0.3417	0.837	4.39%	-9.54%
CM_MC2	6	18.48	17.51	19.44	16.98	19.48	0.3767	0.9227	4.99%	-6.12%
LC_LCDSSLCC	6	18.62	17.56	19.68	17.12	19.69	0.4128	1.011	5.43%	-6.96%

### Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	6	72.13	65.8	78.47	66.15	80.74	2.465	6.037	8.37%	0.0%
①FR_UFR1	6	80.3	73.23	87.38	72.5	91.18	2.753	6.744	8.4%	-11.33%
①GH_ER2	6	78.05	73.83	82.27	72.5	84.44	1.641	4.02	5.15%	-8.21%
FR_FRCP1	6	81.15	73.66	88.63	71.25	87.5	2.911	7.13	8.79%	-12.49%
GH_FR1	6	91.74	86.02	97.46	81.58	97.78	2.227	5.454	5.95%	-27.18%
GH_ERC	6	88.67	80.16	97.17	77.5	99.47	3.308	8.103	9.14%	-22.92%
EV_HC1	6	82.78	73.88	91.68	76.19	98.46	3.462	8.48	10.24%	-14.76%
EV_MC2	6	86.1	78.5	93.7	75.19	95.6	2.957	7.244	8.41%	-19.36%
CM_MC2	6	84.32	76.96	91.67	75.65	92.73	2.861	7.009	8.31%	-16.89%
LC_LCDSSLCC	6	90.47	82.81	98.13	77.62	100	2.98	7.299	8.07%	-25.42%

*June 27/17*

**CETIS Summary Report**

Report Date: 21 Jun-17 16:42 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	17.36	17.29	17.21	16.67	17.84	18.09
FR_UFR1	18.75	19.05	18.29	19.02	20.11	20.18
GH_ER2	17.69	18.55	18.21	18.06	17.6	17.35
FR_FRCP1	18.64	19.45	19.73	18.67	18	18.3
GH_FR1	21.02	20.92	19.45	20.69	20.95	19.25
GH_ERC	19.98	20.08	18.5	20.81	20.63	20.26
EV_HC1	17.78	18.86	18	18.81	17.57	19.9
EV_MC2	19	19.46	19.4	17.76	20.21	18.6
CM_MC2	18	19.48	16.98	18.43	18.61	19.35
LC_LCDSSLCC	17.73	18.73	17.12	19.52	19.69	18.94

FR\_UFR1 and GH\_ER2 are reference tanks.

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	77.6	66.15	69.17	72.78	66.36	80.74
FR_UFR1	72.5	80.91	82.38	73.75	81.11	91.18
GH_ER2	84.44	80	76.67	78.46	72.5	76.25
FR_FRCP1	82.22	87.5	86.92	73.33	71.25	85.65
GH_FR1	94.4	97.78	81.58	93.08	92.11	91.5
GH_ERC	82.86	85.56	77.5	92.86	93.75	99.47
EV_HC1	77.2	84.55	76.82	83.46	76.19	98.46
EV_MC2	82.26	89.17	95.6	75.19	83.57	90.83
CM_MC2	84.35	92.73	75.65	81.11	79.57	92.5
LC_LCDSSLCC	91.54	89.5	77.62	90.83	93.33	100

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 June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 1 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 09-5754-1814      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 21 Jun-17 16:37      Analysis: Parametric-Control vs Treatments      Official Results: Yes  
 Batch ID: 19-4340-2590      Test Type: Survival-Development-Growth      Analyst: Kania Lywe  
 Start Date: 10 May-17 19:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 09 Jun-17 12:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 29d 17h      Source: Trout Lodge Fish Farm      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*FR\_UFR1 and GH\_ER2 are reference fish.*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.46%	

**Dunnett Multiple Comparison Test**

Sample Code	vs Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	FR_UFR1	-4.034	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	GH_ER2	-1.106	2.488	1.124	10	0.9958	CDF	Non-Significant Effect
	FR_FRCP1	-3.072	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	GH_FR1	-6.572	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	GH_ERC	-5.827	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	EV_HC1	-2.382	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	EV_MC2	-3.677	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	CM_MC2	-2.356	2.488	1.124	10	1.0000	CDF	Non-Significant Effect
	LC_LCDSSLCC	-2.681	2.488	1.124	10	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	43.47106	4.830118	9	7.883	<0.0001	Significant Effect
Error	30.63779	0.6127559	50			
Total	74.10886		59			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.99	21.67	0.8352	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9771	0.9459	0.3184	Normal Distribution

*Handwritten signature and date: June 27/17*

# CETIS Analytical Report

Report Date: 21 Jun-17 16:42 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

## Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 09-5754-1814      Endpoint: Length-mm  
 Analyzed: 21 Jun-17.16:37      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Length-mm Summary

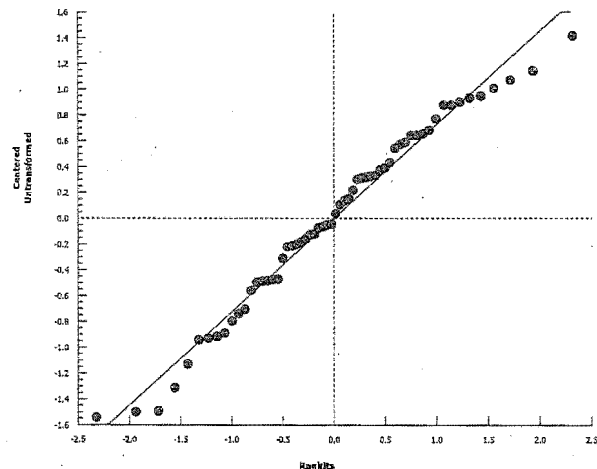
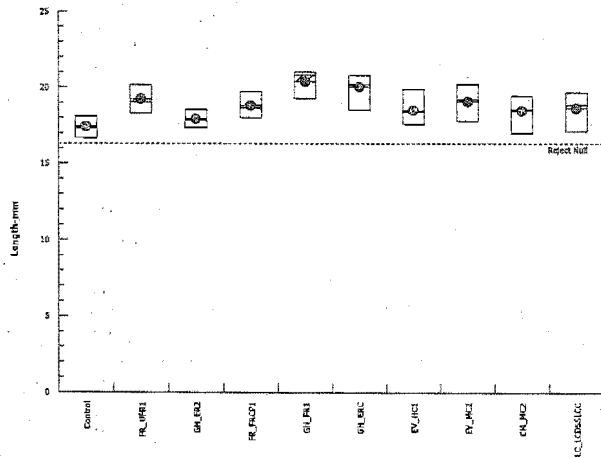
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	6	17.41	16.88	17.94	17.33	16.67	18.09	0.2043	2.87%	0.0%
①FR_UFR1	6	19.23	18.44	20.03	19.03	18.29	20.18	0.3092	3.94%	-10.47%
①GH_ER2	6	17.91	17.45	18.37	17.88	17.35	18.55	0.1808	2.47%	-2.87%
FR_FRCP1	6	18.8	18.1	19.5	18.65	18	19.73	0.272	3.55%	-7.97%
GH_FR1	6	20.38	19.53	21.23	20.81	19.25	21.02	0.3298	3.96%	-17.06%
GH_ERC	6	20.04	19.18	20.9	20.17	18.5	20.81	0.335	4.09%	-15.13%
EV_HC1	6	18.49	17.57	19.4	18.4	17.57	19.9	0.3567	4.73%	-6.18%
EV_MC2	6	19.07	18.19	19.95	19.2	17.76	20.21	0.3417	4.39%	-9.54%
CM_MC2	6	18.48	17.51	19.44	18.52	16.98	19.48	0.3767	4.99%	-6.12%
LC_LCDSSLCC	6	18.62	17.56	19.68	18.83	17.12	19.69	0.4128	5.43%	-6.96%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	17.36	17.29	17.21	16.67	17.84	18.09
①FR_UFR1	18.75	19.05	18.29	19.02	20.11	20.18
①GH_ER2	17.69	18.55	18.21	18.06	17.6	17.35
FR_FRCP1	18.64	19.45	19.73	18.67	18	18.3
GH_FR1	21.02	20.92	19.45	20.69	20.95	19.25
GH_ERC	19.98	20.08	18.5	20.81	20.63	20.26
EV_HC1	17.78	18.86	18	18.81	17.57	19.9
EV_MC2	19	19.46	19.4	17.76	20.21	18.6
CM_MC2	18	19.48	16.98	18.43	18.61	19.35
LC_LCDSSLCC	17.73	18.73	17.12	19.52	19.69	18.94

① FR\_UFR1 and GH\_ER2  
are reference sites

### Graphics



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June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:43 (p 1 of 2)  
 Test Code: 170360b | 06-6811-5570

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 18-2888-9743	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 21 Jun-17 16:38	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 19-4340-2590	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

④ FR\_UFR1 and GH\_ER2 are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.96%	

**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	2.836	2.458	1.147	10	0.0208	CDF	Significant Effect
		FR_FRCP1	0.9324	2.458	1.147	10	0.5346	CDF	Non-Significant Effect
		GH_FR1	-2.458	2.458	1.147	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-1.736	2.458	1.147	10	0.9995	CDF	Non-Significant Effect
		EV_HC1	1.6	2.458	1.147	10	0.2428	CDF	Non-Significant Effect
		EV_MC2	0.3465	2.458	1.147	10	0.7871	CDF	Non-Significant Effect
		CM_MC2	1.625	2.458	1.147	10	0.2339	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.311	2.458	1.147	10	0.3588	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	29.78114	3.722642	8	5.701	<0.0001	Significant Effect
Error	29.38599	0.6530221	45			
Total	59.16713		53			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.487	20.09	0.9002	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9733	0.9407	0.2696	Normal Distribution

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June 27/17



# CETIS Analytical Report

Report Date: 21 Jun-17 16:43 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

## Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 18-2888-9743      Endpoint: Length-mm  
 Analyzed: 21 Jun-17 16:38      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Length-mm Summary

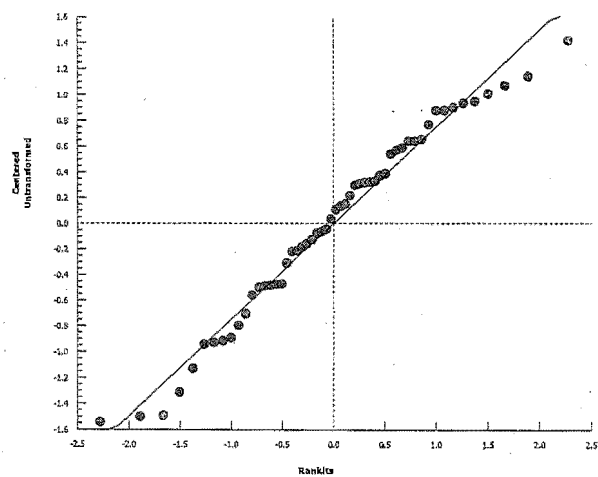
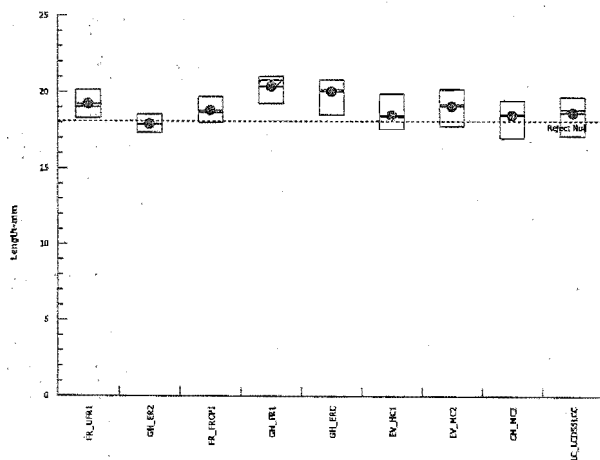
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	6	19.23	18.44	20.03	19.03	18.29	20.18	0.3092	3.94%	0.0%
GH_ER2	6	17.91	17.45	18.37	17.88	17.35	18.55	0.1808	2.47%	6.88%
FR_FRCP1	6	18.8	18.1	19.5	18.65	18	19.73	0.272	3.55%	2.26%
GH_FR1	6	20.38	19.53	21.23	20.81	19.25	21.02	0.3298	3.96%	-5.96%
GH_ERC	6	20.04	19.18	20.9	20.17	18.5	20.81	0.335	4.09%	-4.21%
EV_HC1	6	18.49	17.57	19.4	18.4	17.57	19.9	0.3567	4.73%	3.88%
EV_MC2	6	19.07	18.19	19.95	19.2	17.76	20.21	0.3417	4.39%	0.84%
CM_MC2	6	18.48	17.51	19.44	18.52	16.98	19.48	0.3767	4.99%	3.94%
LC_LCDSSLCC	6	18.62	17.56	19.68	18.83	17.12	19.69	0.4128	5.43%	3.18%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	18.75	19.05	18.29	19.02	20.11	20.18
GH_ER2	17.69	18.55	18.21	18.06	17.6	17.35
FR_FRCP1	18.64	19.45	19.73	18.67	18	18.3
GH_FR1	21.02	20.92	19.45	20.69	20.95	19.25
GH_ERC	19.98	20.08	18.5	20.81	20.63	20.26
EV_HC1	17.78	18.86	18	18.81	17.57	19.9
EV_MC2	19	19.46	19.4	17.76	20.21	18.6
CM_MC2	18	19.48	16.98	18.43	18.61	19.35
LC_LCDSSLCC	17.73	18.73	17.12	19.52	19.69	18.94

FR\_UFR1 and GH\_ER2 are reference SAs

### Graphics



*[Signature]*  
 June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:43 (p 1 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 10-3113-0871      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 21 Jun-17 16:41      Analysis: Parametric-Control vs Treatments      Official Results: Yes  
 Batch ID: 19-4340-2590      Test Type: Survival-Development-Growth      Analyst: Kania Lywe  
 Start Date: 10 May-17 19:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 09 Jun-17 12:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 29d 17h      Source: Trout Lodge Fish Farm      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

FR\_UFR1 and GH\_ER2 are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.4%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	-2.836	2.458	1.147	10	1.0000	CDF	Non-Significant Effect
		FR_FRCP1	-1.904	2.458	1.147	10	0.9997	CDF	Non-Significant Effect
		GH_FR1	-5.294	2.458	1.147	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-4.573	2.458	1.147	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	-1.236	2.458	1.147	10	0.9967	CDF	Non-Significant Effect
		EV_MC2	-2.49	2.458	1.147	10	1.0000	CDF	Non-Significant Effect
		CM_MC2	-1.211	2.458	1.147	10	0.9964	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.525	2.458	1.147	10	0.9989	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	29.78114	3.722642	8	5.701	<0.0001	Significant Effect
Error	29.38599	0.6530221	45			
Total	59.16713		53			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.487	20.09	0.9002	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9733	0.9407	0.2696	Normal Distribution

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 June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:43 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 10-3113-0871      Endpoint: Length-mm  
 Analyzed: 21 Jun-17 16:41      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Length-mm Summary**

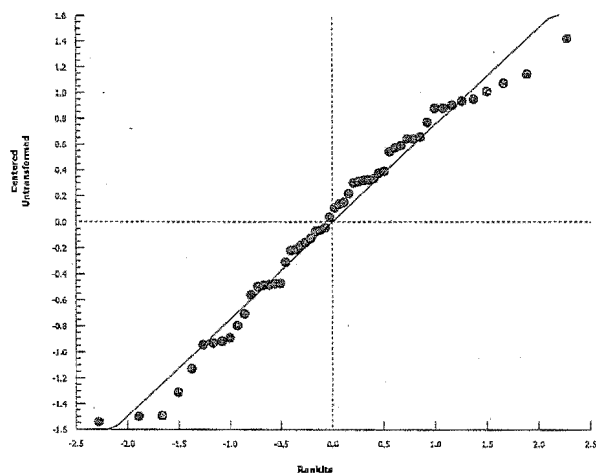
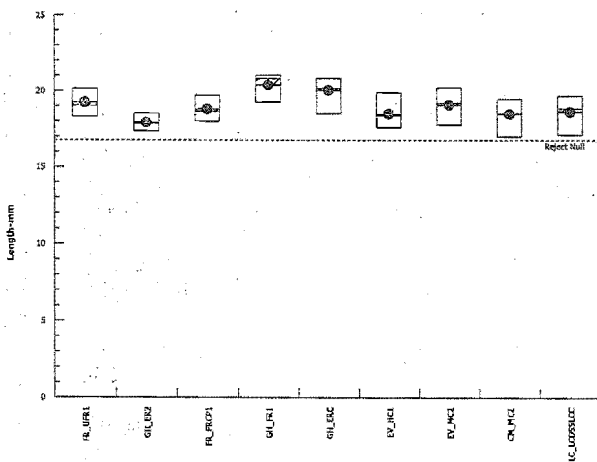
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	6	19.23	18.44	20.03	19.03	18.29	20.18	0.3092	3.94%	0.0%
GH_ER2	6	17.91	17.45	18.37	17.88	17.35	18.55	0.1808	2.47%	6.88%
FR_FRCP1	6	18.8	18.1	19.5	18.65	18	19.73	0.272	3.55%	2.26%
GH_FR1	6	20.38	19.53	21.23	20.81	19.25	21.02	0.3298	3.96%	-5.96%
GH_ERC	6	20.04	19.18	20.9	20.17	18.5	20.81	0.335	4.09%	-4.21%
EV_HC1	6	18.49	17.57	19.4	18.4	17.57	19.9	0.3567	4.73%	3.88%
EV_MC2	6	19.07	18.19	19.95	19.2	17.76	20.21	0.3417	4.39%	0.84%
CM_MC2	6	18.48	17.51	19.44	18.52	16.98	19.48	0.3767	4.99%	3.94%
LC_LCDSSLCC	6	18.62	17.56	19.68	18.83	17.12	19.69	0.4128	5.43%	3.18%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	18.75	19.05	18.29	19.02	20.11	20.18
GH_ER2	17.69	18.55	18.21	18.06	17.6	17.35
FR_FRCP1	18.64	19.45	19.73	18.67	18	18.3
GH_FR1	21.02	20.92	19.45	20.69	20.95	19.25
GH_ERC	19.98	20.08	18.5	20.81	20.63	20.26
EV_HC1	17.78	18.86	18	18.81	17.57	19.9
EV_MC2	19	19.46	19.4	17.76	20.21	18.6
CM_MC2	18	19.48	16.98	18.43	18.61	19.35
LC_LCDSSLCC	17.73	18.73	17.12	19.52	19.69	18.94

*FR\_UFR1 and GH\_ER2 are reference sites*

**Graphics**



*[Signature]*  
 June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 1 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test** Nautilus Environmental

Analysis ID: 00-6856-6471	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 21 Jun-17 16:37	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 19-4340-2590	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	14-4223-0458	10 May-17	10 May-17	19h	Teck Coal	
①FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)		
①GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

①FR\_UFR1 and GH\_ER2 are the reference sites.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
①FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
①GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	13.7%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	①	FR_UFR1	-2.062	2.488	9.86	10	0.9999	CDF	Non-Significant Effect
	①	GH_ER2	-1.494	2.488	9.86	10	0.9990	CDF	Non-Significant Effect
		FR_FRCP1	-2.274	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-4.947	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-4.172	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	-2.686	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		EV_MC2	-3.525	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		CM_MC2	-3.074	2.488	9.86	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-4.627	2.488	9.86	10	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1954.066	217.1185	9	4.608	0.0002	Significant Effect
Error	2355.652	47.11304	50			
Total	4309.718		59			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.345	21.67	0.9491	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9874	0.9459	0.7903	Normal Distribution

*June 27/17*

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 00-6856-6471 Endpoint: Mean Dry Weight-mg  
 Analyzed: 21 Jun-17 16:37 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Mean Dry Weight-mg Summary**

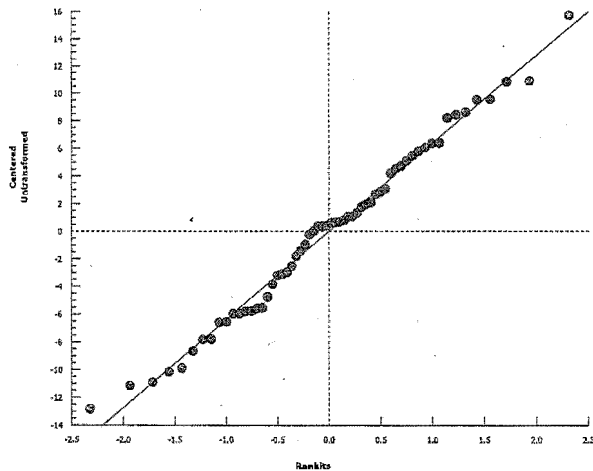
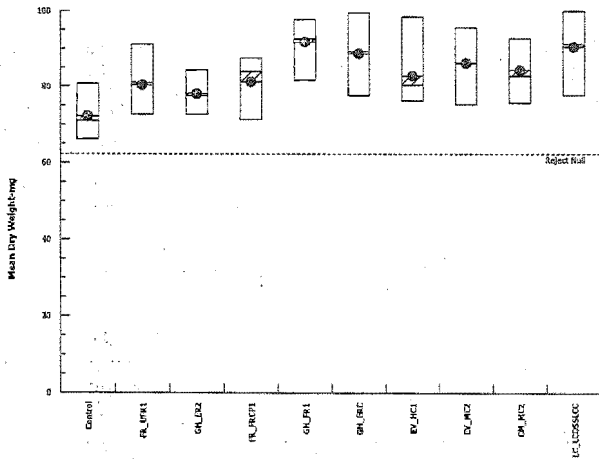
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	6	72.13	65.8	78.47	70.97	66.15	80.74	2.465	8.37%	0.0%
① FR_UFR1	6	80.3	73.23	87.38	81.01	72.5	91.18	2.753	8.4%	-11.33%
② GH_ER2	6	78.05	73.83	82.27	77.56	72.5	84.44	1.641	5.15%	-8.21%
FR_FRCP1	6	81.15	73.66	88.63	83.94	71.25	87.5	2.911	8.79%	-12.49%
GH_FR1	6	91.74	86.02	97.46	92.59	81.58	97.78	2.227	5.95%	-27.18%
GH_ERC	6	88.67	80.16	97.17	89.21	77.5	99.47	3.308	9.14%	-22.92%
EV_HC1	6	82.78	73.88	91.68	80.33	76.19	98.46	3.462	10.24%	-14.76%
EV_MC2	6	86.1	78.5	93.7	86.37	75.19	95.6	2.957	8.41%	-19.36%
CM_MC2	6	84.32	76.96	91.67	82.73	75.65	92.73	2.861	8.31%	-16.89%
LC_LCDSSLCC	6	90.47	82.81	98.13	91.19	77.62	100	2.98	8.07%	-25.42%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
Control	77.6	66.15	69.17	72.78	66.36	80.74
① FR_UFR1	72.5	80.91	82.38	73.75	81.11	91.18
② GH_ER2	84.44	80	76.67	78.46	72.5	76.25
FR_FRCP1	82.22	87.5	86.92	73.33	71.25	85.65
GH_FR1	94.4	97.78	81.58	93.08	92.11	91.5
GH_ERC	82.86	85.56	77.5	92.86	93.75	99.47
EV_HC1	77.2	84.55	76.82	83.46	76.19	98.46
EV_MC2	82.26	89.17	95.6	75.19	83.57	90.83
CM_MC2	84.35	92.73	75.65	81.11	79.57	92.5
LC_LCDSSLCC	91.54	89.5	77.62	90.83	93.33	100

① FR\_UFR1 and GH\_ER2 are reference sites

**Graphics**



*[Signature]*  
 June 27/17

**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 1 of 2)

Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 10-9817-8550	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 21 Jun-17 16:38	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 19-4340-2590	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*FR\_UFR1 and GH\_ER2 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.3%	

**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	0.561	2.458	9.863	10	0.7037	CDF	Non-Significant Effect
		FR_FRCP1	-0.2099	2.458	9.863	10	0.9303	CDF	Non-Significant Effect
		GH_FR1	-2.85	2.458	9.863	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-2.084	2.458	9.863	10	0.9999	CDF	Non-Significant Effect
		EV_HC1	-0.6168	2.458	9.863	10	0.9758	CDF	Non-Significant Effect
		EV_MC2	-1.445	2.458	9.863	10	0.9984	CDF	Non-Significant Effect
		CM_MC2	-1	2.458	9.863	10	0.9925	CDF	Non-Significant Effect
		LC_LCDSSLCC	-2.534	2.458	9.863	10	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1081.933	135.2417	8	2.8	0.0132	Significant Effect
Error	2173.42	48.29823	45			
Total	3255.354		53			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.188	20.09	0.9220	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.987	0.9407	0.8201	Normal Distribution

*KL*  
*June 27/17*

# CETIS Analytical Report

Report Date: 21 Jun-17 16:42 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

## Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 10-9817-8550 Endpoint: Mean Dry Weight-mg  
 Analyzed: 21 Jun-17 16:38 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Mean Dry Weight-mg Summary

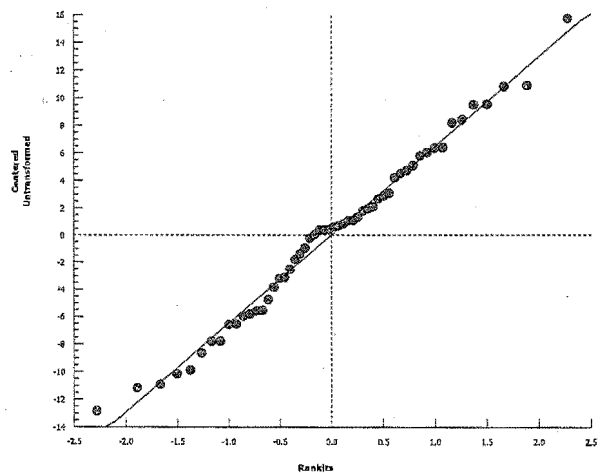
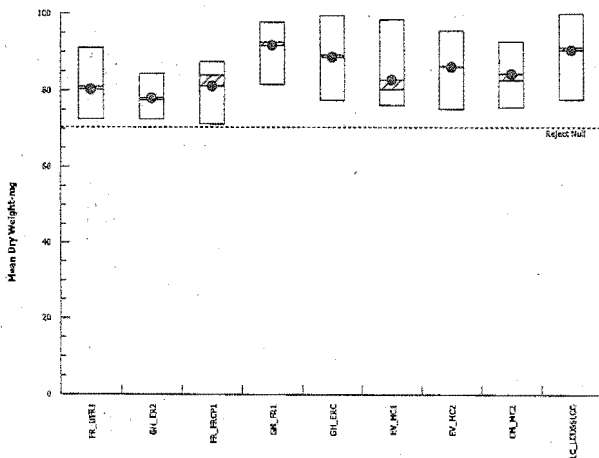
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	6	80.3	73.23	87.38	81.01	72.5	91.18	2.753	8.4%	0.0%
GH_ER2	6	78.05	73.83	82.27	77.56	72.5	84.44	1.641	5.15%	2.8%
FR_FRCP1	6	81.15	73.66	88.63	83.94	71.25	87.5	2.911	8.79%	-1.05%
GH_FR1	6	91.74	86.02	97.46	92.59	81.58	97.78	2.227	5.95%	-14.24%
GH_ERC	6	88.67	80.16	97.17	89.21	77.5	99.47	3.308	9.14%	-10.41%
EV_HC1	6	82.78	73.88	91.68	80.33	76.19	98.46	3.462	10.24%	-3.08%
EV_MC2	6	86.1	78.5	93.7	86.37	75.19	95.6	2.957	8.41%	-7.22%
CM_MC2	6	84.32	76.96	91.67	82.73	75.65	92.73	2.861	8.31%	-5.0%
LC_LCDSSLCC	6	90.47	82.81	98.13	91.19	77.62	100	2.98	8.07%	-12.66%

### Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	72.5	80.91	82.38	73.75	81.11	91.18
GH_ER2	84.44	80	76.67	78.46	72.5	76.25
FR_FRCP1	82.22	87.5	86.92	73.33	71.25	85.65
GH_FR1	94.4	97.78	81.58	93.08	92.11	91.5
GH_ERC	82.86	85.56	77.5	92.86	93.75	99.47
EV_HC1	77.2	84.55	76.82	83.46	76.19	98.46
EV_MC2	82.26	89.17	95.6	75.19	83.57	90.83
CM_MC2	84.35	92.73	75.65	81.11	79.57	92.5
LC_LCDSSLCC	91.54	89.5	77.62	90.83	93.33	100

FR\_UFR1 and GH\_ER2 are reference sites

### Graphics



**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 1 of 2)

Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 19-8624-5909	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 21 Jun-17 16:41	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 19-4340-2590	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 10 May-17 19:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 09 Jun-17 12:00	Species: Oncorhynchus mykiss	Brine:
Duration: 29d 17h	Source: Trout Lodge Fish Farm	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	07-7992-0354	09 May-17 12:08	10 May-17 09:45	31h (4.5 °C)	Teck Coal	
GH_ER2	17-6282-4703	09 May-17 12:41	10 May-17 09:45	30h (6.5 °C)		
FR_FRCP1	15-7680-7072	09 May-17 09:53	10 May-17 09:45	33h (6 °C)		
GH_FR1	21-3363-5154	09 May-17 10:00	10 May-17 09:45	33h (9 °C)		
GH_ERC	09-4944-8724	09 May-17 14:02	10 May-17 09:45	29h (6 °C)		
EV_HC1	02-7836-5969	09 May-17 12:35	10 May-17 09:45	31h (6.5 °C)		
EV_MC2	06-3101-2560	09 May-17 08:50	10 May-17 09:45	34h (3.5 °C)		
CM_MC2	02-3928-3608	09 May-17 11:00	10 May-17 09:45	32h (7.5 °C)		
LC_LCDSSLCC	09-5833-6740	09 May-17	10 May-17 09:45	43h (5.5 °C)		

*FR\_UFR1 and GH\_ER2 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_QR_17042017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-05-09_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_QR_17042017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-05-09_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-05-09_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-05-09_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-05-09_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170509_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-08		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.6%	

**Dunnnett Multiple Comparison Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2	FR_UFR1	-0.561	2.458	9.863	10	0.9717	CDF	Non-Significant Effect
	FR_FRCP1	-0.7709	2.458	9.863	10	0.9846	CDF	Non-Significant Effect
	GH_FR1	-3.411	2.458	9.863	10	1.0000	CDF	Non-Significant Effect
	GH_ERC	-2.645	2.458	9.863	10	1.0000	CDF	Non-Significant Effect
	EV_HC1	-1.178	2.458	9.863	10	0.9959	CDF	Non-Significant Effect
	EV_MC2	-2.006	2.458	9.863	10	0.9998	CDF	Non-Significant Effect
	CM_MC2	-1.561	2.458	9.863	10	0.9990	CDF	Non-Significant Effect
	LC_LCDSSLCC	-3.095	2.458	9.863	10	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1081.933	135.2417	8	2.8	0.0132	Significant Effect
Error	2173.42	48.29823	45			
Total	3255.354		53			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.188	20.09	0.9220	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.987	0.9407	0.8201	Normal Distribution



**CETIS Analytical Report**

Report Date: 21 Jun-17 16:42 (p 2 of 2)  
 Test Code: 170360b | 06-6811-5570

**Salmonid Embryo-Alevin-Fly Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 19-8624-5909      Endpoint: Mean Dry Weight-mg  
 Analyzed: 21 Jun-17 16:41      Analysis: Parametric Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Mean Dry Weight-mg Summary**

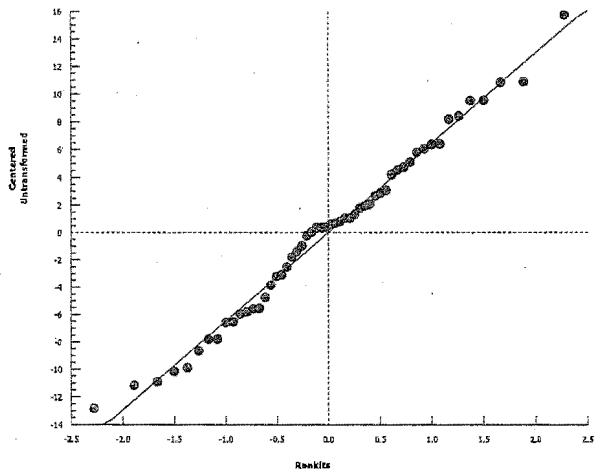
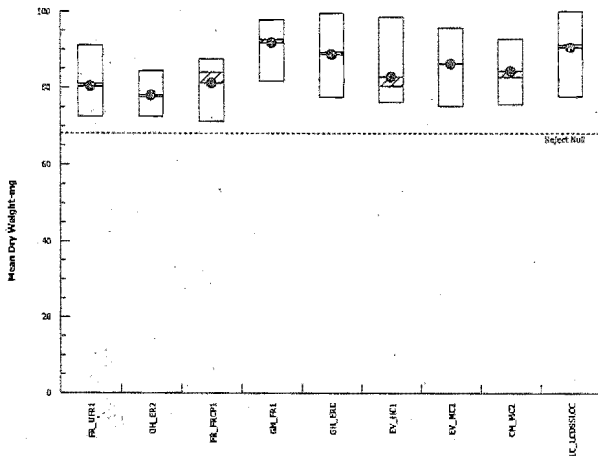
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	6	80.3	73.23	87.38	81.01	72.5	91.18	2.753	8.4%	0.0%
GH_ER2	6	78.05	73.83	82.27	77.56	72.5	84.44	1.641	5.15%	2.8%
FR_FRCP1	6	81.15	73.66	88.63	83.94	71.25	87.5	2.911	8.79%	-1.05%
GH_FR1	6	91.74	86.02	97.46	92.59	81.58	97.78	2.227	5.95%	-14.24%
GH_ERC	6	88.67	80.16	97.17	89.21	77.5	99.47	3.308	9.14%	-10.41%
EV_HC1	6	82.78	73.88	91.68	80.33	76.19	98.46	3.462	10.24%	-3.08%
EV_MC2	6	86.1	78.5	93.7	86.37	75.19	95.6	2.957	8.41%	-7.22%
CM_MC2	6	84.32	76.96	91.67	82.73	75.65	92.73	2.861	8.31%	-5.0%
LC_LCDSSLCC	6	90.47	82.81	98.13	91.19	77.62	100	2.98	8.07%	-12.66%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
FR_UFR1	72.5	80.91	82.38	73.75	81.11	91.18
GH_ER2	84.44	80	76.67	78.46	72.5	76.25
FR_FRCP1	82.22	87.5	86.92	73.33	71.25	85.65
GH_FR1	94.4	97.78	81.58	93.08	92.11	91.5
GH_ERC	82.86	85.56	77.5	92.86	93.75	99.47
EV_HC1	77.2	84.55	76.82	83.46	76.19	98.46
EV_MC2	82.26	89.17	95.6	75.19	83.57	90.83
CM_MC2	84.35	92.73	75.65	81.11	79.57	92.5
LC_LCDSSLCC	91.54	89.5	77.62	90.83	93.33	100

*FR\_UFR1 and GH\_ER2 are reference sites*

**Graphics**



*[Signature]*  
 June 27/17

Client: TECL

W.O.#: 170360

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
PR.FE.FP.1	May 9/17	May 11/17	50	6.5	6.7	126	50	6.8	136	V
GH.EP.2				8.4	8.7	162	↓	8.2	164	
PR.FE.FP.1				8.6	8.8	168	↓	3.3	330	
GH.FP.1				8.3	8.5	162	100	3.0	300	
GH.EP.C				8.8	9.0	172	50	9.1	182	
EX.HC.1				10.2	10.3	202	↓	14.2	284	
EX.MC.2				6.4	6.6	124	↓	8.3	166	
OM.MC.2				9.0	9.2	176	100	3.1	310	
LC.LDSS.LCC				8.8	9.0	172	100	3.1	310	
Dechlor	May 10/17	May 10/17	100	1.7	1.8	16	100	1.6	16	
PR.FE.FP.1	May 16/17	May 17/17	50	6.3	6.4	124	50	6.1	122	
GH.EP.2			50	7.9	8.0	156	50	7.8	156	
PR.FE.FP.1			50	8.9	9.1	174	100	3.6	360	
GH.FP.1			50	8.5	8.7	166	100	3.3	330	
GH.EP.C			50	8.1	8.3	158	50	8.7	174	
EX.HC.1			50	9.5	9.7	186	50	13.9	278	
EX.MC.2			50	6.7	6.9	130	50	9.0	180	
OM.MC.2			50	8.4	8.6	164	100	3.4	340	
LC.LDSS.LCC			50	8.0	8.2	156	100	3.3	330	
Dechlor	May 16/17	May 16/17	100	1.7	1.9	15	100	1.6	16	↓

Notes: ① Sample diluted w/ DI water up to 100ml

Reviewed by: \_\_\_\_\_

Date Reviewed: \_\_\_\_\_

June 26, 2017

Client: Teck

W.O.#: 170360

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FR.UFP1	May 23/17	May 24/17	50	5.8	6.0	112	50	5.7	114	KL
CHLER2				7.5	7.7	146	50	7.7	154	
FR.FRPC1				7.7	7.9	150	10 <sup>⓪</sup>	3.0	300	
CHL.FP1				8.2	8.4	160	10 <sup>⓪</sup>	2.8	280	
CHLERC				7.9	8.1	154	50	8.3	166	
EV.HCI				8.8	9.0	172	50	12.9	258	
EV.MI2				5.3	5.5	102	50	6.7	134	
CM.MI2				7.2	7.5	138	100	2.7	270	
LL.LOSSLC				7.8	8.0	152	100	2.7	270	
Dechlor	May 24/17	May 24/17	100	1.4	1.6	12	100	1.5	15	
FR.UFP1	May 30/17	May 31/17	50	5.3	5.5	102	50	5.5	110	
CHLER2				7.7	7.8	152	50	7.5	150	
FR.FRPC1				7.7 <sup>6</sup>	7.9	146	10 <sup>⓪</sup>	2.6	260	
CHL.FP1				7.6	7.8	148	10 <sup>⓪</sup>	2.6 <del>2.6</del>	260	
CHLERC				7.9	8.2	152	50	7.8 <sup>6</sup>	152	
EV.HCI				8.5	8.7	166	50	10.2	204	
EV.MI2				5.1	5.3	98	50	5.8	116	
CM.MI2				7.0	7.2	136	10 <sup>⓪</sup>	2.1	210	
LL.LOSSLC				7.0	7.2	136	100	2.2	220	
Dechlor	May 31/17	May 31/17	100	1.3	1.4	12	100	1.4	14	

Notes: <sup>⓪</sup> Diluted to 100 mL w/ DI water.

Reviewed by: 

Date Reviewed: June 26, 2017

Client: TECK

W.O.#: 170360

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness							
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician				
FR-UFPI	June 7/17	June 7/17	50	5.7	5.8	112	50	5.9	118	ML				
GH-ERZ	↓	↓	↓	6.8	7.1	130	50	7.0	140	↓				
<del>EM-MCZ</del> FR-FCPI				8.2	8.4	160	10 <sup>Ⓟ</sup>	2.6	260					
GH-FPI				8.2	8.5	158	10 <sup>Ⓟ</sup>	2.4	240					
GH-ERC				7.5	7.7	146	50	7.9	158					
EV-HCI				8.5	8.7	166	50	12.1	242					
EV-MCZ				5.1	5.3	98	50	6.8	136					
CM-MCZ				7.1	7.3	138	10 <sup>Ⓟ</sup>	2.2	220					
LC-LCSSLCC				7.6	7.8	148	10 <sup>Ⓟ</sup>	2.6	260					
Dechlor				June 6/17	June 6/17	100	1.3	1.4	12		100	1.4	14	↓
<del>FR-UFPI</del>														
<del>GH-ERZ</del>														
<del>FR-FCPI</del>														
<del>GH-FPI</del>														
<del>GH-ERC</del>														
<del>EV-HCI</del>														
<del>EV-MCZ</del>														
<del>CM-MCZ</del>														
<del>LC-LCSSLCC</del>														
<del>Dechlor</del>														

Notes: Ⓟ Sample diluted w/ DI water up to 100ml.

Reviewed by: \_\_\_\_\_



Date Reviewed: \_\_\_\_\_

June 26, 2017

**APPENDIX F – Chain-of-Custody Forms**

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COC ID: **20170424-1248**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			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.	28 Day H. azteca Pass/Fail	7 D C. Dubia Pass/Fail	72 hr P. subcapitata Pass/Fail	30 D Rainbow Trout early life stage Pass/Fail	30 d FA Rainbow Trout Microbial Testing Copper Test	32 d FHM P/F Conducted in Calgary	7d Rot Embryo P/F						Temp °C		
FR_FRCP1_Q_03042017_N ①	FR_FRCP1	WS		2017/04/24	10:55	G	7 x 20L	1	1	1	1	1	-	-								6.5
FR_UFRI_Q_03042017_N ②	FR_UFRI	WS		2017/04/24	09:14	G	8 x 20L	1	1	1	1	1	-	-								8.0
① clear, colourless, odourless, dark brown particulates present ② clear, colourless, odourless, some brown particulates present								wo # 170361 170358 170359 170360 170363 170362 170368														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Begon	4/24	Nautilus - Burnaby	Apr 25/17 @ 09:00
			M.Y. Nani Yamamoto	

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Dylan Begon	250 865 5273
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
<i>[Signature]</i>	April 24/2017

COC ID: **April 24 TOX**

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	Krysta Pearcy			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	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: sean.beswick@teck.com				
Phone Number	250 865 3274			Phone Number				Email 3: jevin.wolchuk@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	None	#N/A	#N/A				
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dania P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	32 d FHM P/F 28 day Microbial Testing conducted in Calgary	28 Day Hyalella P/F	2006 EA Rainbow Trout Microbial Testing (Copper Test)	7 Day Rainbow Trout P/F					
GH_FR1_WS_2017-04-24_N ①	GH_FR1	WS	N	24-Apr-17	10:00	G	7 x 20L				x		x	x	x	x	x					4.5	
GH_ERC_WS_2017-04-24_N ②	GH_ERC	WS	N	24-Apr-17	13:00	G	4 x 20L				x		x	x								5.5	
GH_ER2_WS_2017-04-24_N ③	GH_ER2	WS	N	24-Apr-17	12:00	G	7 x 20L				x		x	x	x	x		x				5.5	
① clear, colourless, odourless, dark brown particulates present																							
② clear, colourless, odourless, some brown particulates present																							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Evans	24 April 2017	11:17	Nautilus - Burnaby	Apr 25/17	@09:00
				NY - Nan Yaamadob		

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. Evans	Mobile #	
Sampler's Signature		Date/Time	

# Teck

COC ID: 20170424N		TURNAROUND TIME:		RUSH:			
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		
Job Description	SA Chronic Toxicity Sampling			Lab Contact	Krysta Peracy		
Project Manager	Jeff Williams			Email	krysta@nautilusenvironmental.ca		
Email	Jeff.Williams@teck.com			Address	8664 Commerce Court		
Address	RR#1 HWY# 3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8746			Phone Number			
Report Format / Distribution	Excel	PDF	EDD	Email 1:	Jeff.Williams@teck.com		
	X	X	X	Email 2:	teckcoal@equisonline.com		
				Email 3:	James.Bold@teck.com		
	X	X	X	Email 4:	Cameron.Griffin@teck.com		
	X	X	X	Email 5:	Teck.Lab.Results@sharepoint.teck.com		
				PO number	475474		

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 CARBOYS	72h P.subcapitata P/F	7d C.dupia P/F						
EV_HC1_WS_2017-04-24_N (1)	EV_HC1	WS	N	2017/04/24	10:10	G	4 X	ZOL	3	1							Temp PC
EV_MC2_WS_2017-04-24_N (2)	EV_MC2	WS	N	2017/04/24	12:00	G	4 X	ZOL	3	1							3.5
																	4.0
Total							8										
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION				DATE/TIME	ACCEPTED BY/AFFILIATION				DATE/TIME				
72h P.subcapitata P/F 30d rainbow trout early life stage P/F									Nautilus - Burnaby NY - Nari Yamamoto				Apr 25/17 @ 09:00				
7d C.dupia P/F																	
NB OF BOTTLES RETURNED/DESCRIPTION																	
Regular (default) X				Sampler's Name				Jesse Way				Mobile #					
Priority (2-3 business days) - 50% surcharge				Sampler's Signature				du way				Date/Time					
Emergency (1 Business Day) - 100% surcharge												Apr 24, 2017					
For Emergency <1 Day, ASAP or Weekend - Contact ALS																	

(1) clear, colourless, odourless, some brown particulates  
 (2) clear, colourless, odourless, dark brown particulates



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Bob Werner  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7321  
 Email EDD To: Rick.Magliocco@teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com

Lab Name: Nautilus Environmental  
 Contact Name: Krysta Percy  
 Address: Emma Marus  
 Address: 8664 commerce Court  
 City: Burnaby State: BC  
 Postal Code: V5A 4N7 Country: Canada  
 Phone Number: 604-420-8773  
 Email Address: krysta@nautilusenvironmental.ca  
 emma@nautilusenvironmental.ca  
 PO Number: CMO00478260

Send Invoice To  
 Address  
 City  
 State  
 Postal Code  
 Country  
 Task Code  
 Shipping Company  
 Tracking Number  
 CC Hardcopy To  
 CC Hardcopy To

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS						ADDITIONAL INFORMATION	
							72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalella P/F	30 d rainbow trout early life stage P/F	32d FHM P/F conducted in Calgary	30d RST P/F Copper Test		
CM_MC2_WS_20170424_N ①	WS	Apr 24, 2017	12:00	G	1 x 20L		X	X	X	X	X	X	Week 1	
① clear, colourless, odourless, dark brown particulates present							we #	170359	170358	170361	170360	170362	170363	

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions			
				Nautilus - Burnaby	Apr 25/17	09:00	4.5	Y/N	Y/N	Y/N
				NY - Nari Yamamoto				Y/N	Y/N	Y/N
								Y/N	Y/N	Y/N
Sampler's Name	Don Sacino/Bob Werner			Mobile #			Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
Sampler's Signature				Date/Time	4/24/2017 2:00PM					

COC ID: **20170424-0720**      TURNAROUND TIME:      RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Krysta Pearcy			Email 1:	jay.jones@teck.com	x	x	
Email	jay.jones@teck.com			Email	Krysta@NautilusEnvironmental.ca			Email 2:	tim.chala@teck.com	x	x	
Address	Box 2003			Address	8664 commerce Court			Email 3:	teckcoal@equisonline.com	x	x	x
	15km North Hwy 43							Email 4:	cait.good@teck.com			
City	Sparwood	Province	BC	City	Burnaby	Province	BC					
Postal Code	V0B 2G0		Country	Canada	Postal Code	V5A 4N7		Country	Canada	PO number	432106	
Phone Number	250-425-6111			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.	7 d Cdubia dilution series	72hr Psubcapitata dilution series	7d L minor plant grown dilution series	7 d O mykis development dilution series	72h P. subcapitata P/F	7d C.dubia P/F	30 d rainbow trout early life stage P/F	Temp °C	
1 LC_LCDSSLCC_WS_2017-04-24_N	LC_LCDSSLCC	WS	N	24-Apr-17	15:20	G	8 x 20L	X	X	X	X	X	X	X	5.0	
2 LC_LC5_WS_2017-04-24_N	LC_LC5	WS	N	24-Apr-17	14:17	G	5 x 20L	X	X	X	X				4.0	
3 LC_FRSDC_WS_2017-04-25_N	LC_FRSDC	WS	N	24-Apr-17	12:49	G	5 x 20L	X	X	X	X				3.5	
4 LC_DC1_WS_2017-04-25_N	LC_DC1	WS	N	24-Apr-17	12:29	G	5 x 20L	X	X	X	X				3.0	
5 LC_DCDS_WS_2017-04-25_N	LC_DCDS	WS	N	24-Apr-17	10:38	G	5 x 20L	X	X	X	X				3.5	
Sample description:																
1-4 : clear, colorless, odorless, brown particulates present.																
5 : slightly turbid, colorless, odorless, brown particulates present.																
								592061	170366	170367	170364	170359	170358	170360		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	T Phillips/ NUPQU	April 24, 2017	Nautilus - Burnaby NY - Naiti Yamamoto	Apr 25/17 @ 09:00

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) X	Tyler Phillips	(250) 919-0965		April 24, 2017
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

# Teck

COC ID: 20170424-1249      TURNAROUND TIME:      RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Elisabeth Henson			Email 1:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email	elisabeth_henson@golder.com			Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address				Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City		Province		PO number				
Postal Code	VOB 1H0	Country	Canada	Postal Code		Country						
Phone Number	1-250-865-5204			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.	30 Day Fathead Minnow												
FR_FRCP1_Q_03042017_N 1617-0888	FR_FRCP1	WS		2017/04/24	10:55	G	2	2	1											
FR_UFRI_Q_03042017_N 1617-0889	FR_UFRI	WS		2017/04/24	09:14	G	2	2												

2017/04/25  
1100  
2 x 20L CARBOIS  
NO SP  
GOOD CONDITION

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELEASED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Bequin	4/24		110

NO OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/> X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Dylan Bequin	250 865 5273
	Sampler's Signature	Date/Time
		April 24, 2017

# Teck

<b>COC ID:</b>	<b>April 24 TOX</b>		<b>TURNAROUND TIME:</b>	regular	<b>RUSH:</b>		
<b>PROJECT/CLIENT INFO</b>			<b>LABORATORY</b>		<b>OTHER INFO</b>		
Facility Name	Greenhills Operations		Lab Name	Hydroqual Laboratories Ltd		BDD delivery:	
Project Manager	Leigh Stickney		Lab Contact	Jacklyn Pool	Site:	leigh.stickney@teck.com   EQULS: 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	Postal Code	T2H 2K1	Country	Can
Phone Number	250 865 3274		Phone Number	403.253.7121		PO number	Jeremy Enas

**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_2017-04-24_N	GH_FR1	WS	N	24-Apr-17	10:00	G	2	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia NO3/SO4	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyallicella P/F	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow SO4	
GH_ER2_WS_2017-04-24_N	GH_ER2	WS	N	24-Apr-17		G	2										X	X	

<b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b>	<b>RELINQUISHED BY/AFFILIATION</b>	Date	Time	Accepted By/Affiliation	Date	Time

2017/04/25  
 1:00  
 80  
 2x JOL CARBOYS  
 GOOD CONDITION

<b>SERVICE REQUEST (rush - subject to availability)</b>			
Regular (default)	X	Sampler's Name	Jenni Kropp
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Jenni Kropp
Emergency (1 Business Day) - 100% surcharge		Mobile #	250 423 0826
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	4/24/04/2017

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To			
Contact Name	Bob Werner			Contact Name	Claudio Quinteros			Address			
Address	2261 Corbin Rd.			Address	Jessica Wang						
City	Sparwood	Prov.	BC	Address	#4, 6125-12th Street S.E.			City		State	
Postal Code	V0B 2G0	Country	Canada	City	Calgary	State	AB	Postal Code		Country	
Phone Number	250 425 7321			Postal Code	T2H 2K1	Country	Canada	Task Code			
Email EDD To	Rick.Magliocco@teck.com			Phone Number	403-253-7121			Shipping Company			
	Don.Sacino@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number			
	Bob.Werner@teck.com			Email Address	jessica@nautilusenvironmental.ca			CC Hardcopy To			
				PO Number	CM000478075			CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED										ADDITIONAL INFORMATION								
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS PRESERVED																		
1617-6690 CM_MC2_WS_20170424_N	WS	Apr 24, 2017		G	1	ANALYSIS PRESERVED																		Week 1

2017/04/25  
1100  
2x20L CALBOYS  
NO S/I  
GOOD CONDITION

Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions			
									110	Y/N	Y/N	Y/N	Y/N
										Y/N	Y/N	Y/N	Y/N
										Y/N	Y/N	Y/N	Y/N
										Y/N	Y/N	Y/N	Y/N

Sampler's Name	Don Sacino/Bob Werner	Mobile #	250 425 7321
Sampler's Signature		Date/Time	4/24/2017 2:00PM

Temp in °C	Samples on ice	Sample intact?	Trip Blank?

COC ID: **20170502-1325**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			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.	30 DAY RAINBOW TROUT Early Life Stage P/F	Rainbow Trout Microbial Testing Copper test	28 Day H. azteca Pass/Fail	32d FHM P/F Conducted in Calgary				
FR_FRCPI_QR_10042017_N	FR_FRCPI	WS		2017/05/02	10:37	G	7 X20L	X	X	X	X				6.5
FR_UFR1_QR_10042017_N	FR_UFR1	WS		2017/05/02	09:41	G	8 X20L	X	X	X	X				4.0
								wo# 170360	170363	170361	170362				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Nautilus - Burnaby	May 03/17 @ 09:45
			NY - Nan Yamamoto	= refresh sample =

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Bryan Oaden	250 919 2482
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 2, 2017 2:17

COC ID: **May 2 TOX**      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	Krysta Pearcy			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	Yes	Excel			
City	Elkford		Province	BC		City	Burnaby		Province	BC		Email 1:	leigh.stickney@teck.com	
Postal Code	VOB 1H0		Country	Canada		Postal Code	V5A 4N7		Country	Can		Email 2:	sean.beswick@teck.com	
Phone Number	250 865 3274			Phone Number				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	None	#N/A	#N/A	
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	32d FHM P/F <i>Conducted in Calgary</i>	28 Day Hyalella P/F	Rainbow Trout Microbial Testing Copper Test	7 Day Rainbow Trout P/F	Temp °C	
GH_FR1_WS_2017-05-02_N	GH_FR1	WS	N	2-May-17	10:10	G	5 x 20L				X		X	X	X	X	X			6.5
GH_ERC_WS_2017-05-02_N	GH_ERC	WS	N	2-May-17	13:45	G	3 x 20L				X		X	X						6.0
GH_ER2_WS_2017-05-02_N	GH_ER2	WS	N	2-May-17	12:21	G	4 x 20L				X		X	X	X	X				5.5
															170360					
															170362					
															170361					
															170363					

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
				Nautilus - Burnaby	May 03/17	@ 09:45
				NY - Nari Yamamoto		= refresh sample =

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	Janni Krapp/Baylee Phillips
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	<i>Janni Krapp</i>
Emergency (1 Business Day) - 100% surcharge		Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	

# Teck

<b>COC ID:</b>	20170502N			<b>TURNAROUND TIME:</b>		<b>RUSH:</b>	
<b>PROJECT/CLIENT INFO</b>				<b>LABORATORY</b>		<b>OTHER INFO</b>	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		Report Format / Distribution
Job Description	SA Chronic Toxicity Sampling			Lab Contact	Krysta Peracy		Excel
Project Manager	Jeff Williams			Email	krysta@nautilusenvironmental.ca		PDF
Email	Jeff.Williams@teck.com			Email	Jeff.Williams@teck.com		X
Address	RR#1 HWY#3			Email 2:	teckcoal@equisonline.com		X
				Address	8664 Commerce Court		X
					Imperial Square, Lake City		X
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8746			Phone Number			PO number
							475474

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 CARBOYS	72h P.subcapitata P/F	7d C.dupia P/F	Temp °C
EV_HC1_WS_2017-05-02_N	EV_HC1	WS	N	2017/05/02	7:45	G	3		3			7.0
EV_MC2_WS_2017-05-02_N	EV_MC2	WS	N	2017/05/02	11:30	G	3		3			7.0
<b>Total</b>							6					

<b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b>	<b>RELINQUISHED BY/AFFILIATION</b>	<b>DATE/TIME</b>	<b>ACCEPTED BY/AFFILIATION</b>	<b>DATE/TIME</b>
72h P.subcapitata P/F 30d rainbow trout early life stage P/F			Nautilus - Burnaby NY - Nain Yamamoto	May 03/17 @ 09:45
			= refresh sample =	

<b>NE OF BOTTLES RETURNED/DESCRIPTION</b>	<b>Sampler's Name</b>	<b>Mobile #</b>
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	Jesse Way <i>Jesse Way</i>	
	<b>Sampler's Signature</b>	<b>Date/Time</b>
		May 2, 2017



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Bob Werner  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7321  
 Email EDD To: Rick.Magliocco@teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com

Lab Name: Nautilus Environmental  
 Contact Name: Krysta Pearce  
 Address: Emma Marus  
 Address: 8664 commerce Court  
 City: Burnaby State BC  
 Postal Code: V5A 4N7 Country: Canada  
 Phone Number: 604-420-8773  
 Email Address: krysta@nautilusenvironmental.ca  
 emma@nautilusenvironmental.ca  
 PO Number: CMO00478260

Send Invoice To  
 Address  
 City  
 Postal Code  
 Country  
 Task Code  
 Shipping Company  
 Tracking Number  
 CC Hardcopy To  
 CC Hardcopy To

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS REQUESTED						Temp °C	ADDITIONAL INFORMATION
							72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallicella P/F	30 d rainbow trout early life stage P/F	32d FHM P/F conducted in Calgary	30d Rbt EA P/F Copper Test		
CM_MC2_WS_20170502_N ①	WS	2-May-17	8:30	G	7 x 20L		X	X	X	X	X	X	4.5	Week 2
CM_MC1_WS_20170502_N ②	WS	2-May-17	10:00	G	1 x 20L		X	X					3.2	
						WO #	170410	170411	170361	170360	170362	170363		

① clear, colourless, odourless, some particulates  
 ② clear, colourless, odourless, no particulates

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions		
							Y / N	Y / N	Y / N
				Nautilus - Burnaby	May 03/17	09:45	Y / N	Y / N	Y / N
				NY - Nan Yamamoto			Y / N	Y / N	Y / N
				= refresh sample			Y / N	Y / N	Y / N
	Sampler's Name	Don Sacino/Bob Werner	Mobile #		Temp in °C	Samples on ice?	Sample intact?	Trip Blank?	
	Sampler's Signature	<i>Bob Werner</i>	Date/Time	5/2/2017 2:00PM					

# Teck

COC ID: 20170502-0913

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO

LABORATORY

OTHER INFO

Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Krysta Pearcy			Email 1:	jay.jones@teck.com	x	x
Email	jay.jones@teck.com			Email	Krysta@NautilusEnvironmental.ca			Email 2:	tim.chala@teck.com	x	x
Address	Box 2003			Address	8664 commerce Court			Email 3:	teckcoal@equisonline.com	x	x
	15km North Hwy 43							Email 4:	lee.wilm@teck.com	x	x
City	Sparwood	Province	BC	City	Burnaby	Province	BC				
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	432106		
Phone Number	250-425-6111			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.	7 d Cdubia dilution series	72hr Pseudocapitata dilution series	7d L. minor plant grown dilution series	7d O. mysis development dilution series	72h P. subcapitata P/F	7d C. dubia P/F	30 d rainbow trout early life stage P/F				
LC_LCDSSLCC_WS_2017-05-01_N	LC_LCDSSLCC	WS	N	2-May-17	8:35	G	3x20							X				7.0

wo # 170360

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION

DATE/TIME

ACCEPTED BY/AFFILIATION

DATE/TIME

	T Phillips/ NUPQU	May 2, 2017	Nautilus - Burnaby	May 03/17 @ 09:45
			NY - Wain Yamamoto	
				=refresh sample =

NR OF BOTTLES RETURNED/DESCRIPTION

Regular (default)	X	Sampler's Name	Tyler Phillips	Mobile #	(250) 919-0965
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	May 2, 2017
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

**COC ID:** 20170502-1351      **TURNAROUND TIME:**      **RUSH:**

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#: Fording River Operation				Lab Name: Hydroqual				Report Format / Distribution			
Project Manager: Neil MacDonald				Lab Contact: Elisabeth Henson				Email 1: Lee.Wilm@teck.com			
Email: Neil.MacDonald@teck.com				Email: elisabeth_henson@golder.com				Email 2: Neil.Macdonald@teck.com			
Address: PO Box 100				Address:				Email 3: teckcoal@equisonline.com			
City: Elkford		Province: BC		City:		Province:		PO number:			
Postal Code: V0B 1H0		Country: Canada		Postal Code:		Country:					
Phone Number: 1-250-865-5204				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.	30 Day Fathead Minnow									
1617-0888 FR_FRCP1_QR_10042017_N	FR_FRCP1	WS		2017/05/02	10:37	G	2	2									
1617-0889 FR_UFRI_QR_10042017_N	FR_UFRI	WS		2017/05/02	09:41	G	2	2									

*ES*  
 2017/05/03 1145  
 4x20L  
 16 S/I  
 food can: to in  
 drop off  
 70C

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Gravelle	05/02/17		

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default) X		Jason Gravelle	(250) 865-5191
Priority (2-3 business days) - 50% surcharge			
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

*Jason Gravelle*

05/02/17

# Teck

COC ID:

May 2 TOX

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: sean.beswick@teck.com

Phone Number 250 865 3274

Phone Number 403.253.7121

Email 3: jeremy.enns@teck.com

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
1617-0886 Sample ID								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C. dubia NO3/SC4	39 d rainbow trout early life stage NO3/SC4	72 hr P. Subcapitata	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyalella P/F	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow SC4	
GH_FR1_WS_2017-05-02_N	GH_FR1	WS	N	2-May-17	1010	G	2										X		
GH_ER2_WS_2017-05-02_N	GH_ER2	WS	N	2-May-17	1221	G	2										X		
1617-0887																			

ES  
2017105103  
1145  
4x20L  
drop off  
No S II  
good condition  
7°C

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

Jenni Kropf / Bayke Phillips  
J. Kropf / Bayke Phillips

Mobile #

Sampler's Signature

Date/Time

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To				
Contact Name	Bob Werner			Contact Name	Claudio Quinteros			Address				
Address	2261 Corbin Rd.			Address	#4, 6125-120h Street S.E.			City			State	
City	Sparwood	Prov.	BC	City	Calgary	State	AB	Postal Code			Country	
Postal Code	V0B 2G0	Country	Canada	Postal Code	T2H 2K1	Country	Canada	Task Code				
Phone Number	250 425 7321			Phone Number	403-253-7121			Shipping Company				
Email EDD To	Rick.Magliooco@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number				
	Don.Sacino@teck.com				jessica@nautilusenvironmental.ca			CC Hardcopy To				
	Bob.Werner@teck.com			PO Number	CM000478075			CC Hardcopy To				

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION				
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS	30 day early life stage fathead minnow E/E								
1617-0890 CM_MC2_WS_20170502_N	WS	May 2, 2017	8:30	G	2			X								Week 2
<p>ES 2017/05/03 HYS NO SIE 2 x 20L carboys drop off 7c good condition</p>																

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions			
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
							Y / N	Y / N	Y / N	
	Sampler's Name	Don Sacino/Bob Werner		Mobile #			Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
	Sampler's Signature			Date/Time	5/2/2017 2:00PM					

COC ID: **20170509-1313**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	VOB 1H0		Country	Canada	Postal Code	V5A 4N7		Country				
Phone Number	1-250-865-5204			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.	28 Day H. azteca Pass/Fail	30 day Rainbow Trout Early Life Stage P/F	Rainbow Trout Microbial Testing P/F	32d FHM P/F	Temp °C	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None			
FR_FRCPI_QR_17042017_N	FR_FRCPI	WS		2017/05/09	09:53	G	7x20L	x	x	x	x	6.0				
FR_UFRI_QR_17042017_N	FR_UFRI	WS		2017/05/09	12:08	G	7x20L	x	x	x	x	4.5				
							W0 #									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Granelle	05/09/17	Nautilus - Burnaby	May 10/17 @ 09:45
			NY - Nain Yamamoto	
			= refresh sample =	
NO OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) X	Jason Granelle	(250) 865-5191	Jan Granelle	May 09/2017
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

# Teck

COC ID: **May 9 TOX**      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	Krysta Pearcy			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	Yes	Excel	
					Imperial Square Lake City			Email 1: leigh.stickney@teck.com				
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 2: sean.beswick@teck.com				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Can	Email 3: jeremy.enns@teck.com				
Phone Number	250 865 3274			Phone Number				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, Perserved or both (F, P, F/P)												
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	None	#N/A	#N/A	
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	32 d FHM P/F <i>conducted in Calgary</i>	28 Day Hyalella P/F	Rainbow Trout Microbial Testing Copper Test	7 Day Rainbow Trout P/F	Temp °C	
GH_FR1_WS_2017-05-09_N	GH_FR1	WS	N	9-May-17	10:00	G	5 x 20L							X	X	X	X			9.0
GH_ERC_WS_2017-05-09_N	GH_ERC	WS	N	9-May-17	14:02	G	3 x 20L							X						6.0
GH_ER2_WS_2017-05-09_N	GH_ER2	WS	N	9-May-17	12:41	G	4 x 20L							X	X	X				6.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
				Nautilus-Burnaby	May 10/17	09:45
				NY - Nain Yamamoto		
				= refresh sample =		

SERVICE REQUEST (rush - subject to availability)		Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/>		Jenni Kropp/Bayke Phillips	
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
		<i>[Signature]</i>	

# Teck

COC ID:	20170509N			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		
Job Description	SA Chronic Toxicity Sampling			Lab Contact	Krycia Peracy		
Project Manager	Jeff Williams			Email	krysta@nautilusemvironmental.ca		
Email	Jeff.Williams@teck.com			Address	8664 Commerce Court		
Address	RR#1 HWY#3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8746			Phone Number			
Report Format / Distribution				Excel	PDF	EDD	
Email 1: Jeff.Williams@teck.com				X	X	X	
Email 2: teckcoal@egulsonline.com				X	X	X	
Email 3: James.Bold@teck.com				X	X	X	
Email 4: Cameron.Griffin@teck.com				X	X	X	
Email 5: Teck.Lab.Results@sharepoint.teck.com				X	X	X	
PO number				475474			

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 CARBOYS	72h P.subcapitata P/F	7d C.dupia P/F						
① EV_HC1_WS_2017-05-09_N	EV_HC1	WS	N	2017/05/09	12:35	G	3 x 20L		3								6.5
① EV_MC2_WS_2017-05-09_N	EV_MC2	WS	N	2017/05/09	8:50	G	3 x 20L		3								3.5
							Total	6									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
72h P.subcapitata P/F 30d rainbow trout early life stage P/F			Nautilus - Burnaby NY - Naia Yamamoto = refresh sample =	May 10/17 @ 09:45

NO. OF BOTTLES RETURNED/DESCRIPTION	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	Patrick LeClair Pat LeClair	
	Sampler's Signature	Date/Time
		May 9, 2017 13:45

① Clear, colourless, odourless, some brown particulates.

Temp °C

wo # 170360



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Nautilus Environmental			Send Invoice To			
Contact Name	Bob Werner			Contact Name	Krysta Pearcey			Address			
Address	2261 Corbin Rd.			Address	Emma Marus			City			
City	Sparwood	Prov.	BC	Address	8664 commerce Court			City			
Postal Code	V0B 2G0	Country	Canada	City	Burnaby	State	BC	Postal Code		Country	
Phone Number	250 425 7321			Postal Code	V5A 4N7	Country	Canada	Task Code			
Email EDD To	Rick.Magliocco@teck.com			Phone Number	604-420-8773			Shipping Company			
	Don.Sacino@teck.com			Email Address	krysta@nautilusenvironmental.ca			Tracking Number			
	Bob.Werner@teck.com				emma@nautilusenvironmental.ca			CC Hardcopy To			
	Errin.deBoer@teck.com			PO Number	CMO00478260			CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION			
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	72h F. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalella P/F	30 d rainbow trout early life stage P/F	32d FHM P/F	30d RBT EA P/F				
① CM_MC2_WS_20170509_N	WS	9-May-17	11:00	G	7 x 20L	X	X	X	X	X	X				Week 3

Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions			
						Nautilus - Burnaby		May 10/17	09:45	7.5	Y/N	Y/N	Y/N
						NY - Nari Yamamoto					Y/N	Y/N	Y/N
						= Refresh sample =					Y/N	Y/N	Y/N
Sampler's Name		Don Sacino/Errin deBoer			Mobile #				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?	
Sampler's Signature					Date/Time		9 May 2017 11:00 AM						

① Clear, colourless, odourless,  
Some brown particulates

PRESERV. ANALYSIS

ANALYSIS REQUESTED

60 #

170361  
170360  
170362  
170363

32d FHM P/F conducted in Calgary  
30d RBT EA P/F Copper test

NY - Nari Yamamoto  
= Refresh sample =

9 May 2017 11:00 AM



COC ID: **20170509-1322**      TURNAROUND TIME:      RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Elisabeth Henson			Email 1:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email	elisabeth_henson@golder.com			Email 2:	Neil.MacDonald@teck.com	x	x	x
Address	PO Box 100			Address				Email 3:	teckcoal@equisonline.com			x
City	Elkford			City				PO number				
Postal Code	V0B 1H0			Postal Code				Country				
Phone Number	1-250-865-5204			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.	30 Day	Fathead	Minnow												
1045 2017/05/10 RW Beatspaw 8°C 2 x 20L carboys, 2 x 20L carboys NO STE, good cond																						
FR_FRCPI_QR_17042017_N	FR_FRCPI	WS		2017/05/09	09:53	G	2	2														
FR_UFR1_QR_17042017_N	FR_UFR1	WS		2017/05/09	12:08	G	2	2														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Granelle	09/09/17		

NR OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default)	X	Jason Granelle	(250) 865-5191
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: *Jason Granelle*      Date/Time: *May 09, 2017*

# Teck

COC ID: **May 9 TOX**      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		
Email	leigh.stickney@teck.com			Email				EQUIS:	GHO		
Address	PO Box 5000			Address	#4, 6125 - 12th Street S.E.			Report Format / Distribution			
								Yes	PDF	Yes	Excel
City	Elkford			Province	BC			City	Calgary		
Postal Code	V0B 1H0			Country	Canada			Province	AB		
Phone Number	250 865 3274			Postal Code	T2H 2K1			Country	Can		
				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
2017/05/10 1045 TW Bearspaw 8°C NO SFI good condition 2x20L carboys + 2x20L carboys.								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	76 C.dubia NO3/SO4	39 d rainbow trout early life stage NO3/SO4	72 hr P-Subcapitata	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyallicia P/F	30 d early life stage fathead minnow P/F	30 d early life stage fathead minnow SO4	
GH_FR1_WS_2017-05-09_N	GH_FR1	WS	N	9-May-17	10:00	G	2										X		
GH_ER2_WS_2017-05-09_N	GH_ER2	WS	N	9-May-17	12:41	G	2										X		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AT FILIATION	Date	Time	Accepted By/Affiliation	Date	Time

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	<input checked="" type="checkbox"/>	Sampler's Name	J. Krupp / B. Phillips
Priority (2-3 business days) - 50% surcharge	<input type="checkbox"/>	Sampler's Signature	<i>[Signature]</i>
Emergency (1 Business Day) - 100% surcharge	<input type="checkbox"/>	Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	<input type="checkbox"/>	Date/Time	



COC ID: **20170516-1305**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoat@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			Phone Number	604-420-8773							

SAMPLE DETAILS								ANALYSIS REQUESTED					Temp °C
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	30 Day Rainbow Trout early life stage P/F	28 Day H. azteca Pass/Fail	30d RBT EA P/F Rainbow Trout Microbial Testing Copper Test	32 d FHM P/F conducted in Calgary		
FR_FRCP1_QR_24042017_N	FR_FRCP1	WS		2017/05/16	11:17	G	7 x 20L	X	X	X	X		4.0
FR_UFRI_QR_24042017_N	FR_UFRI	WS		2017/05/16	09:54	G	7 x 20L	X	X	X	X		3.5
								170360	170361	170363	170362		
= refresh sample =													

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Granelle	05/16/17	Nautilus - Burnaby	May 17/17 @ 10:00
			NY - Mai Yamamoto	

NB OF BOTTLES RETURNED/DESCRIPTION	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	Jason Granelle	(250) 865-5191
	Jason Granelle	May 16/17

**COC ID:** May 16 2017 TOX

**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	Krysta Pearcy			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	Yes	Excel	
City	Elkford	Province	BC	City	Imperial Square Lake City	Province	BC	Email 1: leigh.stickney@teck.com				
Postal Code	VOB 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Can	Email 2: sean.beswick@teck.com				
Phone Number	250 865 3274			Phone Number				Email 3: jevin.wolchuk@teck.com				
								PO number				

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

Please indicate below Filtered, Preserved or both (F, P, F/P)

① slightly turbid, slightly grey-brown, odorless, brown particulates.

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	None	#N/A	#N/A	
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C. dubia P/F	39 d rainbow trout early life stage NO3/504	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	32d FHM P/F	28 Day Hyallella P/F	Rainbow Trout Microbial Testing Copper Test	7 Day Rainbow Trout P/F	Temp °C	
GH_FRI_WS_2017-05-16_N	GH_FRI	WS	N	16-May-17	13:30	G	7 x 20L							x	X	x	x			3.0
GH_ERC_WS_2017-05-16_N	GH_ERC	WS	N	16-May-17	12:17	G	3 x 20L							x						4.5
GH_ER2_WS_2017-05-16_N	GH_ER2	WS	N	16-May-17	9:55	G	4 x 20L							x	X	x				3.5

= refresh sample =

WO # 170360  
170362  
170361  
170363

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
				Nautilus - Burnaby	May 17/17	10:00
				NY - New Yamamoko		

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	J. Kropp / B. Phillips
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	J. Kropp / B. Phillips
Emergency (1 Business Day) - 100% surcharge		Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	

# Teck

COC ID:	20170516N			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		Report Format / Distribution
Job Description	SA Chronic Toxicity Sampling			Lab Contact	Krysta Peracy		Excel
Project Manager	Jeff Williams			Email	krysta@nautilusenvironmental.ca		PDF
Email	Jeff.Williams@teck.com			Address	8664 Commerce Court		EDD
Address	RR#1 HWY# 3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8746			Phone Number			

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	C=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED							Temp °C	
								30-day rainbow trout early life stage P/F CARBOYS	72h P.subscriptum P/F	7d C.dupia P/F						
① EV_HCI_WS_2017-05-16_N	EV_HCI	WS	N	2017/05/16	12:20	G	3 x 20L	3								4.5
① EV_MC2_WS_2017-05-16_N	EV_MC2	WS	N	2017/05/16	7:35	G	3 x 20L	3								4.0
							Total	6	WO # 170360							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
72h P.subscriptum P/F	30d rainbow trout early life stage P/F	7d C.dupia P/F			Nautilus - Burnaby	May 17/17 @ 10:00
					NY - Nain Yawamoko	= refresh sample =
NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Mobile #	Date/Time	
Regular (default) X		Jesse Way			May 16, 2017 15:00	
Priority (2-3 business days) - 50% surcharge		Sampler's Signature				
Emergency (1 Business Day) - 100% surcharge		m Way				
For Emergency <1 Day, ASAP or Weekend - Contact ALS						

① slightly turbid, slightly grey-brown, odourless, many particulates.



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name Coal Mountain Operation  
 Contact Name Bob Werner  
 Address 2261 Corbin Rd.  
 City Sparwood Prov. BC  
 Postal Code V0B 2G0 Country Canada  
 Phone Number 250 425 7321  
 Email EDD To Rick.Maglio@teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com  
 Errin.deBoer@teck.com

Lab Name Nautilus Environmental  
 Contact Name Krysta Pearcy  
 Emma Marus  
 Address 8664 commerce Court  
 City Burnaby State BC  
 Postal Code V5A 4N7 Country Canada  
 Phone Number 604-420-8773  
 Email Address krysta@nautilusenvironmental.ca  
 emma@nautilusenvironmental.ca  
 PO Number CMO00478260

Send Invoice To  
 Address  
 City  
 Postal Code  
 Country  
 Task Code  
 Shipping Company  
 Tracking Number  
 CC Hardcopy To  
 CC Hardcopy To

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS REQUESTED					TEMP °C	ADDITIONAL INFORMATION	
							72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallella P/F	30 d rainbow trout early life stage P/F	30d Rainbow Trout EA P/F Microbial Testing - Copper Test			32 d FHM P/F
① CM_MC2_WS_20170516_N	WS	16-May-17	08:30	G	7 x 501				X	X	X	X	4.8	Week 4
								170361						
								170360						
								170363						
								170362						

= refresh sample =

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions				
				Nautilus - Burnaby				May 17 / 17	10:00	Y / N	Y / N	Y / N
				NY - Nari Yamamoto						Y / N	Y / N	Y / N
										Y / N	Y / N	Y / N
Sampler's Name		Don Sacino/Errin deBoer		Bob Werner		Mobile #		Temp in °C	Samples on ice?	Sample intact?	Trip Blank?	
Sampler's Signature				Date/Time		May 16, 2017						

COC ID: 20170516-0913

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO

LABORATORY

OTHER INFO

Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Krysta Percy			Email 1:	jay.jones@teck.com	x	x
Email	jay.jones@teck.com			Email	Krysta@NautilusEnvironmental.ca			Email 2:	chris.blurton@teck.com	x	x
Address	Box 2003			Address	8664 comnerce Court			Email 3:	teckcoal@egulsonline.com		x
	15km North Hwy 43							Email 4:	lee.wilm@teck.com	x	x
City	Sparwood	Province	BC	City	Burnaby	Province	BC				
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	432106		
Phone Number	250-425-6111			Phone Number	604-420-8773						

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - P: Field, L: Lab, FL: Field & Lab, N: Non

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7 d C.dubia dilution series	72hr P.subcapitata dilution series	7d L. minor plant grown dilution series	7 d O mykiss development dilution series	72h P. subcapitata P/F	7d C.dubia P/F	30 d rainbow trout early life stage P/F	Temp °C
① LC_LCDSSLCC_WS_2017-05-15_N	LC_LCDSSLCC	WS	N	16-May-17	8:50	G	3x20							X	4.0

WO# 170360

= refresh sample =

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	T Phillips/ NUPQU	May 16, 2017	Nautilus - Burnaby	May 17/17 @ 10:00
			NY - Nan Yaomonok	
NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Tyler Phillips	Mobile #	(250) 919-0965
Regular (default) X	Sampler's Signature		Date/Time	May 16, 2017
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

# Teck

COC ID: 20170516-1321

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY			OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual		Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Elisabeth Henson		Email 1:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email	elisabeth_henson@golder.com		Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address			Email 3:	teckcoal@equisonline.com			x
City	Elkford		Province	BC		City			PO number		
Postal Code	V0B 1H0		Country	Canada		Postal Code					
Phone Number	1-250-865-5204			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.	30 Day Fathead Minnow			
1617-0888 FR_FRCPI_QR_24042017_N	FR_FRCPI	WS		2017/05/16	11:17	G	2	2			
FR_UFRI_QR_24042017_N	FR_UFRI	WS		2017/05/16	09:54	G	2	1			

BEARS PAW  
@ 1130, 2017/05/17  
4x 20L CARBOYS  
NO S/I  
40 GOOD CONDUCTION

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Gravelle	05/16/17		

NO OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Jason Gravelle	(250) 865-5191
Priority (2-3 business days) - 50% surcharge	Jason Gravelle	May 16, 2017
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS		



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name: Coal Mountain Operation				Lab Name: Hydroqual Laboratories				Send Invoice To:			
Contact Name: Bob Werner				Contact Name: Claudio Quinteros				Address:			
Address: 2261 Corbin Rd.				Address: Jessica Wang							
City: Sparwood		Prov.: BC		Address: #4, 6125-12th Street S.E.				City:		State:	
Postal Code: V0B 2G0		Country: Canada		City: Calgary		State: AB		Postal Code:		Country:	
Phone Number: 250 425 7321				Postal Code: T2H 2K1		Country: Canada		Task Code:			
Email EDD To: Rick.Maglio@teck.com				Phone Number: 403-253-7121				Shipping Company:			
Don.Saeino@teck.com				Email Address: claudio@nautilusenvironmental.ca				Tracking Number:			
Bob.Werner@teck.com				jessica@nautilusenvironmental.ca				CC Hardcopy To:			
Erin.deBoer@teck.com				PO Number: CMO00478075				CC Hardcopy To:			

SAMPLE DETAILS						ANALYSIS REQUESTED										ADDITIONAL INFORMATION		
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.													
CM_MC2_WS_20170516_N	WS	May 16, 2017	08:30	G	1											Week 4		

1617-0890

BEARSPAW

2017/05/17

@ 11:30

2 x 20 L CARBOYS

GOOD CONDITION

40 NO S/I

Additional Comments/Special Instructions		Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions			
										Y/N	Y/N	Y/N	
		Don.Saeino/Erin.deBoer				Bob Werner				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
		Sampler's Name		Mobile #									
		Sampler's Signature				Date/Time	May 16, 2017						

COC ID: **20170523-1323**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.Macdonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			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	TEMP °C	Filtered - F: Field; L: Lab; FL: Field & Lab; N: None									
① FR_FRCPI_QR_01052017_N	FR_FRCPI	WS		2017/05/23	09:16	G	6 X 20	30 Day Rainbow Trout Early Life Stage Pass/Fail	10.0										
① FR_UFRI_QR_01052017_N	FR_UFRI	WS		2017/05/23	09:25	G	6 X 20	Rainbow Trout Microbial Testing Copper Test	8.0										
								32d FHM P/F Conducted in Calgary.											
								WO # 170360											
								170363											
								170362											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Granelle	05/23/17	Nautilus - Burnaby	May 24/17 @ 10:30
			Ny. Nain Yamamoto	

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Jason Granelle	(250) 865-5191
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
	<i>Jason Granelle</i>	May 23, 2017

- refresh sample -

COC ID: **May 23 2017 TOX**      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	Krysta Pearcy			Site:	leigh.stickney@teck.com		EQulS:	GHO		
Email	leigh.stickney@teck.com			Email				Report Format / Distribution						
Address	PO Box 5000			Address	8664 Commence Court			Yes	PDF	Yes	Excel			
City	Elkford	Province	BC	City	Burnaby	Province	BC	Imperial Square Lake City				Email 1:	leigh.stickney@teck.com	
Postal Code	VOB 1H0		Country	Canada	Postal Code	V5A 4N7		Country	Can		Email 2:	sean.beswick@teck.com		
Phone Number	250 865 3274			Phone Number				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)												Temp °C
								#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	None	#N/A	
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	32d FHM P/F	28 Day Hyalella P/F	Rainbow Trout Microbial Testing Copper Test	7 Day Rainbow Trout P/F	Amphibian Testing	
GH_FRI_WS_2017-05-23_N	GH_FRI	WS	N	23-May-17	9:30	G	7 x 20L							X	X		X		X	10.0
GH_ERC_WS_2017-05-23_N	GH_ERC	WS	N	23-May-17	14:38	G	3 x 20L							X						11.0
GH_ER2_WS_2017-05-23_N	GH_ER2	WS	N	23-May-17	12:00	G	4 x 20L 3 x 20L							X	X				X	10.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
				Nautilus - Burnaby	May 24/17	10:30
				NY - Nari Yamamoto		

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	Sampler's Signature	Mobile #	Date/Time

① refresh sample

# Teck

COC ID:	20170523N			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job:	Elkview Operations			Lab Name:	Nautilus Environmental		Report Format / Distribution
Job Description:	SA Chronic Toxicity Sampling			Lab Contact:	Krysta Peracy		Excel
Project Manager:	Jeff Williams			Email:	krysta@nautilusenvironmental.ca		PDF
Email:	Jeff.Williams@teck.com			Email:	Jeff.Williams@teck.com		X
Address:	RR#1 HWY#3			Address:	8664 Commerce Court		X
					Imperial Square, Lake City		X
City:	Sparwood	Province:	BC	City:	Burnaby	Province:	BC
Postal Code:	V1C 4C3	Country:	Canada	Postal Code:	V5A 4N7	Country:	Canada
Phone Number:	1-250-425-8746			Phone Number:			PO number
							475474

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 CARBOYS	72h P. subcapitata P/F	7d C.dupia P/F						
EV_HC1_WS_2017-05-23_N	EV_HC1	WS	N	2017/05/23	10:40	G	3 x 20L		3								TEMP °C
EV_MC2_WS_2017-05-23_N	EV_MC2	WS	N	2017/05/23	7:40	G	3 x 20L		3								9.5
																	6.0
					Total		6										

*① Slightly turbid, slightly grey-brown, odorless, brown particulates.*

*wo# 170360*

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
72h P.subcapitata P/F 30d rainbow trout early life stage P/F			Nautilus - Burnaby NY - Nani Yamamoto	May 24/17 @ 10:30

NB OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Jesse Woy	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge	<i>[Signature]</i>	May 28, 2017
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

*= refresh sample =*



# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Bob Werner  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7321  
 Email EDD To: Rick.Magliocco@teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com  
 Errin.deBoer@teck.com

Lab Name: Nautilus Environmental  
 Contact Name: Krysta Pearcy  
 Emma Marus  
 Address: 8664 commerce Court  
 City: Burnaby State: BC  
 Postal Code: V5A 4N7 Country: Canada  
 Phone Number: 604-420-8773  
 Email Address: krysta@nautilusenvironmental.ca  
 emma@nautilusenvironmental.ca  
 PO Number: CMO00478260

Send Invoice To: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_  
 Postal Code: \_\_\_\_\_ Country: \_\_\_\_\_  
 Task Code: \_\_\_\_\_  
 Shipping Company: \_\_\_\_\_  
 Tracking Number: \_\_\_\_\_  
 CC Hardcopy To: \_\_\_\_\_  
 CC Hardcopy To: \_\_\_\_\_


**SAMPLE DETAILS**

**ANALYSIS REQUESTS**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS	72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallella P/F	30 d rainbow trout early life stage P/F	Rainbow Trout Microbial Testing Copper Test	32d FHM P/F	Conducted in Calgary	Temp °C	ADDITIONAL INFORMATION
① CM_MC2_WS_20170523_N	WS	23-May-17	12:30	G	2 x 20L						X	X	X		8.0	CO4 x 20L arrived May 26/17 @ 08:50 T= 9.0°C from Nautilus Calgary. Here they were sent by mistake.

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions
				Nautilus - N.Y. - Nan Yaononob Burnaby	May 24/17	10:30	Y / N Y / N Y / N
							Y / N Y / N Y / N
							Y / N Y / N Y / N

Sampler's Name	Don Sacino/Errin deBoer	Mobile #	
Sampler's Signature		Date/Time	May 23, 2017

**COC ID:** 20160523-1421      **TURNAROUND TIME:**      **RUSH:**

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Burnaby			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Can Dang			Email 1:	jay.jones@teck.com	x	x	
Email	jay.jones@teck.com			Email	can.dang@alsglobal.com			Email 2:	chris.blurton@teck.com	x	x	
Address	Box 2003 15km North Hwy 43			Address	8081 Lougheed Hwy			Email 3:	teckcoal@equisonline.com			x
City	Sparwood	Province	BC	City	Burnaby	Province	BC	Email 4:	lee.wilm@teck.com	x	x	
Postal Code	V0B 2G0		Country	Canada	Postal Code	V5A 1W9		Country	Canada	PO number	432106	
Phone Number	250-425-6111			Phone Number	604-253-4188							

SAMPLE DETAILS								ANALYSIS REQUESTED														
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	7 d C dubia dilution series	72hr P subcapitata dilution series	7d L minor plant grown dilution series	7 d O mykiss development dilution series	72h P. subcapitata P/F	7d C. dubia P/F	30 d rainbow trout early life stage P/F							Temp °C	
LC_LCDSSLCC_WS_2017-05-22_N	LC_LCDSSLCC	WS	N	23-May-17	14:22	G	3 x 200l							X								9.0
<p><i>Clear, colourless, odourless, some black particulates.</i></p> <p><i>w/o # 170360</i></p> <p><i>= refresh sample =</i></p>																						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	T Phillips/ NUPQU	May 23, 2017	Nautilus - Burnaby NY - Nari Yamamoto	May 24/17 @ 10:30
NB OF BOTTLES RETURNED/DESCRIPTION	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	Tyler Phillips		(250) 919-0965	May 23, 2017



# Teck

**COC ID:** May 23 2017 TOX

**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:	sean.beswick@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
1607-0886 GH_FR1_WS_2017-05-23_N	GIL_FR1	WS	N	23-May-17	9:30	G	2	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia NO3/SO4	39 d rainbow trout early life stage NO3/SO4	72 hr P Subcapitata	30 day rainbow trout early life stage P/F	28 day H azteca	28 Day Hyalella P/F	30 d early life stage fathead minnow P/F	30 d early life stage, fathead minnow SO4	
GH_ER2_WS_2017-05-23_N	GIL_ER2	WS	N	23-May-17		G	2										X	X	

BEARSPAW  
Q 1230 2017/05/24  
2x 20 L CARBOYS  
NO S/I  
100  
GOOD CONDITION

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS			RELINQUISHED BY/AFFILIATION		Date	Time	Accepted By/Affiliation		Date	Time
			J. Enns		23-May-17	10:00				

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	J. Enns
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	<i>[Signature]</i>
Emergency (1 Business Day) - 100% surcharge		Mobile#	425-1170
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	23-May-17

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To			
Contact Name	Bob Werner			Contact Name	Claudio Quiñeros			Address			
Address	2261 Corbin Rd.				Jessica Wang						
City	Sparwood	Prov.	BC	Address	#4, 6125-12th Street S.E.			City			
Postal Code	V0B 2G0	Country	Canada	City	Calgary	State	AB	Postal Code		Country	
Phone Number	250 425 7321			Postal Code	T2H 2K1	Country	Canada	Task Code			
Email EDD To	Rick.Maghocco@teck.com			Phone Number	403-253-7121			Shipping Company			
	Don.Sucino@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number			
	Bob.Werner@teck.com				jessica@nautilusenvironmental.ca			CC Hardcopy To			
	Erin.deBoer@teck.com			PO Number	CM000478075			CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION		
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS								
CM_MC2_WS_20170523_N	WS	May 23, 2017	12:30	G.	1	RESERV								Week 4
1617-0890														

BEAR'S PAW  
 @ 12:30 2017/05/24  
 6x20 L CAR BOX  
 10°  
 GOOD CONDITION

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions		
							Y/N	Y/N	Y/N

Sampler's Name	Don Sacino/Erin deBoer	Mobile #		Temp in °C	
Sampler's Signature	<i>Bob W</i>	Date/Time		Samples on ice	
				Sample intact?	
				Trip Blank?	

COC ID: **20170530-1237**      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:	lee.wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.MacDonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			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.	30 DAY RAINBOW TROUT EARLY LIFE STAGE PF	RAINBOW TROUT EA PF MICROBIAL TESTING - Copper Toxic							Temp °C	
② FR_FRCP1-WS-201705301050	FR_FRCP1	WS		2017/05/30	10:50	G	6x20L	3	3								11.5
① FR_FUFR1-WS-201705300908	FR_FUFR1	WS		2017/05/30	09:08	G	6x20L	3	3								9.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Gravelle	05/30/17	Nautilus - Burnaby	May 31/17 @ 09:30
			NY - Nain Yamamoto	= refresh sample =

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	Mobile #	Sampler's Signature	Date/Time
					Jason Gravelle	(250) 865-5191	<i>Jason Gravelle</i>	May 30, 2017



# Teck

COC ID:	20170530N			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Elkview Operations			Lab Name	Nautilus Environmental		
Job Description	SA Chronic Toxicity Sampling			Lab Contact	Krysta Peracy		
Project Manager	Jeff Williams			Email	krysta@nautilusenvironmental.ca		
Email	Jeff.Williams@teck.com			Address	8664 Commerce Court		
Address	RR#1 HWY# 3				Imperial Square, Lake City		
City	Sparwood	Province	BC	City	Burnaby	Province	BC
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-425-8746			Phone Number			

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 CARBOYS	72h P. subcapitata P/F	7d Cdopia P/F					Temp °C
① EV_HC1_WS_2017-05-30_N	EV_HC1	WS	N	2017/05/30	10:00	G	3 x 20L		3							10.5
② EV_MC2_WS_2017-05-30_N	EV_MC2	WS	N	2017/05/30	13:20	G	3 x 20L		3							10.0
						Total										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME	ACCEPTED BY/AFFILIATION		DATE/TIME
72h P.subcapitata P/F	30d rainbow trout early life stage P/F				Nautilus - Burnaby	May 31/17 @ 09:30	
					NY - New Yamamoto	= refresh sample =	

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default) X		<i>Cameron Griffin</i>	
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge		<i>[Signature]</i>	30 MAY 2017
For Emergency <1 Day, ASAP or Weekend - Contact ALS			



# Chain Of Custody Record

**COC ID:** 20160823-0823

Page: 1 of 1

**Turnaround Time:**

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name	Coal Mountain Operation	Lab Name	Nautilus Environmental	Send Invoice To	
Contact Name	Bob Werner	Contact Name	Krysta Pearcy	Address	
Address	2261 Corbin Rd.		Emma Marus		
City	Sparwood	Prov.	BC	Address	8664 commerce Court
Postal Code	VOB 2G0	Country	Canada	City	Burnaby
Phone Number	250 425 7321	City	Burnaby	State	BC
Email EDD To	Rick.Magliocco@teck.com	Postal Code	V5A 4N7	Country	Canada
	Don.Sacino@teck.com	Phone Number	604-420-8773	Task Code	
	Bob.Werner@teck.com	Email Address	krysta@nautilusenvironmental.ca	Shipping Company	
	Errin.deBoer@teck.com	PO Number	CMO00478260	Tracking Number	
				CC Hardcopy To	
				CC Hardcopy To	

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS	72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyallella P/F	30 d rainbow trout early life stage P/F	Rainbow Trout EA P/F Microbial Testing - Copper Test	Temp (°C)	ADDITIONAL INFORMATION
① CM_MC2_WS_20170530_N	WS	30-May-17	12:42	G	6x20L						X	X	11.0	Week 4

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions
1 carboy leaked, had the lid broken, but still 3/4 full. NY				Nautilus - NY - Nanaimo			Y / N   Y / N   Y / N
				Burnaby			Y / N   Y / N   Y / N
					MAY 31/17	09:30	Y / N   Y / N   Y / N
							Y / N   Y / N   Y / N
Sampler's Name	Don Sacino/Kim		Mobile #				Temp in °C
Sampler's Signature			Date/Time	MAY 30/17			Samples on ice?
							Sample intact?
							Trip Blank?

= refresh sample =

WO# 170360  
 170363

14:50



COC ID: **20170530-1237**      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:	Lee.Wilm@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.MacDonald@teck.com	x	x	x
Address	PO Box 100			Address	8664 Commerce Court			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Burnaby	Province	BC	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada					
Phone Number	1-250-865-5204			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.	30 DAY RAINBOW TROUT EARLY LIFE STAGE P/F	RAINBOW TROUT EA P/F MICROBIAL TESTING - Copper Test										
① FR_FRCP1-WS-201706061031	FR_FRCP1	WS		2017/06/06	10:31	G	① 6 x 20L	3	3										10.5 9.5
① FR_UFRI-WS-201706060932	FR_UFRI	WS		2017/06/06	09:32	G	6 x 20L	3	3										9.5

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Gravelle	06/06/17	Nautilus - Burnaby NY - Nain Yamamoto	Jun 07/17 @ 08:45
				= refresh sample =

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	Mobile #	Sampler's Signature	Date/Time
					Jason Gravelle	(250) 865-5191	Jason Gravelle	June 06, 2017

① 1 canbox 1/4 full - NY

**COC ID:** June 6 2017 TOX

**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	Krysta Pearcy			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	Yes	Excel
					Imperial Square Lake City			Email 1: leigh.stickney@teck.com			
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 2: sean.beswick@teck.com			
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Can	Email 3: jeremy.enns@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)

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	Note	#N/A	P
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage INO3/SO4	72 hr P. Subcapitata P/F	30 day rainbow trout early life stage P/F	28 day H. azteca	28 Day Hyalella P/F	Rainbow Trout Microbial Testing EA P/F - CopiaTest	7 Day Rainbow Trout P/F	Tadpole Development Study
GH_FR1_WS_2017-06-06_N	GH_FR1	WS	N	6-Jun-17	9:15	G	6 x 20L							X			X		
GH_ERC_WS_2017-06-06_N	GH_ERC	WS	N	6-Jun-17	12:04	G	3 x 20L							X					
GH_ER2_WS_2017-06-06_N	GH_ER2	WS	N	6-Jun-17	10:45	G	6 x 20L							X					

① slightly turbid, slightly grey-brown, odourless, brown particulates  
 ② clear, colourless, odourless, some brown particulates

Temp °C - 20L  
 8.5  
 9.3

wo #  
 170360  
 170363  
 170497

= refresh sample =

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	JKropp/B. Phillips	6/6/2017		Nautilus-Burnaby	Jun 07/17	08:45
				M. Nani Yamamoto		

SERVICE REQUEST (rush - subject to availability)		Sampler's Name	Mobile #
Regular (default)	X	Jenni Kropp / Baylee Phillips	
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
		<i>Jenni Kropp / Baylee Phillips</i>	

# Teck

<b>COC ID:</b> 20170606N		<b>TURNAROUND TIME:</b>		<b>RUSH:</b>			
<b>PROJECT/CLIENT INFO</b>				<b>LABORATORY</b>		<b>OTHER INFO</b>	
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Email 5: Teck.Lab.Results@sharepoint.teck.com				X	X	X	
PO number				475474			

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 CARBOYS	72h P. subcapitata P/F	7d C.dupia P/F						Temp °C
① EV_HCI_WS_2017-06-06_N	EV_HCI	WS	N	2017/06/06	7:30	G	① 1x20L		3								9.4
② EV_MC2_WS_2017-06-06_N	EV_MC2	WS	N	2017/06/06	8:45	G	① 1x20L		3								9.0
<b>Total</b>							<b>6</b>										

<b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b>				<b>REINQUISHED BY/AFFILIATION</b>				<b>DATE/TIME</b>				<b>ACCEPTED BY/AFFILIATION</b>				<b>DATE/TIME</b>			
72h P.subcapitata P/F 30d rainbow trout early life stage P/F												Nautilus - Burnaby NY - Nari Yamamoto				Jun 07/17 @ 08:45 = refresh sample =			

<b>NE OF BOTTLES RETURNED/DESCRIPTION</b>		<b>Sampl'er's Name</b>		<b>Mobile #</b>	
Regular (default)	X	JAMES BOLDT			
Priority (2-3 business days) - 50% surcharge		7-73-J			
Emergency (1 Business Day) - 100% surcharge		<b>Sampl'er's Signature</b>		<b>Date/Time</b>	
For Emergency <1 Day, ASAP or Weekend - Contact ALS				JUNE 6 2017	

① 1 canboy leaked but still 1/2 full - NY

# Chain Of Custody Record

COC ID: 20160823-0823

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

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**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV	ANALYSIS					Temp °C	ADDITIONAL INFORMATION
							72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalella P/F	30 d rainbow trout early life stage P/F	Rainbow Trout EA P/F Microbial Testing - Copper Test		
① CM_MC2_WS_20170606_N	WS	6-Jun-17	10:20	G	6 x 20L							10.0	Week 4

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions				
				Nautilus - Burnaby	Jun 07/17	08:45	Y / N	Y / N	Y / N	Y / N	Y / N
				NP - Nari Yamamoto			Y / N	Y / N	Y / N	Y / N	Y / N
							Y / N	Y / N	Y / N	Y / N	Y / N
	Sampler's Name	DS/KS/BW	Mobile #				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?	
	Sampler's Signature			Date/Time	6-Jun-17	14:00					

① slightly turbid, slightly brown-green, odourless, brown particulates

EA P/F  
Microbial Testing - Copper Test

WO# 170360  
170363

=refresh sample =

COC ID: **20160606-1531**      TURNAROUND TIME:      RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
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Phone Number	250-425-6111			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.	7 d Cdubia dilution series	72hr Psubcapitata dilution series	7d L minor plant grown dilution series	7 d O mykis development dilution series	72h P. subcapitata P/F	7d C.dubia P/F	30 d rainbow trout early life stage P/F												
LC_LCDSSLCC_WS_2017-06-05_N	LC_LCDSSLCC	WS	N	6-Jun-17	14:35	G	3 x 20L							X									Temp °C			
																							9.5			
wo # 170360																										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	T Phillips/ NUPQU	June 6, 2017	Nautilus - Burnaby NY- Nari Yamamoto	Jun 07/17 @ 08:45
= refresh sample =				
NB OF BOTTLES RETURNED/DESCRIPTION	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	Tyler Phillips		(250) 919-0965	June 6, 2017

**END OF REPORT**

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Appendix B-3  
Third Quarter 2017 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 2017 Results

Final Report

December 22, 2017

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>Hyaella azteca</i> .....	10
3.4 <i>Pimephales promelas</i> .....	10
4.0 QA/QC .....	15
5.0 References .....	16

### 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.	Results: <i>Ceriodaphnia dubia</i> survival and reproduction test.....	12
Table 7.	Results: <i>Pseudokirchneriella subcapitata</i> growth inhibition test.....	13
Table 8.	Results: <i>Hyaella azteca</i> survival and growth test.....	13
Table 9.	Results: <i>Pimephales promelas</i> survival and growth test.....	14
Table 10.	Reference toxicant test results.....	15

### List of Figures

Figure 1.	Chronic toxicity monitoring locations.....	3
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## 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

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## SIGNATURE PAGE

### Original Signed By

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Report By:  
Krysta Percy, R.P.Bio.  
Laboratory Coordinator

### Original Signed By

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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 2017 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 and LC_LCDSSLCC*
Sample collection dates	July 25, August 1, 8, 15 and 22, 2017
Sample receipt dates	July 26, August 2, 9, 16 and 23, 2017
Sample receipt temperatures	Ranged from 10.0 to 19.9°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

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

## Summary of Results

Endpoint	Mean ± SD				
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1
<b><i>C. dubia</i></b>					
Survival (%)	100	100	100	100	100
Reproduction	18.4 ± 3.1	20.0 ± 1.8	22.5 ± 2.7	21.7 ± 3.2	13.8 ± 6.3 <sup>αβ†</sup>
<b><i>P. subcapitata</i></b>					
Cell Yield (x 10 <sup>4</sup> cells/mL)	37.6 ± 2.7	160.8 ± 10.8	158.1 ± 9.2	150.6 ± 10.2	134.8 ± 6.1 <sup>αβ†</sup>
<b><i>H. azteca</i></b>					
Survival (%)	82.0 ± 13.0	72.0 ± 17.9	68.0 ± 13.0	66.0 ± 16.7	68.0 ± 14.8
Dry weight (mg)	0.71 ± 0.27	0.72 ± 0.12	0.67 ± 0.23	0.46 ± 0.17	0.77 ± 0.05
<b><i>P. promelas</i></b>					
<b>(10 µg/L Cu treatments)</b>					
Hatch (%)	100 ± 0.0	98.3 ± 3.3	100 ± 0.0	100 ± 0.0	93.3 ± 7.7
Survival (%)	80.0 ± 5.4	78.3 ± 17.5	66.7 ± 21.1	73.3 ± 21.1	15.0 ± 22.0 <sup>*αβ†</sup>
Biomass (mg)	0.46 ± 0.03	0.60 ± 0.06	0.60 ± 0.15	0.59 ± 0.09	0.16 ± 0.23 <sup>*αβ†</sup>
Length (mm)	9.9 ± 0.1	8.3 ± 0.5 <sup>*</sup>	8.4 ± 0.3	8.1 ± 0.4 <sup>*</sup>	10.6 ± 2.0
Normal development (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

### Summary of Results (continued)

Endpoint	Mean ± SD					
	GH_FR1	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<b><i>C. dubia</i></b>						
Survival (%)	100	100	100	100	70	100
Reproduction	16.7 ± 4.0 <sup>β†</sup>	17.5 ± 5.2	17.7 ± 2.0 <sup>β†</sup>	19.3 ± 2.9	6.0 ± 3.7 <sup>*αβ†</sup>	19.2 ± 4.5
<b><i>P. subcapitata</i></b>						
Cell Yield (x 10 <sup>4</sup> cells/mL)	155.5 ± 4.7	156.5 ± 12.5	157.0 ± 12.1	158.3 ± 9.6	131.0 ± 8.8 <sup>αβ†</sup>	146.8 ± 10.1
<b><i>H. azteca</i></b>						
Survival (%)	64.0 ± 25.1	NT	NT	NT	0.0 ± 0.0 <sup>*αβ†</sup>	NT
Dry weight (mg)	0.76 ± 0.07	NT	NT	NT	0.0 ± 0.0 <sup>*αβ†</sup>	NT
<b><i>P. promelas</i></b>						
<b>(10 µg/L Cu treatments)</b>						
Hatch (%)	100 ± 0.0	NT	NT	NT	98.3 ± 3.3	NT
Survival (%)	73.3 ± 31.7	NT	NT	NT	50.0 ± 16.8 <sup>*α†</sup>	NT
Biomass (mg)	0.54 ± 0.22	NT	NT	NT	0.65 ± 0.14	NT
Length (mm)	8.9 ± 1.4	NT	NT	NT	9.4 ± 1.2	NT
Normal development (%)	100 ± 0.0	NT	NT	NT	100 ± 0.0	NT

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1



**Summary of Results (continued)**

Endpoint	Mean ± SD		
	Laboratory Control	FR_FRCP1	CM_MC2
<b><i>P. promelas</i></b>			
<b>(20 µg/L Cu treatments)</b>			
Hatch (%)	98.3 ± 3.3	100 ± 0.0	100 ± 0.0
Survival (%)	80.0 ± 18.0	66.7 ± 27.2	76.7 ± 15.9
Biomass (mg)	0.47 ± 0.11	0.46 ± 0.18	0.56 ± 0.07
Length (mm)	9.6 ± 0.2	9.9 ± 1.2	9.2 ± 0.4
Normal development (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0

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## 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 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. Samples were received at temperatures ranging from 10.0 to 19.9°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; the other toxicity tests were conducted at the Burnaby, BC location.

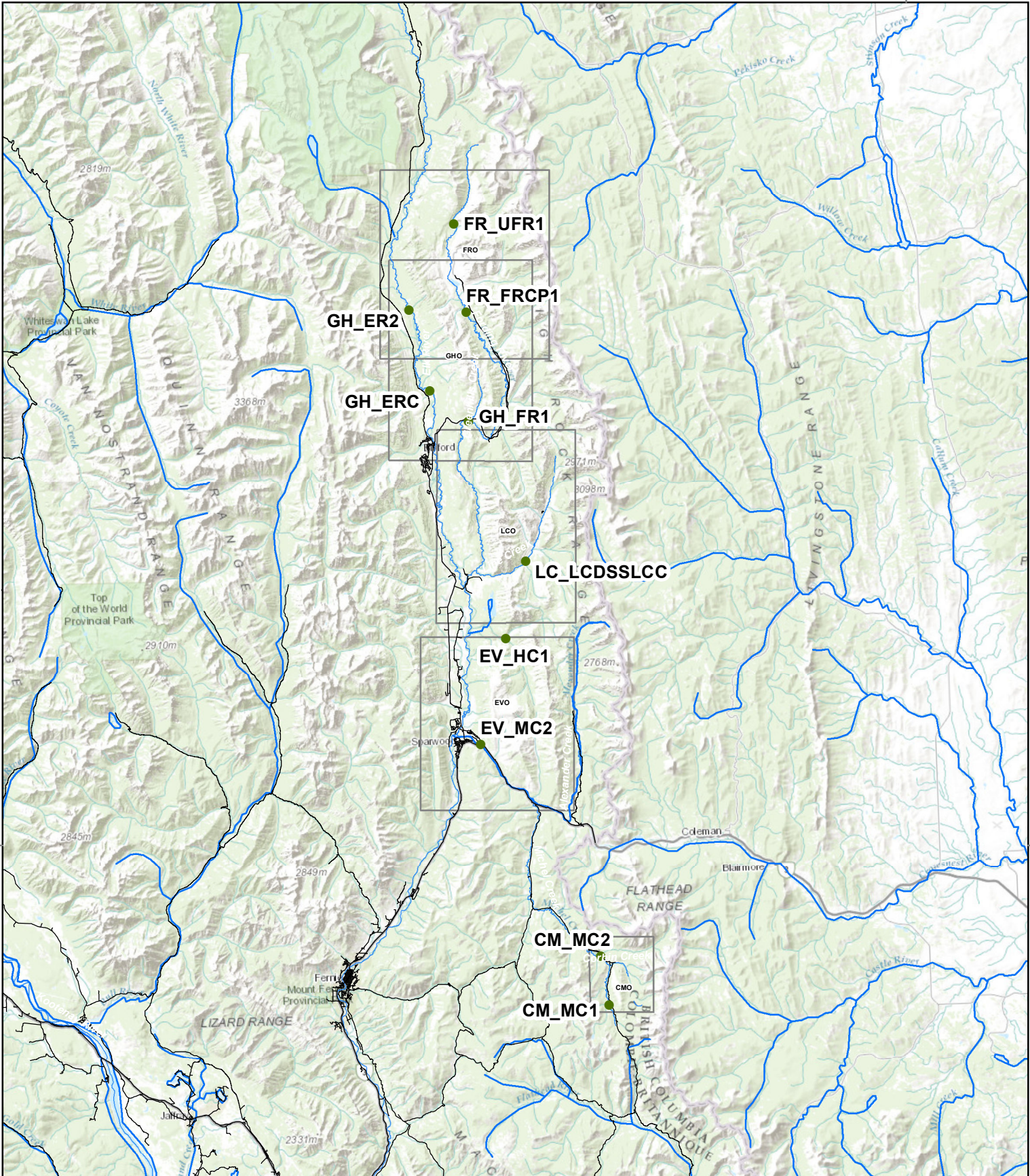
This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through D. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management 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> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
GH_ERC	E300090	<i>C. dubia</i> and <i>P. subcapitata</i>	July 25, 2017
EV_MC2	E300091	<i>C. dubia</i> and <i>P. subcapitata</i>	July 25, 2017
EV_HC1	E102682	<i>C. dubia</i> and <i>P. subcapitata</i>	July 25, 2017
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> and <i>P. promelas</i> <sup>†</sup>	July 25, August 1, 8, 15 and 22, 2017
LC_LCDSSLCC	E297110	<i>C. dubia</i> and <i>P. subcapitata</i>	July 25, 2017

\* Site water controls

† *P. promelas* tests were conducted on copper-treated samples

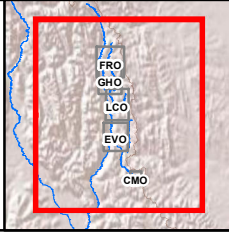


5,500,000

5,500,000

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### Chronic Toxicity Monitoring Locations

- Roads
- Rivers
- Monitoring Locations

N

0 4,000 8,000 16,000 Meters

DATE: 8/29/2017	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 for *P. promelas*; and moderately hard 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; Ksoz et al., 2009; 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. Samples FR\_FRPC1 and CM\_MC2 were also tested with the addition of 20 µg/L copper to test whether a higher dose of copper was required to effectively control the fungal and microbial growth in these samples, which had a higher hardness than the other samples. Copper-treated control water treatments, containing 10 and 20 µg/L 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/dilution 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 ehippia 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/dilution 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 <sub>4</sub> )

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

Test species	<i>Hyalella azteca</i>
Organism source	Aquatic Research Organisms, Hampton, 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/dilution water	Reconstituted water containing ~75 mg/L Cl and 0.8 mg/L Br (Environment Canada 2013). Samples 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 treated with 10 and/or 20 µg/L Cu, plus laboratory control and laboratory control treated with 10 and 20 µg/L Cu
Test replicates	4 per treatment
Number of organisms	10 per replicate
Control/dilution 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 performed similarly to 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.

Survival of *C. dubia* was 100% in the samples, with the exception of CM\_MC2, which had 70% survival. A statistically significant reduction in reproduction of *C. dubia* was observed in one sample, CM\_MC2, compared to the laboratory control; percent reduction was 67%. Relative to the Fording River site water control, a statistically significant reduction in reproduction was observed in two samples (FR\_FRCP1 and CM\_MC2); the reduction was 31% for FR\_FRCP1 and 70% for CM\_MC2. A statistically significant reduction in reproduction was observed in four samples (FR\_FRCP1, GH\_FR1, EV\_MC2 and CM\_MC2) relative to the Elk River and Michel Creek site water controls; reduction in reproduction ranged from 21% in EV\_MC2 to 73% in CM\_MC2 compared to the Elk River site water control, and from 18% in EV\_MC2 to 72% in CM\_MC2 compared to the Michel Creek site water control.

### 3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 7. In these tests, the Fording River, Elk River, and Michel Creek site water controls produced 4.0 to 4.3-fold greater growth than the laboratory water controls. 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.

All of the samples exhibited a stimulation of cell growth relative to the laboratory water control; there was no adverse effect on cell growth compared to the laboratory water control. Two samples (FR\_FRCP1 and CM\_MC2) exhibited a statistically significant reduction in cell growth relative to the Fording River, Elk River and Michel Creek site water controls. For FR\_FRCP1, percent reduction was 16, 15 and 10%, relative to the Fording River, Elk River and Michel Creek site water controls, respectively. Percent reduction in CM\_MC2 relative to the Fording River, Elk River and Michel Creek site water controls was 19, 17 and 13%, respectively.

### 3.3 *Hyaella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 8. Survival and dry weight in the Fording River, Elk River and Michel Creek site water controls were similar to the laboratory water control for this species, indicating that there were no adverse effects associated with the upstream Fording River, Elk River and Michel Creek stations.

A statistically significant reduction in survival and dry weight was only observed in sample CM\_MC2. There were no surviving *H. azteca* in sample CM\_MC2 at test termination, therefore percent reduction relative to the laboratory control, Fording River, Elk River and Michel Creek site water controls was 100% for survival and dry weight.

### 3.4 *Pimephales promelas*

Results of the toxicity tests using *P. promelas* are provided in Table 9. Hatch, survival, biomass, and normal development (i.e., incidence of deformities) were similar in the Fording River, Elk River and Michel Creek site water controls and laboratory control, indicating that there were no adverse effects associated with the upstream Fording River, Elk River and Michel Creek stations for these endpoints. Length in the Fording River and Michel Creek site water control was statistically significantly lower than the copper-treated laboratory control; percent reduction was 16% for the Fording River site water control and 18% for the Michel Creek site water control.

There were no statistically significant reductions in hatch, length or normal development (i.e., incidence of deformities) in the samples relative to the copper-treated laboratory control, Fording River site water control, Elk River site water control or Michel Creek site water control. Survival and biomass were statistically significantly reduced in sample FR\_FRCP1 relative to the copper-treated laboratory control and Fording River, Elk River and Michel Creek site water controls; percent reduction ranged from 78 to 81% for survival and from 73 to 66% for biomass, compared to the copper-treated laboratory control and the three site water controls. Sample CM\_MC2 exhibited a statistically significant reduction in survival relative to the copper-treated laboratory control, Fording River site water control and Michel Creek site water control; percent reduction ranged from 32 to 38% relative to the copper-treated laboratory control and Fording River and Michel creek site water controls.

Fathead minnows are known to be susceptible to adverse effects caused by fungi and microbes (Grothe and Johnson, 1996; Ksoz et al., 1997; Downey et al. 2000). Amending the samples with 10 µg/L copper successfully curtailed fungal growth in majority of the samples, similar to the results from prior rounds of testing. However, samples FR\_FRCP1 and CM\_MC2 treated with 10

$\mu\text{g/L}$  copper still exhibited adverse effects that appear to be related to fungal or microbial growth. The adverse response observed on survival in FR\_FRCP1 and CM\_MC2 occurred primarily between Day 6 and 13 of exposure, which is consistent with the pattern of adverse responses that has previously been attributed to fungal or microbial growth.

Samples FR\_FRCP1 and CM\_MC2 were also tested with the addition of 20  $\mu\text{g/L}$  copper, since these samples had a higher hardness than the other samples, and it was anticipated that 10  $\mu\text{g/L}$  copper may not be sufficient to curtail microbial growth in these samples. No adverse effects were observed in the 20  $\mu\text{g/L}$  copper-treated samples compared to the 20  $\mu\text{g/L}$  copper-treated laboratory control. Survival and biomass were statistically significantly higher in the 20  $\mu\text{g/L}$  copper-treated FR\_FRCP1 sample, relative to the 10  $\mu\text{g/L}$  copper-treated sample. Survival in the 20  $\mu\text{g/L}$  copper-treated CM\_MC2 sample was statistically significantly higher than in the 10  $\mu\text{g/L}$  copper-treated sample. Thus, it appears that the concentration of 10  $\mu\text{g/L}$  copper added to samples FR\_FRCP1 and CM\_MC2 was not sufficient to entirely remove the adverse response caused by fungal or microbial growth.

Results of the laboratory control and copper-treated laboratory controls were similar for hatch, survival and normal development, indicating that there were no adverse effects associated with the 10 and 20  $\mu\text{g/L}$  copper additions for these endpoints. However, a statistically significant reduction in biomass was observed in the 10 and 20  $\mu\text{g/L}$  copper-treated laboratory controls relative to the un-treated laboratory control; biomass was reduced 28 and 27% for the 10 and 20  $\mu\text{g/L}$  copper-treated laboratory controls, respectively. A small (3 to 6%), but statistically significant reduction in length was also observed in the 10 and 20  $\mu\text{g/L}$  copper-treated laboratory controls relative to the laboratory control.

**Table 6. Results: *Ceriodaphnia dubia* survival and reproduction test.**

Sample ID	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	18.4 ± 3.1
FR_UFR1 (Site Control)	100	20.0 ± 1.8
GH_ER2 (Site Control)	100	22.5 ± 2.7
CM_MC1 (Site Control)	100	21.7 ± 3.2
FR_FRCP1	100	13.8 ± 6.3 <sup>αβ†</sup>
GH_FR1	100	16.7 ± 4.0 <sup>β†</sup>
GH_ERC	100	17.5 ± 5.2
EV_MC2	100	17.7 ± 2.0 <sup>β†</sup>
EV_HC1	100	19.3 ± 2.9
CM_MC2	70	6.0 ± 3.7 <sup>*αβ†</sup>
LC_LCDSSLCC	100	19.2 ± 4.5

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 7. Results: *Pseudokirchneriella subcapitata* growth inhibition test.**

Sample ID	Cell Yield (x 10 <sup>4</sup> cells/mL) (Mean ± SD)	Stimulation relative to laboratory control (%)
FR_UFR1 (Site Control)	160.8 ± 10.8	327.2
GH_ER2 (Site Control)	158.1 ± 9.2	320.3
CM_MC1 (Site Control)	150.6 ± 10.2	300.3
FR_FRCP1	134.8 ± 6.1 <sup>αβ†</sup>	258.1
GH_FR1	155.5 ± 4.7	313.3
GH_ERC	156.5 ± 12.5	315.9
EV_MC2	157.0 ± 12.1	317.3
EV_HC1	158.3 ± 9.6	320.6
CM_MC2	131.0 ± 8.8 <sup>αβ†</sup>	248.2
LC_LCDSSLCC	146.8 ± 10.1	290.0

SD = Standard Deviation

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 8. Results: *Hyaella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	82.0 ± 13.0	0.71 ± 0.27
FR_UFR1 (Site Control)	72.0 ± 17.9	0.72 ± 0.12
GH_ER2 (Site Control)	68.0 ± 13.0	0.67 ± 0.23
CM_MC1 (Site Control)	66.0 ± 16.7	0.46 ± 0.17
FR_FRCP1	68.0 ± 14.8	0.77 ± 0.05
GH_FR1	64.0 ± 25.1	0.76 ± 0.07
CM_MC2	0.0 ± 0.0 <sup>*αβ†</sup>	0.0 ± 0.0 <sup>*αβ†</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> 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	100 ± 0.0	78.3 ± 8.4	0.64 ± 0.05	10.2 ± 0.2	100 ± 0.0
<b>10 µg/L Cu treatment</b>					
Laboratory Control [+Cu]	100 ± 0.0	80.0 ± 5.4	0.46 ± 0.03	9.9 ± 0.1	100 ± 0.0
FR_UFR1 (Site Control) [+Cu]	98.3 ± 3.3	78.3 ± 17.5	0.60 ± 0.06	8.3 ± 0.5 *	100 ± 0.0
GH_ER2 (Site Control) [+Cu]	100 ± 0.0	66.7 ± 21.1	0.60 ± 0.15	8.4 ± 0.3	100 ± 0.0
CM_MC1 (Site Control) [+Cu]	100 ± 0.0	73.3 ± 21.1	0.59 ± 0.09	8.1 ± 0.4 *	100 ± 0.0
FR_FRCP1 [+Cu]	93.3 ± 7.7	15.0 ± 22.0 * <sup>αβ†</sup>	0.16 ± 0.23* <sup>αβ†</sup>	10.6 ± 2.0	100 ± 0.0
GH_FR1 [+Cu]	100 ± 0.0	73.3 ± 31.7	0.54 ± 0.22	8.9 ± 1.4	100 ± 0.0
CM_MC2 [+Cu]	98.3 ± 3.3	50.0 ± 16.8 * <sup>α†</sup>	0.65 ± 0.14	9.4 ± 1.2	100 ± 0.0
<b>20 µg/L Cu treatment</b>					
Laboratory Control [+Cu]	98.3 ± 3.3	80.0 ± 18.0	0.47 ± 0.11	9.6 ± 0.2	100 ± 0.0
FR_FRPC1 [+Cu]	100 ± 0.0	66.7 ± 27.2 §	0.46 ± 0.18 §	9.9 ± 1.2	100 ± 0.0
CM_MC2 [+Cu]	100 ± 0.0	76.7 ± 15.9 §	0.56 ± 0.07	9.2 ± 0.4	100 ± 0.0

SD = Standard Deviation

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

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

<sup>§</sup> Result was significantly higher than the respective 10 µg/L copper-treated sample

#### 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): 2.1 g/L NaCl	2.0 (1.9 – 2.2)	4	July 25, 2017
	Reproduction (IC50): 1.2 g/L NaCl	1.5 (1.1 – 2.2)	19	
<i>P. subcapitata</i>	Growth (IC50): 32.2 µg/L Zn	33.4 (26.4 – 42.3)	13	July 21, 2017
<i>H. azteca</i>	Survival (LC50): 5.6 g/L NaCl	5.8 (5.1 – 6.6)	7	July 26, 2017
<i>P. promelas</i>	Survival (LC50): 5.6 g/L NaCl	6.5 (4.0 – 10.7)	16	August 1, 2017
	Biomass (IC25): 3.3 g/L NaCl	3.8 (2.1 – 6.8)	19	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration



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## 5.0 REFERENCES

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**APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data**

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### Ceriodaphnia dubia Summary Sheet

Client: Peck Coal  
 Work Order No.: 170738

Start Date/Time: July 27/17 @ 1145h  
 Set up by: JS

**Sample Information:**

Sample ID: Various; see results table  
 Sample Date: July 25/17 for 10s  
 Date Received: July 26/17  
 Sample Volume: 1x20L

**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  $\geq 15$  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) =  $25 \pm 1$ ; DO (mg/L) = 3.3 to 8.4; pH = 6.0 to 8.5

**Test Organism Information:**

Broodstock No.: 071817B  
 Age of young (Day 0): 24-h (within 12-h)  
 Avg No. young in first 3 broods of previous 7 d: 4 20  
 Mortality (%) in previous 7 d: 0  
 Individual female # used  $\geq 8$  young on test day: 21, 22, 24, 30, 32

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: Ca162  
 Stock Solution ID: July 25/17 gen  
 Date Initiated: 7/25/17

7-d LC50 (95% CL): 2.1 (1.9-2.2) g/L NaCl  
 7-d IC50 (95% CL): 1.2 (1.0-1.6) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.9-2.2) g/L NaCl CV (%): 4  
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.5 (1.1-2.2) g/L NaCl CV (%): 19

**Test Results:**

	Survival (%)	Reproduction (Mean $\pm$ SD)
lab Negative Control	100	18.4 $\pm$ 3.1 <sup>b</sup>
FR-UFELQ-03072017N	100	20.0 $\pm$ 1.8
CM-MCL-WS-20170725N	100	21.7 $\pm$ 3.2
FR-FRCP1-Q-03072017-N	100	13.8 $\pm$ 6.3 <sup>abc</sup>
GH-FRL-WS-2017-07-25-N	100	16.7 $\pm$ 4.0 <sup>bc</sup>
GH-FR2-WS-2017-07-25-N	100	17.5 <del>18.7</del> $\pm$ 4.1 <sup>5.2</sup>
EV-MC2-WS-2017-07-25-N	100	17.7 $\pm$ 2.0 <sup>bc</sup>
EV-HCL-WS-2017-07-25-N	100	19.3 $\pm$ 2.9
CM-MW2-WS-2017-07-25-N	70	6.0 $\pm$ 3.7 <sup>*abc</sup>
LC-LCSSLR-WS-2017-05-22	100	19.2 $\pm$ 4.5
GH-FR2-WS-2017-07-25-N	100	22.5 $\pm$ 2.7

(site control)  
 \*reproduction significantly less than lab control  
 a=reproduction significantly less than site control FR-UFEL  
 b= reproduction significantly less than site control GH-FR2

C=reproductor significantly less than site control CM-MCL

Reviewed by: (site) JG

Date reviewed: Aug. 24/17

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck coal  
 Sample ID: Vanous passfall  
 Work Order #: 170738

Start Date & Time: July 27/17 @ 1145h  
 Stop Date & Time: Aug 02/17 @ 1500h  
 CER #: 4  
 Test Species: Ceriodaphnia dubia

100% (V/V)

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
20% Perrier															
Temperature (°C)	24.5	25.0	24.5	25.0	24.5	25.0	25.0	25.0	25.0	24.0	25.0	24.0	25.0	25.0	25.0
DO (mg/L)	8.0	7.6	8.0	7.5	8.0	7.4	8.1	7.7	8.0	7.4	8.0	7.3	7.3	7.3	7.3
pH	8.0	7.7	8.0	7.8	7.9	7.7	8.1	7.6	8.0	7.7	8.0	7.5	7.5	7.5	7.5
Cond. (µS/cm)	208	207		203		205		204		204		202		202	
Initials	JS	JS		JW		A		EMM		EMM		JS		JS	

(site control)

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
FR_UFRI															
Temperature (°C)	25.0	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	25.0
DO (mg/L)	7.9	7.6	8.2	7.5	8.2	7.4	8.3	7.8	8.2	7.3	8.2	7.4	7.4	7.4	7.4
pH	8.1	7.9	8.0	8.0	7.9	8.1	8.0	8.0	8.0	8.0	8.0	7.8	7.8	7.8	7.8
Cond. (µS/cm)	329	329		324		328		328		318		324		324	
Initials	JS	JS		JW		A		EMM		EMM		JS		JS	

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
CM_MCI															
Temperature (°C)	25.0	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	25.0
DO (mg/L)	8.1	7.5	8.2	7.4	8.1	7.5	8.2	7.8	8.2	7.3	8.1	7.4	7.4	7.4	7.4
pH	7.9	7.9	7.9	8.0	7.8	8.1	7.9	8.1	8.0	8.0	8.0	7.8	7.8	7.8	7.8
Cond. (µS/cm)	281	280		274		277	324	280		307		304		304	
Initials	JS	JS		JW		A		EMM		EMM		JS		JS	

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
FR_FRCP1															
Temperature (°C)	25.0	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	25.0
DO (mg/L)	8.1	7.6	8.2	7.5	8.2	7.4	8.3	7.3	8.2	7.3	8.3	7.4	7.4	7.4	7.4
pH	7.9	7.9	7.9	7.9	7.8	8.0	8.0	8.0	8.0	8.0	8.0	7.8	7.8	7.8	7.8
Cond. (µS/cm)	872	870		868		859		869		870		821		821	
Initials	JS	JS		JW		A		EMM		EMM		JS		JS	

Thermometer: 4 DO meter/probe: 1, 2 pH meter/probe: 1, 2 Conductivity meter/probe: 1, 2

	Control	FR_UFRI	CM_MCI	FR_FRCP1
Hardness*	96	100	166	600
Alkalinity*	100	96	158	206

Analysts: EMM, AWO, JS  
 Reviewed by: JS  
 Date reviewed: Aug. 24/17

\* mg/L as CaCO3

Sample Description:

Vanous ; see <sup>EMM</sup> for sample descriptions

Comments:

Broodboard Used: 07/8/17B (21, 22, 24-30, 32)

### Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck coal  
 Sample ID: vanous passfall  
 Work Order #: 170738

Start Date & Time: July 27/17 @ 1145h  
 Stop Date & Time: Aug 02/17 @ 15h 1500h  
 CER #: 4 JS  
 Test Species: Ceriodaphnia dubia

100% (v/v)

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
GH_FRI															
Temperature (°C)	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)	8.0	7.6	8.1	7.6	8.2	7.5	8.2	7.7	8.2	7.2	8.3	7.3			
pH	7.9	8.1	7.9	8.1	7.8	8.0	7.9	8.0	8.0	8.0	8.0	7.9			
Cond. (µS/cm)	759	744		748		747		745		742		731			
Initials	JS	JS		JW		A		EMM		EMM		JS			

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
GH_ERC															
Temperature (°C)	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)	8.0	7.5	8.2	7.5	8.2	7.4	8.3	7.1	8.2	7.2	8.3	7.3			
pH	7.9	8.0	7.9	8.1	7.8	8.1	7.9	8.1	7.9	8.0	8.0	7.9			
Cond. (µS/cm)	303	301		298		299		300		300		299			
Initials	JS	JS		JW		A		EMM		EMM		JS			

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
EV_MC2															
Temperature (°C)	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)	8.0	7.5	8.1	7.5	8.1	7.4	8.3	7.1	8.2	7.2	8.3	7.4			
pH	8.0	8.0	8.0	8.1	7.9	8.1	8.0	8.1	8.0	8.1	8.0	8.0			
Cond. (µS/cm)	555	564		553		557		560		542		552			
Initials	JS	JS		JW		A		EMM		EMM		JS			

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
EV_HCl															
Temperature (°C)	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)	8.1	7.5	8.1	7.5	8.1	7.4	8.3	7.2	8.2	7.3	8.3	7.4			
pH	8.0	8.1	8.0	8.1	7.9	8.1	8.0	8.1	8.0	8.1	8.0	8.0			
Cond. (µS/cm)	650	636		636		637		638		638		631			
Initials	JS	JS		JW		A		EMM		EMM		JS			

Thermometer: 4 DO meter/probe: 1, 2 pH meter/probe: 1, 2 Conductivity meter/probe: 1, 2

	Control	GH_ERC	EV_MC2	EV_HCl
Hardness*	550	152	400	380
Alkalinity*	204	152	178	200

Analysts: EMM, AWD, JS  
 Reviewed by: JW  
 Date reviewed: Aug 10/17

\* mg/L as CaCO3  
 Sample Description: vanous; see ees for sample descriptions  
 Comments: Broodboard Used: 071817B (21, 22, 24-30, 32)

### Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Vanus Passifail  
 Work Order #: 170738

Start Date & Time: July 27/17 @ 1145h  
 Stop Date & Time: Aug 02/17 @ 1506h  
 CER #: 4  
 Test Species: Ceriodaphnia dubia

100% (V/V)

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
CM-MC2															
Temperature (°C)	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)	8.1	7.5	8.2	7.5	8.2	7.4	8.3	7.7	8.2	7.2	8.2	7.4			
pH	8.1	8.1	8.1	8.1	8.0	8.0	8.0	7.9	8.0	8.0	8.0	8.0			
Cond. (µS/cm)	839	836		832			830	832		830		816			
Initials	JS	JS		JW			A	EMM		EMM		JS			

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
LC-LCDSSLC															
Temperature (°C)	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)	8.1	7.5	8.2	7.5	8.2	7.5	8.3	7.8	8.2	7.2	8.2	7.3			
pH	7.9	8.1	8.0	8.1	7.8	8.0	7.9	8.0	7.9	8.0	8.0	8.0			
Cond. (µS/cm)	809	820		797			799	798		796		784			
Initials	JS	JS		JW			A	EMM		EMM		JS			

Concentration	Days														
	0		1		2		3		4		5		final 6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new
GH-ER2															
Temperature (°C)	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)	8.1	7.6	8.2	7.6	8.2	7.5	8.3	7.8	8.2	7.3	8.2	7.3			
pH	7.8	8.0	7.9	8.1	7.8	8.1	7.9	8.1	7.9	8.1	8.0	7.9			
Cond. (µS/cm)	284	285		275			283	280		280		291			
Initials	JS	JS		JW			A	EMM		EMM		JS			

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
Temperature (°C)															
DO (mg/L)															
pH															
Cond. (µS/cm)															
Initials															

Thermometer: 4 DO meter/probe: 112 pH meter/probe: 112 Conductivity meter/probe: 112

	Control	LC-LCDSSLC	GH-ER2
Hardness*	560	580	150
Alkalinity*	192	206	148

Analysts: EMM, AWD, JS  
 Reviewed by: JS  
 Date reviewed: Aug. 10/17

\* mg/L as CaCO3  
 Sample Description: Vanus; see CGS for Sample descriptions  
 Comments: Broodboard Used: 071817B(21, 22, 24-30, 32)

1/2

### Chronic Freshwater Toxicity Test C. dubia Reproduction Data

Client: Teck coal  
Sample ID: various posttail  
Work Order: 170738

Start Date & Time: July 27/17 @ 1145h  
Stop Date & Time: Aug 02/17 @ 1500h  
Set up by: JS

100% CUW)

Days	Concentration: 20% Peillier											Concentration: FR-UFR1											Concentration: CM-MCI												
	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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
4	3	3	4	4	3	4	3	3	3	3	EMM	4	4	5	4	4	3	3	3	3	3	3	EMM	3	3	3	4	4	4	3	4	3	4	EMM	
5	5	5	5	5	4	5	5	5	5	6	JS	4	5	7	5	5	7	7	8	7	6	5	JS	11	9	11	8	8	8	7	5	5	9	JS	
6	14	8	8	10	12	12	10	10	13	9	JS	9	12	10	8	11	11	11	11	10	10	5	JS	14	10	10	9	11	9	10	7	11	10	JS	
7																																			
8																																			
Total	22	11	17	19	19	21	18	18	21	18	JS	17	21	22	17	20	21	21	22	20	19	JS	28	22	24	21	23	21	20	16	19	23	EMM		

Days	Concentration: FR-FRCPI											Concentration: GH-FRI											Concentration: GH-ERC												
	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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
4	2	4	3	3	2	3	3	✓	✓	✓	EMM	3	3	4	3	3	3	3	4	4	4	EMM	3	4	3	5	3	3	3	4	3	3	EMM		
5	6	12	7	5	2	6	8	6	4	4	JS	7	6	6	5	5	9	6	9	6	6	JS	5	5	5	7	7	8	11	6	5	5	JS		
6	10	9	6	8	✓	7	6	✓	6	6	JS	10	9	8	✓	8	8	6	9	8	9	JS	11	4	11	8	9	9	10	9	✓	11	JS		
7																																			
8																																			
Total	18	25	16	16	4	16	17	6	10	10	JS	13	18	18	8	16	20	15	22	18	19	JS	19	20	19	20	19	20	24	19	19	19	JS		

Days	Concentration: EV-MC2											Concentration: EV-HC1											Concentration: CM-MC2												
	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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
4	3	3	2	3	3	3	3	4	4	3	EMM	3	3	2	2	3	2	3	4	3	3	EMM	2	2	3	✓	3	✓	2	2	2	✓	EMM		
5	6	4	8	4	5	6	5	4	5	✓	JS	3	5	6	6	8	9	5	4	6	6	JS	X	✓	2	3	3	✓	4	2	2	✓	JS		
6	8	12	9	8	10	9	10	10	12	11	JS	9	9	9	10	12	15	11	11	9	10	JS		4	✓	X	X	3	8	6	3	4	JS		
7																																			
8																																			
Total	17	19	19	15	18	18	18	18	21	14	JS	17	17	17	19	23	26	19	19	18	19	JS	2x	6	5	3x	6x	3	14	10	7	4	JS		

Notes: X = mortality.

Sample Description: various; see ~~see~~ for all sample descriptions  
Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JW

Date reviewed: Aug. 24/17



Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data

Client: Tectrol  
Sample ID: Vancus Passfall  
Work Order: 170738

Start Date & Time: July 27/17 @ 1145h  
Stop Date & Time: Aug 02/17 @ 1500h  
Set up by: JS

10086C/W

Days	Concentration: <u>LC-LC055LCC</u>											Concentration: <u>GH-ERZ</u>											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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS											JS	JS
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW												
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JS												
4	3	3	4	3	3	4	4	5	4	4	mm	4	3	3	3	4	4	4	4	4	4	5	mm												
5	3	8	8	✓	6	6	6	7	6	6	JS	6	5	6	6	12	8	7	8	8	8	8	JS												
6	9	11	10	5	11	11	10	11	12	9	JS	11	10	15	10	9	11	12	15	10	10	JS													
7																																			
8																																			
Total	15	22	22	8	20	21	20	23	28	19	JS	21	18	24	19	25	23	23	27	22	23	JS													

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																																			

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. P. subcapitata

Sample Description: Vancus; see GC for all sample descriptions

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: Joh en Date reviewed: Aug. 10/17

Client: Teck coal

W.O.#: 170738

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FR_FRCP1	July 27/17	July 27/17	50	10.5	10.7	206	100	6.0	600	JS
FR_UFR1				8.1	8.3	158	50	8.3	166	
GH_FR1				10.4	10.6	204	100	5.5	550	
GH_ERC				7.8	8.0	152	50	7.6	152	
GH_ER2				7.7	8.0	148	50	7.5	150	
CM_MC1				7.7	7.9	150	50	7.2	144	
CM_MC2				9.8	10.0	192	100	5.6	560	
EV_HC1				10.3	10.6	200	100	3.8	380	
EV_EV_MC2				9.2	9.5	178	100	4.0	400	
LC_LCDSSLCC				10.5	10.7	206	100	5.8	580	
20% perme	July 27/17	July 27/17	50	4.9	5.0	96	50	5.0	100	EMM

Notes: ① Diluted to 100ml w/ D.I. water

Reviewed by: Jon Date Reviewed: Aug. 10/17

**CETIS Summary Report**

Report Date: 23 Aug-17 11:16 (p 1 of 2)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Batch ID: 16-0801-9276      Test Type: Reproduction-Survival (7d)      Analyst: Emma Marus  
 Start Date: 27 Jul-17 11:45      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 02 Aug-17 15:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 6d 3h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_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%
FR_FRCP1	10	1	1	1	1	1	0	0	0.0%	0.0%
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	0.7	0.3544	1	0	1	0.1528	0.483	69.01%	30.0%
LC_LCDSSLCC	10	1	1	1	1	1	0	0	0.0%	0.0%
GH_ER2	10	1	1	1	1	1	0	0	0.0%	0.0%

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	11	22	0.9684	3.062	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	17	22	0.5774	1.826	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	16	28	1.012	3.199	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	4	25	1.982	6.268	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	8	22	1.257	3.974	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	8	24	1.655	5.233	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	14	21	0.6333	2.003	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	17	26	0.9315	2.946	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	2	14	1.155	3.651	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	8	23	1.436	4.541	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	18	27	0.8466	2.677	11.9%	-22.28%

**CETIS Summary Report**

Report Date: 23 Aug-17 11:16 (p 2 of 2)  
 Test Code: 170738 | 10-9095-5632

**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
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_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	0	1	1	0	0	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
GH_ER2	1	1	1	1	1	1	1	1	1	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
Lab Control	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

**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
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_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	0/1	1/1	1/1	0/1	0/1	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
GH_ER2	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-17 11:14 (p 4 of 9)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 13-7539-7463	<b>Endpoint:</b> 6d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:00	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_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 Lab Control		FR_UFR1	1	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_MC2	1	1.0000	Exact	Non-Significant Effect
Lab Control		EV_HC1	1	1.0000	Exact	Non-Significant Effect
Lab Control		CM_MC2	0.1053	1.0000	Exact	Non-Significant Effect
Lab Control		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
Lab Control		GH_ER2	1	1.0000	Exact	Non-Significant Effect

① Lab control = 20% perrier control water

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:14 (p 5 of 9)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 13-7539-7463  
 Analyzed: 22 Aug-17 15:00

Endpoint: 6d Survival Rate  
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 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%
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_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	7	3	10	0.7	0.3	30.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
GH_ER2	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
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_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	0	1	1	0	0	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
GH_ER2	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
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_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	0/1	1/1	1/1	0/1	0/1	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
GH_ER2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

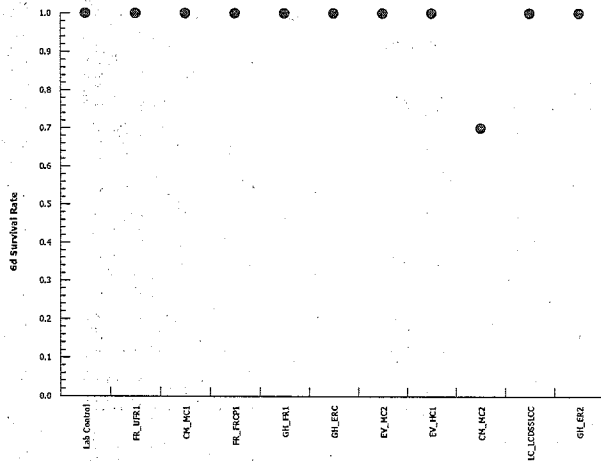
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-7539-7463      Endpoint: 6d Survival Rate  
Analyzed: 22 Aug-17 15:00      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:14 (p 7 of 9)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 19-6086-9453	<b>Endpoint:</b> 6d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:01	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_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		Lab Control	1	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_MC2	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.1053	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		GH_ER2	1	1.0000	Exact	Non-Significant Effect

① FR\_UFR1 = site control



# CETIS Analytical Report

Report Date: 23 Aug-17 11:14 (p 8 of 9)  
 Test Code: 170738 | 10-9095-5632

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-6086-9453  
 Analyzed: 22 Aug-17 15:01

Endpoint: 6d Survival Rate  
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 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 Negative Contr	10	0	10	1	0	0.0%
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_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	7	3	10	0.7	0.3	30.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
GH_ER2	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
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_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	0	1	1	0	0	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
GH_ER2	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
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_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	0/1	1/1	1/1	0/1	0/1	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
GH_ER2	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-17 11:14 (p 9 of 9)  
Test Code: 170738 | 10-9095-5632

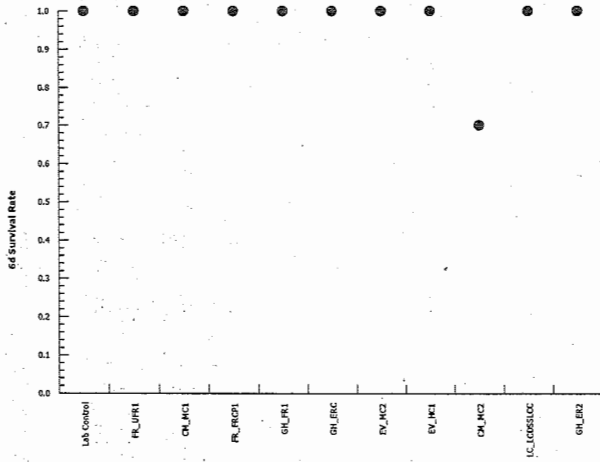
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 19-6086-9453      Endpoint: 6d Survival Rate  
Analyzed: 22 Aug-17 15:01      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



# CETIS Analytical Report

Report Date: 23 Aug-17 11:14 (p 1 of 9)  
 Test Code: 170738 | 10-9095-5632

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-3092-7575	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 22 Aug-17 14:58	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 16-0801-9276	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 27 Jul-17 11:45	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 02 Aug-17 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 3h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_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%)
GH_ER2 ①		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	1	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	0.1053	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① GH\_ER2 = site control

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:14 (p 2 of 9)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 17-3092-7575      Endpoint: 6d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 14:58      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	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_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	7	3	10	0.7	0.3	30.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
GH_ER2 Negative Contr	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
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_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	0	1	1	0	0	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
GH_ER2	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
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_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	0/1	1/1	1/1	0/1	0/1	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
GH_ER2	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-17 11:14 (p 3 of 9)  
Test Code: 170738 | 10-9095-5632

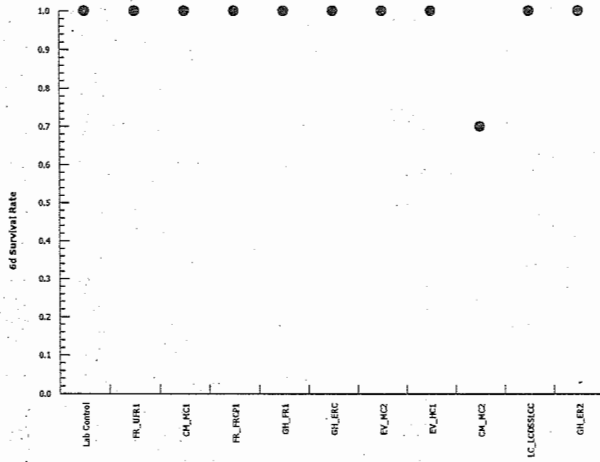
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 17-3092-7575      Endpoint: 6d Survival Rate  
Analyzed: 22 Aug-17 14:58      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 13 Oct-17 15:11 (p 1 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 05-1785-9356	<b>Endpoint:</b> 6d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 13 Oct-17 15:10	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_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%)
CM_MC1		Lab Control	1	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_UFR1	1	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_MC2	1	1.0000	Exact	Non-Significant Effect
CM_MC1		EV_HC1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.1053	1.0000	Exact	Non-Significant Effect
CM_MC1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ER2	1	1.0000	Exact	Non-Significant Effect

① cm\_mc1 = site control

**CETIS Analytical Report**

Report Date: 13 Oct-17 15:11 (p 2 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 05-1785-9356      Endpoint: 6d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 13 Oct-17 15:10      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      Negative Contr	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_MC2	10	0	10	1	0	0.0%
EV_HC1	10	0	10	1	0	0.0%
CM_MC2	7	3	10	0.7	0.3	30.0%
LC_LCDSSLCC	10	0	10	1	0	0.0%
GH_ER2	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
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_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	0	1	1	0	0	1	1	1	1	1
LC_LCDSSLCC	1	1	1	1	1	1	1	1	1	1
GH_ER2	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
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_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	0/1	1/1	1/1	0/1	0/1	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
GH_ER2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

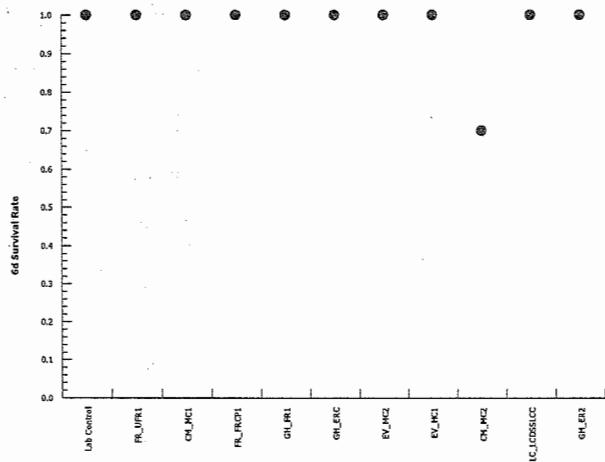
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 05-1785-9356      Endpoint: 6d Survival Rate  
Analyzed: 13 Oct-17 15:10      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 7 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-1964-4553	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:00	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	23.0%	

**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	121	72	4	18	0.9979	Asymp	Non-Significant Effect
		CM_MC1	134.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	73	72	2	18	0.0537	Asymp	Non-Significant Effect
		GH_FR1	91	72	3	18	0.5110	Asymp	Non-Significant Effect
		GH_ERC	109	72	1	18	0.9566	Asymp	Non-Significant Effect
		EV_MC2	92.5	72	4	18	0.5661	Asymp	Non-Significant Effect
		EV_HC1	104.5	72	3	18	0.9011	Asymp	Non-Significant Effect
		CM_MC2	56	72	0	18	0.0010	Asymp	Significant Effect
		LC_LCDSSLCC	122.5	72	3	18	0.9986	Asymp	Non-Significant Effect
		GH_ER2	142	72	4	18	1.0000	Asymp	Non-Significant Effect

① lab control = 20% perrier

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 8 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 08-1964-4553      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 15:00      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

Ceriodaphnia 7-d Survival and Reproduction Test

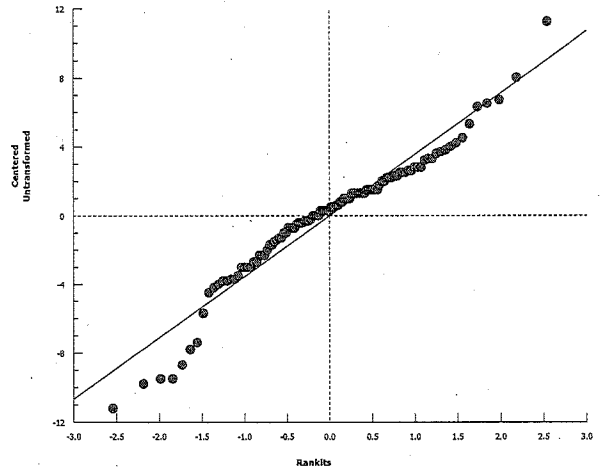
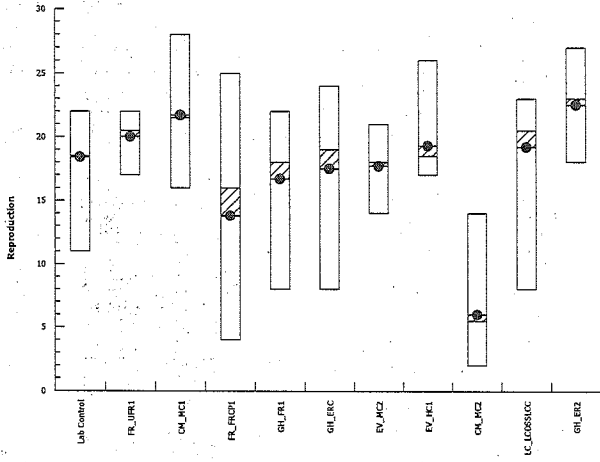
Nautilus Environmental

Analysis ID: 08-1964-4553  
Analyzed: 22 Aug-17 15:00

Endpoint: Reproduction  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 10 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 01-3089-1198	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:00	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	23.0%	

**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	89	72	4	18	0.4376	Asymp	Non-Significant Effect
		CM_MC1	75.5	72	3	18	0.0829	Asymp	Non-Significant Effect
		FR_FRCP1	137	72	2	18	1.0000	Asymp	Non-Significant Effect
		GH_FR1	119	72	3	18	0.9961	Asymp	Non-Significant Effect
		GH_ERC	101	72	1	18	0.8313	Asymp	Non-Significant Effect
		EV_MC2	117.5	72	4	18	0.9941	Asymp	Non-Significant Effect
		EV_HC1	105.5	72	3	18	0.9166	Asymp	Non-Significant Effect
		CM_MC2	154	72	0	18	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	87.5	72	3	18	0.3840	Asymp	Non-Significant Effect
		GH_ER2	68	72	4	18	0.0200	Asymp	Significant Effect

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 11 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 01-3089-1198      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 15:00      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

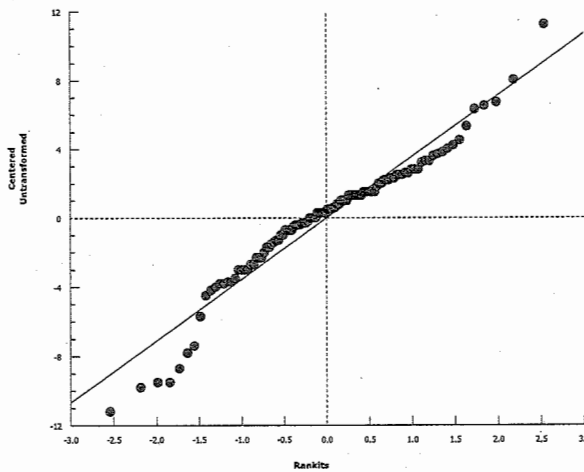
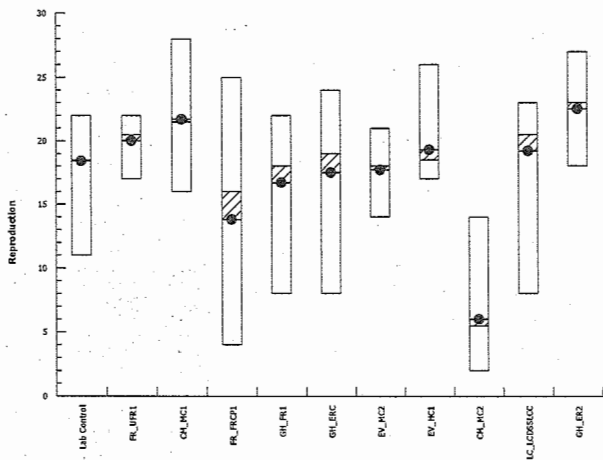
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-3089-1198      Endpoint: Reproduction  
Analyzed: 22 Aug-17 15:00      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 13 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-1421-7620	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:01	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.1%	

**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 (1)	Lab Control	89	72	5	18	0.4376	Asymp	Non-Significant Effect
	CM_MC1	123.5	72	5	18	0.9990	Asymp	Non-Significant Effect
	FR_FRCP1	68	72	1	18	0.0200	Asymp	Significant Effect
	GH_FR1	76.5	72	4	18	0.0975	Asymp	Non-Significant Effect
	GH_ERC	85.5	72	2	18	0.3161	Asymp	Non-Significant Effect
	EV_MC2	75.5	72	3	18	0.0829	Asymp	Non-Significant Effect
	EV_HC1	89.5	72	2	18	0.4559	Asymp	Non-Significant Effect
	CM_MC2	55	72	0	18	0.0007	Asymp	Significant Effect
	LC_LCDSSLCC	109	72	5	18	0.9566	Asymp	Non-Significant Effect
	GH_ER2	135	72	4	18	1.0000	Asymp	Non-Significant Effect

① FR\_UFR1 = site control

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 14 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 08-1421-7620      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 15:01      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23



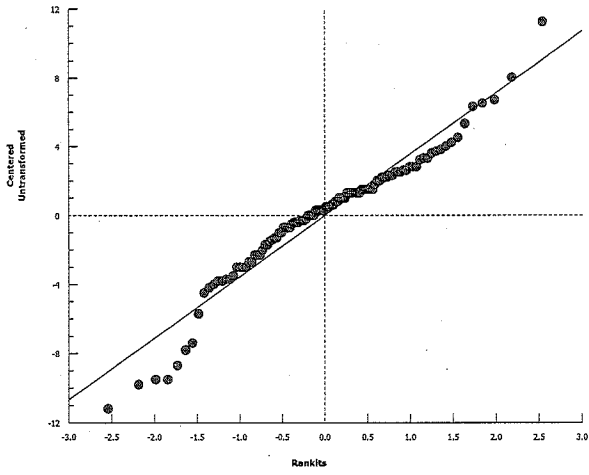
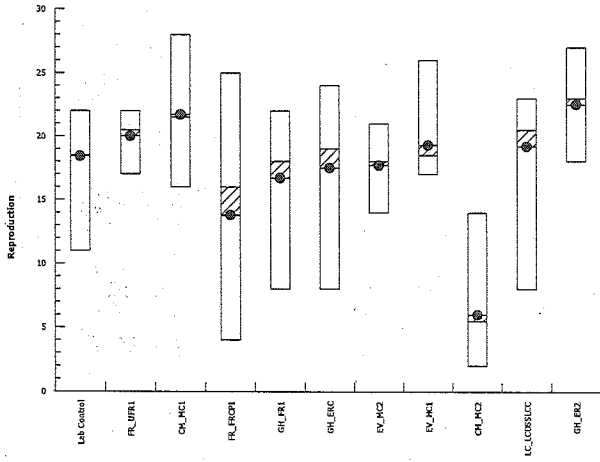
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 08-1421-7620      Endpoint: Reproduction  
Analyzed: 22 Aug-17 15:01      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 16 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 05-3540-6355	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 15:02	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	21.1%	

**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	121	72	5	18	0.9979	Asymp	Non-Significant Effect
		CM_MC1	86.5	72	5	18	0.3494	Asymp	Non-Significant Effect
		FR_FRCP1	142	72	1	18	1.0000	Asymp	Non-Significant Effect
		GH_FR1	133.5	72	4	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	124.5	72	2	18	0.9993	Asymp	Non-Significant Effect
		EV_MC2	134.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		EV_HC1	120.5	72	2	18	0.9975	Asymp	Non-Significant Effect
		CM_MC2	155	72	0	18	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	101	72	5	18	0.8313	Asymp	Non-Significant Effect
		GH_ER2	75	72	4	18	0.0762	Asymp	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 17 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 05-3540-6355      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 15:02      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

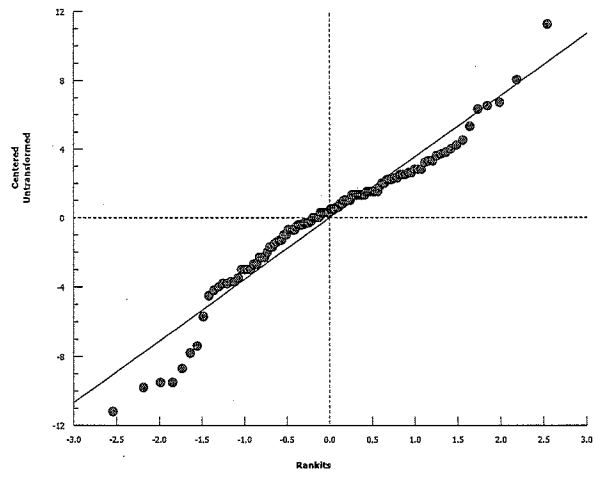
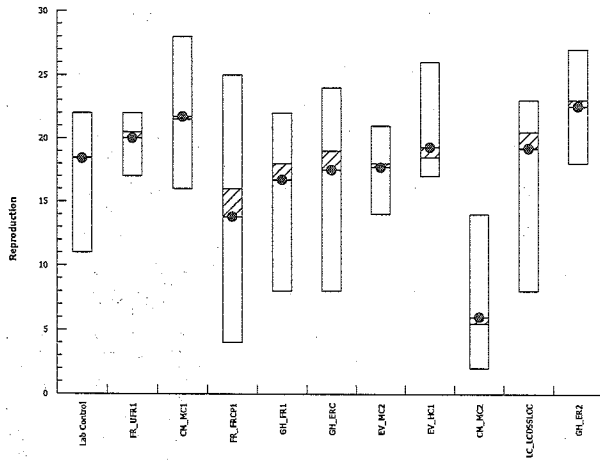
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 05-3540-6355      Endpoint: Reproduction  
 Analyzed: 22 Aug-17 15:02      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 1 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 01-3726-3662	Endpoint: Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 22 Aug-17 14:58	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 16-0801-9276	Test Type: Reproduction-Survival (7d)	Analyst: Emma Marus
Start Date: 27 Jul-17 11:45	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 02 Aug-17 15:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 3h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	18.8%	

**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 ①		Lab Control	68	72	4	18	0.0200	Asymp	Significant Effect
		FR_UFR1	75	72	3	18	0.0762	Asymp	Non-Significant Effect
		CM_MC1	95.5	72	5	18	0.6719	Asymp	Non-Significant Effect
		FR_FRCP1	64	72	2	18	0.0081	Asymp	Significant Effect
		GH_FR1	63.5	72	3	18	0.0072	Asymp	Significant Effect
		GH_ERC	74	72	2	18	0.0642	Asymp	Non-Significant Effect
		EV_MC2	62.5	72	3	18	0.0056	Asymp	Significant Effect
		EV_HC1	75	72	3	18	0.0762	Asymp	Non-Significant Effect
		CM_MC2	55	72	0	18	0.0007	Asymp	Significant Effect
		LC_LCDSSLCC	79	72	4	18	0.1422	Asymp	Non-Significant Effect

① GH\_ER2 = site control

**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 2 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 01-3726-3662      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 14:58      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

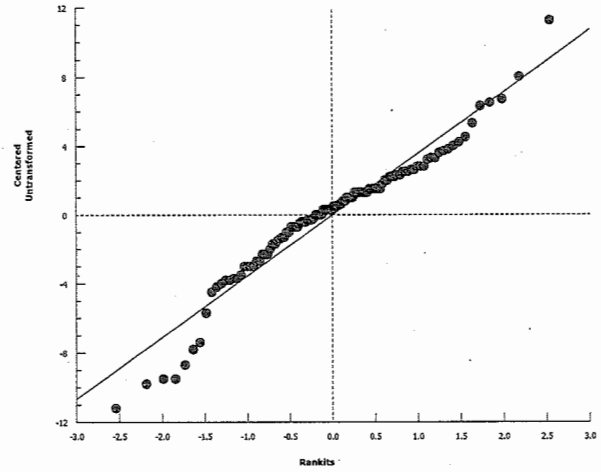
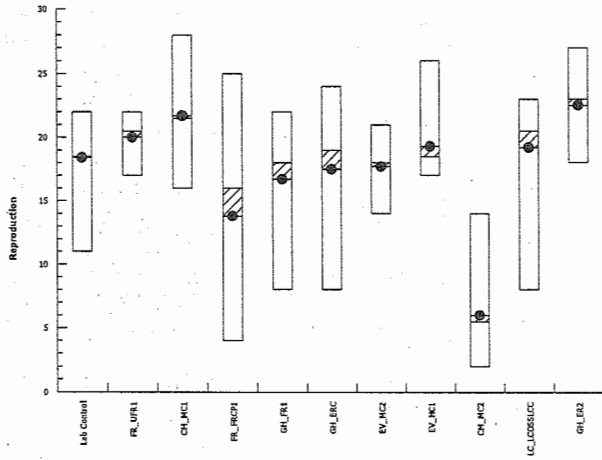
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-3726-3662      Endpoint: Reproduction  
Analyzed: 22 Aug-17 14:58      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 4 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 13-9788-4718	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 22 Aug-17 14:58	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	18.8%	

**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		Lab Control	142	72	4	18	1.0000	Asymp	Non-Significant Effect
		FR_UFR1	135	72	3	18	1.0000	Asymp	Non-Significant Effect
		CM_MC1	114.5	72	5	18	0.9873	Asymp	Non-Significant Effect
		FR_FRCP1	146	72	2	18	1.0000	Asymp	Non-Significant Effect
		GH_FR1	146.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	136	72	2	18	1.0000	Asymp	Non-Significant Effect
		EV_MC2	147.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		EV_HC1	135	72	3	18	1.0000	Asymp	Non-Significant Effect
		CM_MC2	155	72	0	18	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	131	72	4	18	0.9999	Asymp	Non-Significant Effect



**CETIS Analytical Report**

Report Date: 23 Aug-17 11:15 (p 5 of 18)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 13-9788-4718      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 22 Aug-17 14:58      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

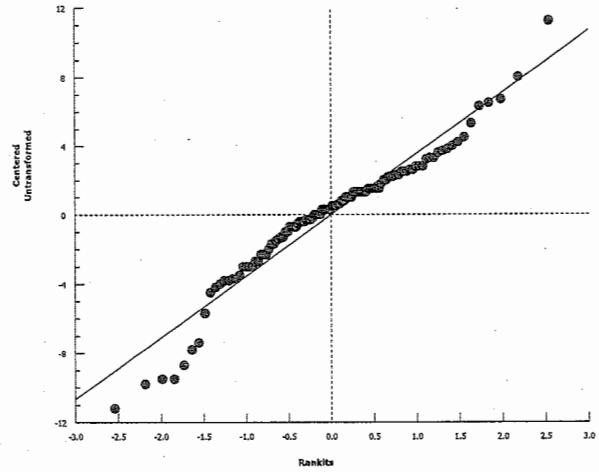
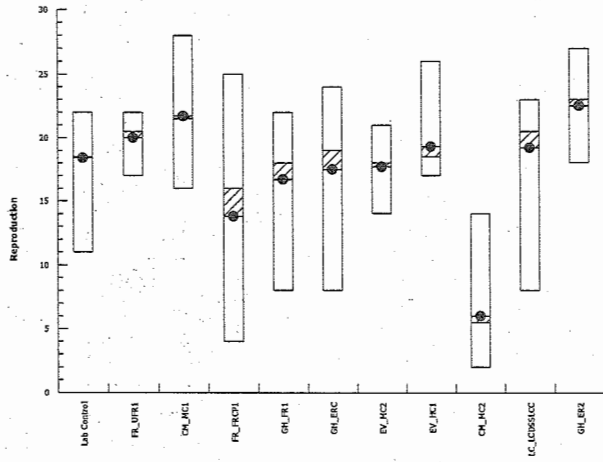
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-9788-4718      Endpoint: Reproduction  
Analyzed: 22 Aug-17 14:58      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 13 Oct-17 15:12 (p 1 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 13-0355-8400	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 13 Oct-17 15:11	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.5%	

**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		Lab Control	75.5	72	3	18	0.0829	Asymp	Non-Significant Effect
		FR_UFR1	86.5	72	4	18	0.3494	Asymp	Non-Significant Effect
		FR_FRCP1	67.5	72	1	18	0.0179	Asymp	Significant Effect
		GH_FR1	68	72	4	18	0.0200	Asymp	Significant Effect
		GH_ERC	76	72	3	18	0.0899	Asymp	Non-Significant Effect
		EV_MC2	67	72	2	18	0.0161	Asymp	Significant Effect
		EV_HC1	80.5	72	2	18	0.1750	Asymp	Non-Significant Effect
		CM_MC2	55	72	0	18	0.0007	Asymp	Significant Effect
		LC_LCDSSLCC	89	72	5	18	0.4376	Asymp	Non-Significant Effect
	GH_ER2	114.5	72	5	18	0.9873	Asymp	Non-Significant Effect	

**CETIS Analytical Report**

Report Date: 13 Oct-17 15:12 (p 2 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 13-0355-8400      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 13 Oct-17 15:11      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

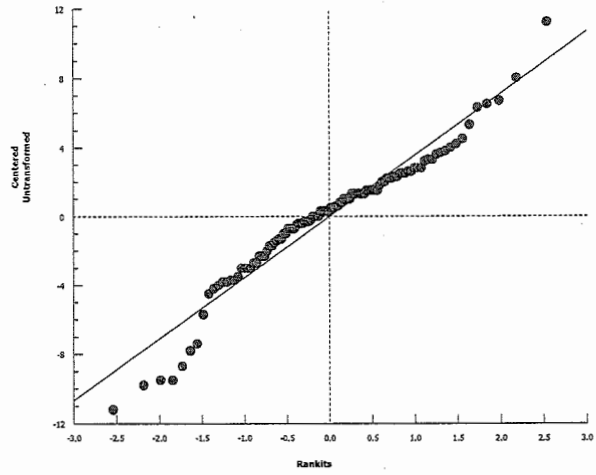
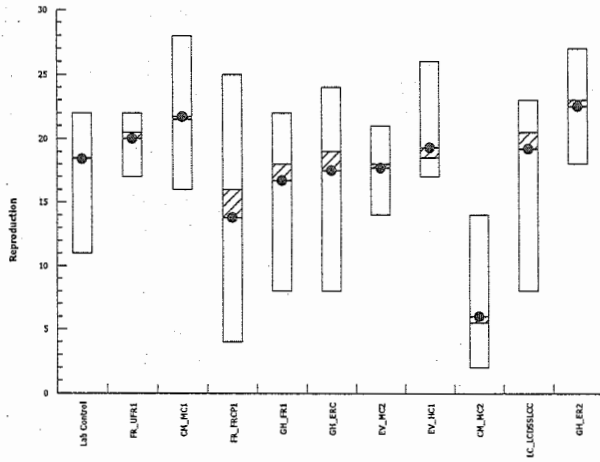
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 13-0355-8400      Endpoint: Reproduction  
 Analyzed: 13 Oct-17 15:11      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 13 Oct-17 15:13 (p 1 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test** Nautilus Environmental

<b>Analysis ID:</b> 15-2019-6409	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 13 Oct-17 15:12	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 16-0801-9276	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 27 Jul-17 11:45	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 02 Aug-17 15:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 6d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	NA	Teck Coal	Teck Coal Q3
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	48h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	51h (14.2 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	51h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	50h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	47h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	46h (16.9 °C)		
EV_HC1	11-5224-8549	25 Jul-17 10:45	26 Jul-17 08:15	49h (16.9 °C)		
CM_MC2	12-2830-5450	25 Jul-17 13:05	26 Jul-17 08:15	47h (18 °C)		
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	49h (13.4 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	49h (15 °C)		Teck Coal Q3

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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Effluent	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	19.5%	

**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		Lab Control	134.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		FR_UFR1	123.5	72	4	18	0.9990	Asymp	Non-Significant Effect
		FR_FRCP1	142.5	72	1	18	1.0000	Asymp	Non-Significant Effect
		GH_FR1	142	72	4	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	134	72	3	18	1.0000	Asymp	Non-Significant Effect
		EV_MC2	143	72	2	18	1.0000	Asymp	Non-Significant Effect
		EV_HC1	129.5	72	2	18	0.9999	Asymp	Non-Significant Effect
		CM_MC2	155	72	0	18	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	121	72	5	18	0.9979	Asymp	Non-Significant Effect
	GH_ER2	95.5	72	5	18	0.6719	Asymp	Non-Significant Effect	

**CETIS Analytical Report**

Report Date: 13 Oct-17 15:13 (p 2 of 3)  
 Test Code: 170738 | 10-9095-5632

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 15-2019-6409      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 13 Oct-17 15:12      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2024.418	202.4418	10	13.99	<0.0001	Significant Effect
Error	1433	14.47475	99			
Total	3457.418		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	23.81	23.21	0.0081	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9497	0.9683	0.0004	Non-normal Distribution

**Reproduction Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	10	18.4	16.21	20.59	18.5	11	22	0.9684	16.64%	0.0%
FR_UFR1	10	20	18.69	21.31	20.5	17	22	0.5774	9.13%	-8.7%
CM_MC1	10	21.7	19.41	23.99	21.5	16	28	1.012	14.74%	-17.93%
FR_FRCP1	10	13.8	9.316	18.28	16	4	25	1.982	45.42%	25.0%
GH_FR1	10	16.7	13.86	19.54	18	8	22	1.257	23.79%	9.24%
GH_ERC	10	17.5	13.76	21.24	19	8	24	1.655	29.91%	4.89%
EV_MC2	10	17.7	16.27	19.13	18	14	21	0.6333	11.32%	3.8%
EV_HC1	10	19.3	17.19	21.41	18.5	17	26	0.9315	15.26%	-4.89%
CM_MC2	10	6	3.388	8.612	5.5	2	14	1.155	60.86%	67.39%
LC_LCDSSLCC	10	19.2	15.95	22.45	20.5	8	23	1.436	23.65%	-4.35%
GH_ER2	10	22.5	20.58	24.42	23	18	27	0.8466	11.9%	-22.28%

**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	22	11	17	19	19	21	18	18	21	18
FR_UFR1	17	21	22	17	20	21	21	22	20	19
CM_MC1	28	22	24	21	23	21	20	16	19	23
FR_FRCP1	18	25	16	16	4	16	17	6	10	10
GH_FR1	13	18	18	8	16	20	15	22	18	19
GH_ERC	19	8	19	20	19	20	24	19	8	19
EV_MC2	17	19	19	15	18	18	18	18	21	14
EV_HC1	17	17	17	18	23	26	19	19	18	19
CM_MC2	2	6	5	3	6	3	14	10	7	4
LC_LCDSSLCC	15	22	22	8	20	21	20	23	22	19
GH_ER2	21	18	24	19	25	23	23	27	22	23

Ceriodaphnia 7-d Survival and Reproduction Test

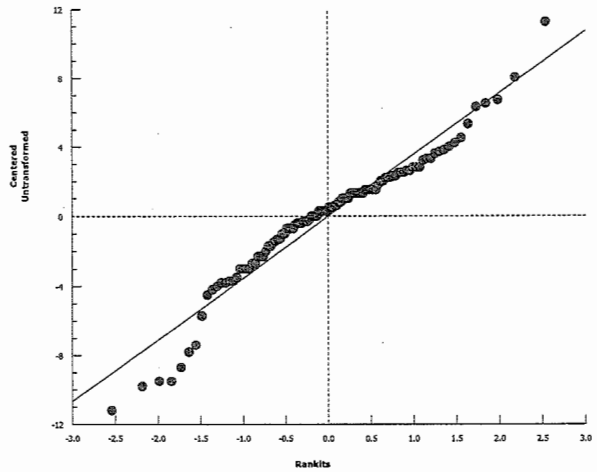
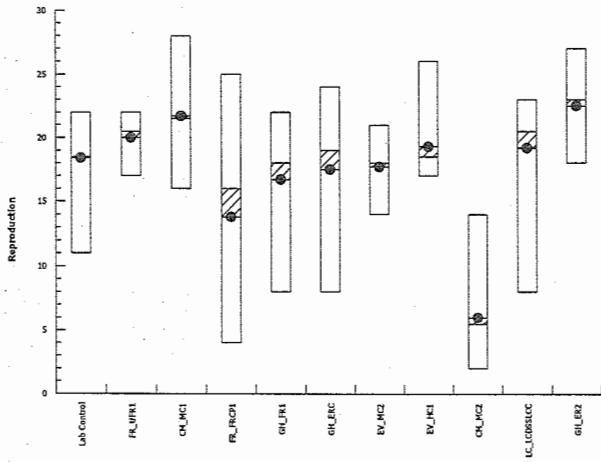
Nautilus Environmental

Analysis ID: 15-2019-6409  
 Analyzed: 13 Oct-17 15:12

Endpoint: Reproduction  
 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Graphics





**APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data**

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**Pseudokirchneriella subcapitata Summary Sheet**

Client: Teck Coal  
 Work Order No.: 170739

Start Date: July 28/17  
 Set up by: MLT

**Sample Information:**

Sample ID: VARIOUS: see results table for IDs  
 Sample Date: July ~~June~~ 25/17  
 Date Received: July 26/17  
 Sample Volume: VARIOUS

**Test Organism Information:**

Culture Date: July 21/17  
 Age of culture (Day 0): 7d

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: SC159  
 Stock Solution ID: 172n03  
 Date Initiated: July 21/17

72-h IC50 (95% CL): 32.2 (30.0-34.2) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 33.4 (26.4-42.3) µg/L Zn CV (%): 13

**Test Results:**

\* indicates cell yield that were significantly greater than the lab control

a. indicates cell yield that were significantly lower than site controls  
 FR-NFR1, CMLMCI, and GH-ER2

Test Results:	Cell Yield (Mean ± SD)
Negative Control	37.6 ± 2.7
FR-NFR1-Q-03072017-N	160.8 ± 10.8 *
CMLMCI-WS-20170725-N	150.6 ± 10.2 *
GH-ER2-WS-2017-07-25-N	158.1 ± 9.2 *
FR-FRP FR-FRCPI-Q-03072017-N	134.8 ± 6.1 *a.
GH-FRI-WS-2017-07-25-N	155.5 ± 4.7 *
GH-ERC-WS-2017-07-25-N	156.5 ± 12.5 *
EY-MC2-WS-2017-07-25-N	157.0 ± 12.1 *
EY-HCL-WS-2017-07-25-N	158.3 ± 9.6 *
CMLMCI-WS-20170725-N	131.0 ± 8.8 *a.
LC-KDSSIC-WS-2017-05-22-N	146.8 ± 10.1 *

b. indicates MLT

Reviewed by: JOB

Date reviewed: Aug. 28/17

### 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck Coal Setup by: MLT  
 Sample ID: various Test Date/Time: July 28/17 @ 0800h  
 Work Order No.: 170739 Test Species: Pseudokirchneriella subcapitata

Culture Date: July 21/17 Age of Culture: 7d Culture Health: Good  
 Culture Count: 1 565 2 590 Average: 577.5 Culture Cell Density (c1): 577.5 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 577.5 \times 10^4 \text{ cells/mL}} = 3.81 \text{ mL}$$

Time Zero Counts: 1 22 2 23 Average: 22.5

No. of Cells/mL: 22.5 x 10<sup>4</sup> Initial Density: # cells/mL + 220 µL x 10 µL = 10227 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	24.0	25.0	26.0	25.0	✓	✓	✓	✓
(site) FR-LFRI ①	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
(site) CM-MCI ②	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
(site) GH-LECI ①	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
FR-FRCP ①	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
GH-FRI ①	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
GH-LECI ①	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
EV-MCI ①	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
EV-HCI ①	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MCI ②	8.8	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	JW	A	MLT	MLT	JW	A	MLT

Initial control pH: Well 1: 7.0 Well 2: 7.0

Final control pH: Well 1: 6.7 Well 2: 6.7

Light intensity (lux): 4220 Date measured: July 28/17

Instruments: Thermometer 4 pH meter 2 Light meter 1

Sample Description: ① clear, colourless, odourless, some particulates present  
② clear, colourless, odourless, no particulates present.

Comments: \_\_\_\_\_

Reviewed: JGH Date reviewed: Aug. 28/17

### 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teek Coal Setup by: MLT  
 Sample ID: various Test Date/Time: July 28/17 @ 0800h  
 Work Order No.: 170739 Test Species: Pseudokirchneriella subcapitata  
 Culture Date: July 21/17 Age of Culture: 7d Culture Health: Good  
 Culture Count: 1 565 2 590 Average: 577.5 Culture Cell Density (c1): 577.5 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/mL} \times 100 \text{ mL}}{(c1) \quad 577.5 \times 10^4 \text{ cells/mL}} = 3.81 \text{ mL}$$

Time Zero Counts: 1 28 2 23 Average: 22.5

No. of Cells/mL: 22.5 x 10<sup>4</sup> Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10227 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature				Microplates rotated 2X per day?			
	pH	Temp (°C)	Temp (°C)				0 h	24 h	48 h	72 h
			0 h	24 h	48 h	72 h				
Control	7.0	23.0	24.0	25.0	25.0	25.0	✓	✓	✓	✓
LE-LE055LCC①	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	JW	A	MLT	MLT	JW	A	MLT

Initial control pH: Well 1: 7.0 Well 2: 7.0  
 Final control pH: Well 1: 6.7 Well 2: 6.7  
 Light intensity (lux): 4220 Date measured: July 28/17  
 Instruments: Thermometer 4 pH meter 2 Light meter 1

Sample Description: ① clear, colourless, odourless, some particulates present

Comments: \_\_\_\_\_

Reviewed: JW Date reviewed: Aug. 28/17

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teek Coal Start Date/Time: July 28/17 @ 0800h  
 Work Order #: 170739 Termination Date: July 31/17 @ 0800h  
 Sample ID: Various Test set up by: MLT  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	37					MLT
	B	36					
	C	43					
	D	40					
	E	42					
	F	38					
	G	36					
	H	37					
site control FR-UPRI (95.2% v/v)	A	166					
	B	170					
	C	156					
	D	171					
	EA	174					
	FB	144					
	GC	150					
	HD	163					
site control CL-MCI (95.2% v/v)	A	145					
	B	166					
	C	167					
	D	148					
	EA	155					
	FB	143					
	GC	140					
	HD	149					
site control GH-ER2 (95.2% v/v)	A	148					
	B	165					
	C	151					
	D	161					
	EA	171					
	FB	170					
	GC	158					
	HD	149					
FR-FRCP1 (95.2% v/v)	A	130					
	B	140					
	C	142					
	D	131					

Comments: \_\_\_\_\_

Reviewed by: JGh Date Reviewed: Aug. 23/17

### Pseudokirchneriella subcapitata Toxicity Test Data Sheet 72-h Algal Cell Counts

Client: TRUCK COAL Start Date/Time: July 28/17 @ 0800h  
 Work Order #: 170739 Termination Date: July 31/17 @ 0800h  
 Sample ID: VARIOUS Test set up by: MLT  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A						MLT
	B						
	C						
	D						
	E						
	F						
	G						
	H						
GH_FR1 (95.2% v/v)	A	152					MLT
	B	153					
	C	161					
	D	160					
GH_ERC (95.2% v/v)	A	170					
	B	166					
	C	150					
	D	144					
EV_ML2 (95.2% v/v)	A	160					
	B	146					
	C	174					
	D	152					
EV_HCl (95.2% v/v)	A	171					
	B	153					
	C	163					
	D	150					
CL_ML2 (95.2% v/v)	A	138					
	B	129					
	C	140					
	D	121					
LE-LEDBLCC (95.2% v/v)	A	141					
	B	162					
	C	148					
	D	140					
	A						
	B						
	C						
	D						

Comments: \_\_\_\_\_

Reviewed by: JGU Date Reviewed: Aug. 28/17

*Pseudokirchneriella subcapitata* Algal Counts

Client: Teck Coal Start Date/Time: 28-Jul-17 @0800h  
 WO#: 170739 Termination Date/Time: 31-Jul-17 @0800h  
 Sample ID: Teck Coal various samples pass/fail  
 Initial Cell Density: 10227 cell/mL

225000  
0.22  
0.01  
10227.27

Concentration %(v/v)	Rep	Count 1 (x 10 <sup>4</sup> )	Count 2 (x 10 <sup>4</sup> )	Count 3 (x 10 <sup>4</sup> )	Count 4 (x 10 <sup>4</sup> )	Mean (x 10 <sup>4</sup> )	Cell Yield (x 10 <sup>4</sup> ) cell/mL		
Control Lab Control	A	37				37	36.0	mean	37.6
	B	36				36	35.0	SD	2.722263
	C	43				43	42.0	CV	7.239623
	D	40				40	39.0		
	E	42				42	41.0		
	F	38				38	37.0		
	G	36				36	35.0		
	H	37				37	36.0		
Control Site Water (FR_UFR1) 95.2% (v/v)	A	166				166	165.0	mean	160.7
	B	170				170	169.0	SD	10.75374
	C	156				156	155.0	CV	6.690673
	D	171				171	170.0		
	E	174				174	173.0		
	F	144				144	143.0		
	G	150				150	149.0		
	H	163				163	162.0		
Control Site Water (CM_MC1) 95.2% (v/v)	A	145				145	144.0	mean	150.6
	B	166				166	165.0	SD	10.19716
	C	167				167	166.0	CV	6.770923
	D	148				148	147.0		
	E	155				155	154.0		
	F	143				143	142.0		
	G	140				140	139.0		
	H	149				149	148.0		
Control Site Water (GH_ER2) 95.2% (v/v)	A	148				148	147.0	mean	158.1
	B	165				165	164.0	SD	9.18753
	C	151				151	150.0	CV	5.811131
	D	161				161	160.0		
	E	171				171	170.0		
	F	170				170	169.0		
	G	158				158	157.0		
	H	149				149	148.0		
FR_FRCP1 95.2% (v/v)	A	130				130	129.0		
	B	140				140	139.0		
	C	142				142	141.0		
	D	131				131	130.0		

Reviewed by:                     JGU                    

Date reviewed:                     Aug. 28/17

*Pseudokirchneriella subcapitata* Algal Counts

Client: Teck Coal Start Date/Time: 28-Jul-17 @ 0800h  
WO#: 170739 Termination Date/Time: 31-Jul-17 @ 0800h  
Sample ID: Teck Coal various samples pass/fail

Initial Cell Density: 10227 cell/mL 225000  
0.22  
0.01

Concentration %(v/v)	Rep	Count 1 (x 10 <sup>4</sup> )	Count 2 (x 10 <sup>4</sup> )	Count 3 (x 10 <sup>4</sup> )	Count 4 (x 10 <sup>4</sup> )	Mean (x 10 <sup>4</sup> )	Cell Yield (x 10 <sup>4</sup> ) cell/mL		
Control	A					#DIV/0!	#DIV/0!	mean	#DIV/0!
Lab Control	B					#DIV/0!	#DIV/0!	SD	#DIV/0!
	C					#DIV/0!	#DIV/0!	CV	#DIV/0!
	D					#DIV/0!	#DIV/0!		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		
GH_FR1 95.2% (v/v)	A	152				152	151.0		
	B	153				153	152.0		
	C	161				161	160.0		
	D	160				160	159.0		
GH_ERC 95.2% (v/v)	A	170				170	169.0		
	B	166				166	165.0		
	C	150				150	149.0		
	D	144				144	143.0		
EV_MC2 95.2% (v/v)	A	160				160	159.0		
	B	146				146	145.0		
	C	174				174	173.0		
	D	152				152	151.0		
EV_HC1 95.2% (v/v)	A	171				171	170.0		
	B	153				153	152.0		
	C	163				163	162.0		
	D	150				150	149.0		
CM_MC2 95.2% (v/v)	A	138				138	137.0		
	B	129				129	128.0		
	C	140				140	139.0		
	D	121				121	120.0		
LC_LCDSSLC 95.2% (v/v)	A	141				141	140.0		
	B	162				162	161.0		
	C	148				148	147.0		
	D	140				140	139.0		
	A					#DIV/0!	#DIV/0!		
	B					#DIV/0!	#DIV/0!		
	C					#DIV/0!	#DIV/0!		
	D					#DIV/0!	#DIV/0!		

Reviewed by: Jb

Date reviewed: Aug. 28/17



**CETIS Summary Report**

Report Date: 24 Aug-17 11:03 (p 1 of 2)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Batch ID: 18-4005-5998      Test Type: Cell Growth      Analyst: Mimi Tran  
 Start Date: 28 Jul-17 08:00      Protocol: EC/EPS 1/RM/25      Diluent: Deionized Water + nutrients  
 Ending Date: 31 Jul-17 08:00      Species: Pseudokirchneriella subcapitata      Brine:  
 Duration: 72h      Source: In-House Culture      Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	07-4298-7467	28 Jul-17	28 Jul-17	8h	Teck Coal	
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)		
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7636-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

① Lab control =  
 Deionized water w/  
 nutrients  
 FR\_UFR1 = site control  
 CM\_MC1 = site control  
 GH\_ER2 = site control

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	37.63	35.35	39.9	35	42	0.9625	2.722	7.24%	0.0%
FR_UFR1	8	160.8	151.8	169.7	143	173	3.802	10.75	6.69%	-327.2%
CM_MC1	8	150.6	142.1	159.2	139	166	3.605	10.2	6.77%	-300.3%
GH_ER2	8	158.1	150.4	165.8	147	170	3.246	9.188	5.81%	-320.3%
FR_FRCP1	4	134.8	125	144.5	129	141	3.065	6.131	4.55%	-258.1%
GH_FR1	4	155.5	148.1	162.9	151	160	2.327	4.655	2.99%	-313.3%
GH_ERC	4	156.5	136.6	176.4	143	169	6.238	12.48	7.97%	-315.9%
EV_MC2	4	157	137.7	176.3	145	173	6.055	12.11	7.71%	-317.3%
EV_HC1	4	158.3	143	173.5	149	170	4.802	9.605	6.07%	-320.6%
CM_MC2	4	131	117.1	144.9	120	139	4.378	8.756	6.68%	-248.2%
LC_LCDSSLCC	4	148.8	130.6	162.9	139	161	5.072	10.14	6.91%	-290.0%

# CETIS Summary Report

Report Date: 24 Aug-17 11:03 (p 2 of 2)  
Test Code: 170739 | 07-2820-2125

## 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	36	35	42	39	41	37	35	36
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:03 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 10-3245-2839	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 24 Aug-17 10:59	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-4005-5998	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Jul-17 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 31 Jul-17 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	07-4298-7467	28 Jul-17	28 Jul-17	8h	Teck Coal	
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)		Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	38.3%	

**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	26.99	2.577	11.76	14	<0.0001	CDF	Significant Effect
		CM_MC1	24.77	2.577	11.76	14	<0.0001	CDF	Significant Effect
		GH_ER2	26.41	2.577	11.76	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	17.38	2.577	14.4	10	<0.0001	CDF	Significant Effect
		GH_FR1	21.09	2.577	14.4	10	<0.0001	CDF	Significant Effect
		GH_ERC	21.27	2.577	14.4	10	<0.0001	CDF	Significant Effect
		EV_MC2	21.36	2.577	14.4	10	<0.0001	CDF	Significant Effect
		EV_HC1	21.59	2.577	14.4	10	<0.0001	CDF	Significant Effect
		CM_MC2	16.71	2.577	14.4	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	19.53	2.577	14.4	10	<0.0001	CDF	Significant Effect

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:03 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 10-3245-2839      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 10:59      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			0.5540	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	95411.36	9541.136	10	114.6	<0.0001	Significant Effect
Error	4080.375	83.27296	49			
Total	99491.73		59			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	13.81	23.21	0.1816	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.977	0.9459	0.3141	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	37.63	35.35	39.9	36.5	35	42	0.9625	7.24%	0.0%
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	-327.2%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.605	6.77%	-300.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	-320.3%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	-258.1%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	-313.3%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	-315.9%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	-317.3%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	-320.6%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.68%	-248.2%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	-290.0%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	36	35	42	39	41	37	35	36
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				

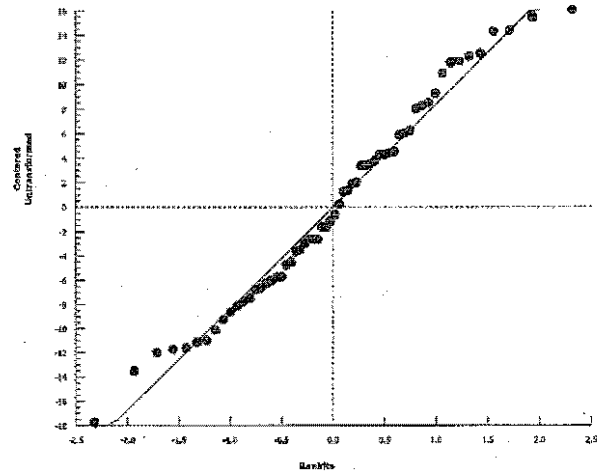
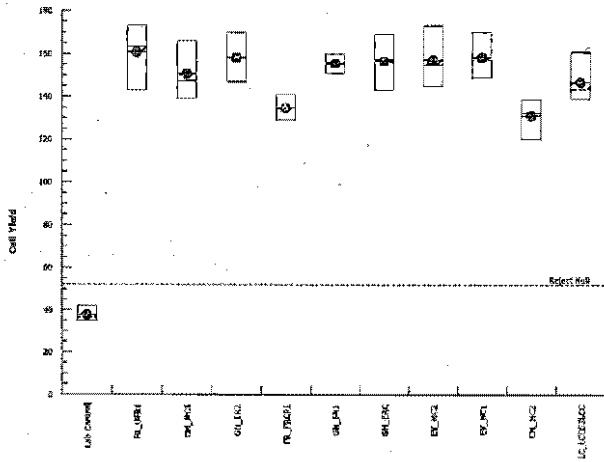
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 10-3245-2839      Endpoint: Cell Yield  
 Analyzed: 24 Aug-17 10:59      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 24 Aug-17 11:03 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Aiga Growth Inhibition Test**

Nautlius Environmental

Analysis ID: 07-0556-5957	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 24 Aug-17 11:00	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-4005-5998	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Jul-17 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 31 Jul-17 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)	Teck Coal	
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.55%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		CM_MC1	2.068	2.559	12.53	14	0.1378	CDF	Non-Significant Effect
		GH_ER2	0.5361	2.559	12.53	14	0.7997	CDF	Non-Significant Effect
		FR_FRCP1	4.335	2.559	15.35	10	0.0004	CDF	Significant Effect
		GH_FR1	0.8754	2.559	15.35	10	0.6523	CDF	Non-Significant Effect
		GH_ERC	0.7086	2.559	15.35	10	0.7294	CDF	Non-Significant Effect
		EV_MC2	0.6253	2.559	15.35	10	0.7646	CDF	Non-Significant Effect
		EV_HC1	0.4168	2.559	15.35	10	0.8414	CDF	Non-Significant Effect
		CM_MC2	4.96	2.559	15.35	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	2.334	2.559	15.35	10	0.0814	CDF	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:03 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 07-0556-5957      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 11:00      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			0.7185	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4376.173	486.2415	9	5.069	0.0001	Significant Effect
Error	4028.5	95.91666	42			
Total	8404.673		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.763	21.67	0.9263	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9612	0.9388	0.0880	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	0.0%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.805	6.77%	6.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	1.63%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	16.17%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	3.27%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	2.64%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	2.33%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	1.56%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.88%	18.51%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	8.71%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				

CETIS Analytical Report

Report Date:  
Test Code:

24 Aug-17 11:03 (p 3 of 3)  
170739 | 07-2820-2125

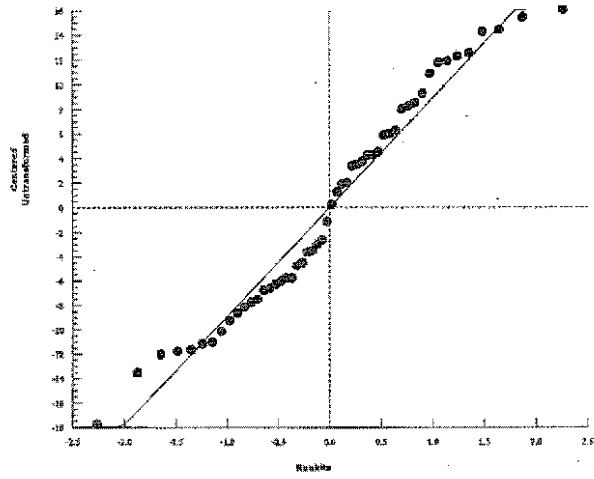
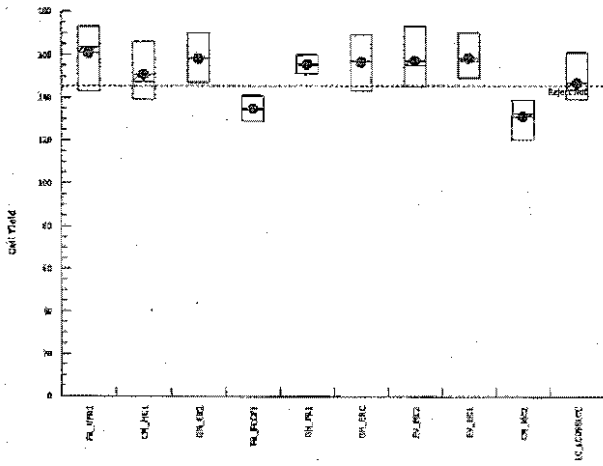
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 07-0556-5957      Endpoint: Cell Yield  
Analyzed: 24 Aug-17 11:00      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 06-1372-5150	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 24 Aug-17 11:02	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-4005-5998	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 28 Jul-17 08:00	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 31 Jul-17 08:00	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)	Teck Coal	
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.71%	

**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	-0.5361	2.559	12.53	14	0.9889	CDF	Non-Significant Effect
	CM_MC1	1.532	2.559	12.53	14	0.3277	CDF	Non-Significant Effect
	FR_FRCP1	3.898	2.559	15.35	10	0.0014	CDF	Significant Effect
	GH_FR1	0.4377	2.559	15.35	10	0.8345	CDF	Non-Significant Effect
	GH_ERC	0.271	2.559	15.35	10	0.8842	CDF	Non-Significant Effect
	EV_MC2	0.1876	2.559	15.35	10	0.9047	CDF	Non-Significant Effect
	EV_HC1	-0.02084	2.559	15.35	10	0.9442	CDF	Non-Significant Effect
	CM_MC2	4.523	2.559	15.35	10	0.0002	CDF	Significant Effect
	LC_LCDSSLCC	1.897	2.559	15.35	10	0.1869	CDF	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 06-1372-5150      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 11:02      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	4376.173	486.2415	9	5.069	0.0001	Significant Effect
Error	4028.5	95.91666	42			
Total	8404.673		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.763	21.67	0.9263	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9612	0.9388	0.0880	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	0.0%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.605	6.77%	6.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	1.63%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	16.17%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	3.27%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	2.64%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	2.33%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	1.56%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.68%	18.51%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	8.71%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				

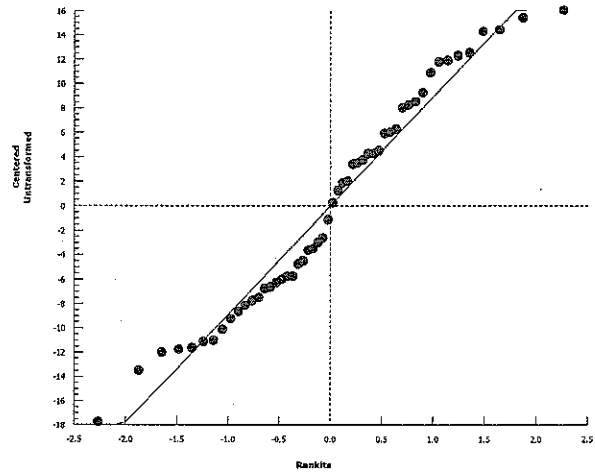
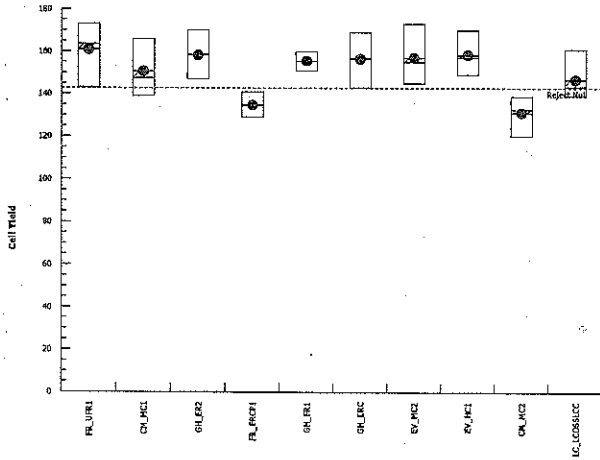
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-1372-5150      Endpoint: Cell Yield  
Analyzed: 24 Aug-17 11:02      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 07-1811-5955	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 24 Aug-17 11:03	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-4005-5998	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Jul-17 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 31 Jul-17 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)	Teck Coal	
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	9.71%	

**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	0.5361	2.559	12.53	14	0.7997	CDF	Non-Significant Effect
		CM_MC1	-1.532	2.559	12.53	14	0.9998	CDF	Non-Significant Effect
		FR_FRCP1	-3.898	2.559	15.35	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	-0.4377	2.559	15.35	10	0.9844	CDF	Non-Significant Effect
		GH_ERC	-0.271	2.559	15.35	10	0.9731	CDF	Non-Significant Effect
		EV_MC2	-0.1876	2.559	15.35	10	0.9653	CDF	Non-Significant Effect
		EV_HC1	0.02084	2.559	15.35	10	0.9375	CDF	Non-Significant Effect
		CM_MC2	-4.523	2.559	15.35	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.897	2.559	15.35	10	1.0000	CDF	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Aiga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 07-1811-5955      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 11:03      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	4375.173	486.2415	9	5.069	0.0001	Significant Effect
Error	4028.5	95.91666	42			
Total	8404.673		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.763	21.67	0.9263	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9612	0.9388	0.0880	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	0.0%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.605	6.77%	6.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	1.63%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	16.17%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	3.27%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	2.64%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	2.33%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	1.56%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.68%	18.51%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	8.71%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				



**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautlius Environmental**

Analysis ID: 06-7443-8058	Endpoint: Cell Yield	CETIS Version: CETISv1.6.7
Analyzed: 24 Aug-17 11:02	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 18-4005-5998	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 28 Jul-17 08:00	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 31 Jul-17 08:00	Species: Pseudokirchneriella subcapitata	Brine:
Duration: 72h	Source: In-House Culture	Age: 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)	Teck Coal	
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8642	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

Data Transform	Zeta	Ait Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.2%	

**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	-2.068	2.559	12.53	14	1.0000	CDF	Non-Significant Effect
		GH_ER2	-1.532	2.559	12.53	14	0.9998	CDF	Non-Significant Effect
		FR_FRCP1	2.647	2.559	15.35	10	0.0409	CDF	Significant Effect
		GH_FR1	-0.8129	2.559	15.35	10	0.9960	CDF	Non-Significant Effect
		GH_ERC	-0.9796	2.559	15.35	10	0.9980	CDF	Non-Significant Effect
		EV_MC2	-1.063	2.559	15.35	10	0.9986	CDF	Non-Significant Effect
		EV_HC1	-1.271	2.559	15.35	10	0.9994	CDF	Non-Significant Effect
		CM_MC2	3.272	2.559	15.35	10	0.0085	CDF	Significant Effect
	LC_LCDSSLCC	0.6461	2.559	15.35	10	0.7562	CDF	Non-Significant Effect	

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 06-7443-8058      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 11:02      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	4376.173	486.2415	9	5.069	0.0001	Significant Effect
Error	4028.5	95.91666	42			
Total	8404.673		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.763	21.67	0.9263	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9612	0.9388	0.0880	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	0.0%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.605	6.77%	6.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	1.63%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	16.17%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	3.27%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	2.64%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	2.33%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	1.56%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.68%	18.51%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	8.71%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				



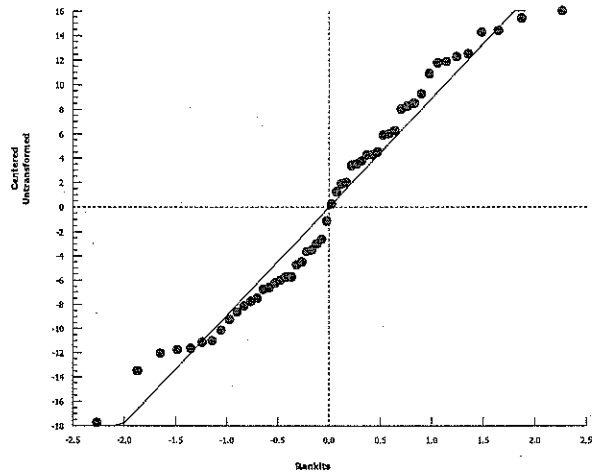
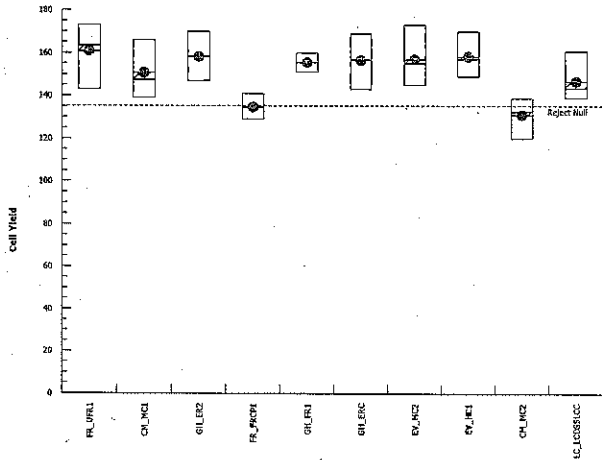
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 06-7443-8058      Endpoint: Cell Yield  
Analyzed: 24 Aug-17 11:02      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 1 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 21-1141-9264	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 24 Aug-17 11:02	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-4005-5998	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 28 Jul-17 08:00	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 31 Jul-17 08:00	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 7d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	14-9297-9074	25 Jul-17 11:41	26 Jul-17 08:15	68h (15.9 °C)	Teck Coal	
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	72h (14.2 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	69h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	71h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	71h (15 °C)		
GH_ERC	05-7638-3020	25 Jul-17 12:16	26 Jul-17 08:15	68h (15 °C)		
EV_MC2	11-6022-0236	25 Jul-17 13:45	26 Jul-17 08:15	66h (16.9 °C)		
EV_HC1	15-1109-5815	25 Jul-17 10:45	26 Jul-17 08:15	69h (16.9 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	67h (18 °C)		Teck Coal Q3
LC_LCDSSLCC	06-5340-5299	25 Jul-17 10:31	26 Jul-17 08:15	69h (13.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-07-25_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-07		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-05-22		

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%)
CM_MC1		FR_UFR1	2.068	2.559	12.53	14	0.1378	CDF	Non-Significant Effect
		GH_ER2	1.532	2.559	12.53	14	0.3277	CDF	Non-Significant Effect
		FR_FRCP1	-2.647	2.559	15.35	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	0.8129	2.559	15.35	10	0.6821	CDF	Non-Significant Effect
		GH_ERC	0.9796	2.559	15.35	10	0.6008	CDF	Non-Significant Effect
		EV_MC2	1.063	2.559	15.35	10	0.5585	CDF	Non-Significant Effect
		EV_HC1	1.271	2.559	15.35	10	0.4523	CDF	Non-Significant Effect
		CM_MC2	-3.272	2.559	15.35	10	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-0.6461	2.559	15.35	10	0.9925	CDF	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 24 Aug-17 11:04 (p 2 of 3)  
 Test Code: 170739 | 07-2820-2125

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 21-1141-9264      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 24 Aug-17 11:02      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	4376.173	486.2415	9	5.069	0.0001	Significant Effect
Error	4028.5	95.91666	42			
Total	8404.673		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.763	21.67	0.9263	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9612	0.9388	0.0880	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	160.8	151.8	169.7	163.5	143	173	3.802	6.69%	0.0%
CM_MC1	8	150.6	142.1	159.2	147.5	139	166	3.605	6.77%	6.3%
GH_ER2	8	158.1	150.4	165.8	158.5	147	170	3.248	5.81%	1.63%
FR_FRCP1	4	134.8	125	144.5	134.5	129	141	3.065	4.55%	16.17%
GH_FR1	4	155.5	148.1	162.9	155.5	151	160	2.327	2.99%	3.27%
GH_ERC	4	156.5	136.6	176.4	157	143	169	6.238	7.97%	2.64%
EV_MC2	4	157	137.7	176.3	155	145	173	6.055	7.71%	2.33%
EV_HC1	4	158.3	143	173.5	157	149	170	4.802	6.07%	1.56%
CM_MC2	4	131	117.1	144.9	132.5	120	139	4.378	6.68%	18.51%
LC_LCDSSLCC	4	146.8	130.6	162.9	143.5	139	161	5.072	6.91%	8.71%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	165	169	155	170	173	143	149	162
CM_MC1	144	165	166	147	154	142	139	148
GH_ER2	147	164	150	160	170	169	157	148
FR_FRCP1	129	139	141	130				
GH_FR1	151	152	160	159				
GH_ERC	169	165	149	143				
EV_MC2	159	145	173	151				
EV_HC1	170	152	162	149				
CM_MC2	137	128	139	120				
LC_LCDSSLCC	140	161	147	139				

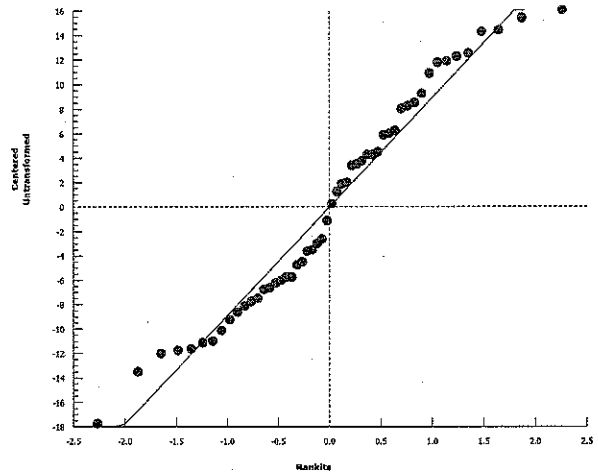
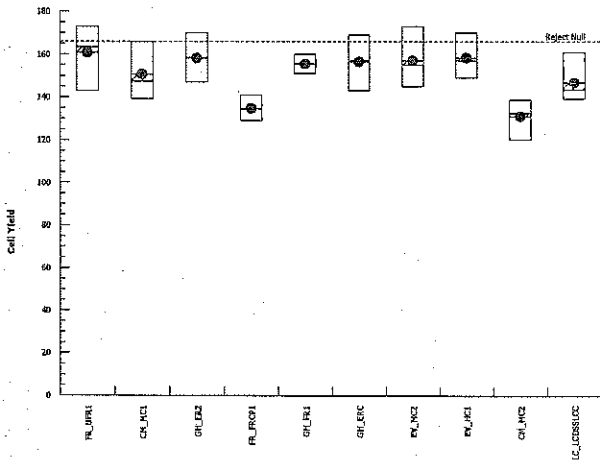
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 21-1141-9264      Endpoint: Cell Yield  
Analyzed: 24 Aug-17 11:02      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**APPENDIX C – *Hyaella azteca* Toxicity Test Data**

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*water only*  
***Hyaella azteca* Sediment Test Summary Sheet**

Client: Teck  
 Work Order No.: 170736

Start Date: July 26 / 17  
 Set up by: KJL

**Sample Information:**

Sample ID: various - see below  
 Sample Date: July 25, August 1, 8, 15, 2017  
 Date Received: July 26, August 2, 9, 16, 2017  
 Sample Volume: 1 x 20L per refresh

**Test Organism Information:**

Species: *Hyaella azteca*  
 Supplier: Aquatic Research organisms  
 Date received: July 26 / 17  
 Age or size (Day 0): 8 days

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: HA 132  
 Stock Solution ID: n/a  
 Date Initiated: July 26 / 17

96-h LC50 (95% CL): 5.6 (4.5 - 6.9) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.1 - 6.6) g/L NaCl CV (%): 7

**Test Results:**

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	82.0 ± 13.0	0.71 ± 0.27
FR - UFR 1	72.0 ± 17.9	0.72 ± 0.12
CM - MCI	66.0 ± 16.7	0.46 ± 0.17 <sup>α</sup>
GH - ER 2	68.0 ± 13.0	0.67 ± 0.23
FR - FRCP 1	68.0 ± 14.8	0.77 ± 0.05
GH - FR 1	64.0 ± 25.1	0.76 ± 0.07
CM - MC 2	0.0 ± 0.0 <sup>*LFB</sup>	0.0 ± 0.00 <sup>*LFB</sup>
JW	±	±

\* Asterisks indicates sample(s) that is significantly different from control

α indicates sample(s) that is significantly different from FR-UFR 1 (site control)

Reviewed by: JCh Date reviewed: Sept 13 / 17  
 # indicates sample(s) that is significantly different from GH-ER2 (site control)  
 B indicates sample(s) that is significantly different from CM-MCI (site control)

*water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment Water Quality  
*water only*

Client: TECK  
 WO #: 170736  
 Sample ID: cep below

Start Date: Jul 26/17  
 Termination Date: AUG 23/17  
 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	24.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
FR-VFRI	23.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
CM-MC1	23.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
GH-ER2	23.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
FR-FRCPI	23.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
GH-FRI	24.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
CM-MC2	24.0	23.5	23.5	23.5	24.0	24.0	23.0	22.5	23.5	23.5	23.5	22.5	23.0	23.0	23.0
Technician Initials	K	K	K	JW	J	K	K	K	K	K	EMM	JS	ML7	KOL	K7C

Temperature (°C)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
FR-VFRI	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
CM-MC1	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
GH-ER2	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
FR-FRCPI	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
GH-FRI	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
CM-MC2	23.0	22.5	23.0	23.0	23.0	22.5	22.5	22.0	22.0	22.0	22.0	22.5	22.5	22.5
Technician Initials	K	K	K	B	K	K	K	K	K	A	A	K	K	K

Thermometer: 6 Light meter: WT-1 Light intensity (Lux): 310670

Comments: All site water supplemented with 25 mg/L Cl and 0.02 mg/L Br.

Reviewed by: JOK Date Reviewed: Sept 7/17

*water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment Water Quality  
*water only*

Client: Teck  
 WO #: 170736  
 Sample ID: See below

Start Date: Jul 26/17  
 Termination Date: AUG 23 /17  
 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	432	435	438	434	429	445	439	440	437	441	442	471	440	471	440
FR-VFRI	408	412	416	417	421	425	418	420	421	434	436	436	433	454	464
CM-MC1	361	364	368	366	372	373	369	370	372	378	390	388	366	380	384
GH-FR2	365	366	370	371	371	379	373	373	377	380	381	376	376	377	365
FR-FRCPI	952	940	953	955	961	951	947	935	928	1075	939	1095	1060	1064	957
GH-FRI	844	813	830	833	840	841	831	831	825	859	859	944	834	848	844
CM-MC2	919	905	922	920	920	919	908	909	903	947	942	950	926	926	923
Technician Initials	K	K	K	JW	A	K	K	K	K	K	EMM	JS	MLT	K	K

Conductivity (µS)

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	441	443	439	443	445	437	441	441	443	448	457	443	439	444
FR-VFRI	485	423	436	431	433	438	439	440	441	444	451	447	443	441
CM-MC1	385	383	375	381	382	377	376	374	378	376	378	382	379	371
GH-FR2	370	374	381	370	378	383	386	379	381	381	375	385	384	384
FR-FRCPI	952	979	1100	1053	1079	1137	1136	1136	1148	1175	1191	1179	1153	1142
GH-FRI	850	838	873	902	892	864	866	864	890	899	882	889	873	876
CM-MC2	925	960	1022	985	992	1023	1024	1021	1026	1027	1047	1018	1004	1009
Technician Initials	K	K	A	JS	K	K	K	K	K	A	K	K	K	K

Conductivity meter/probe: 3/3

Comments: Checked w/ another meter.

Reviewed by: JOU

Date Reviewed: Sept. 7/17



*water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment <sup>water</sup> Water Quality  
*water only*

Client: Teck  
 WO #: 170736  
 Sample ID: See below

Start Date: Jul 26/17  
 Termination Date: AUG 23 /17  
 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)	7.8	7.6	7.5	7.2	7.1	7.3	7.3	7.4	7.5	7.2	7.7	7.2	7.3	7.3	7.3
FR-VFRI	8.1	8.0	7.9	7.8	7.7	7.8	7.8	8.0	8.0	7.8	7.9	7.9	7.8	7.8	7.7
CM-MCA	7.9	8.0	7.9	7.8	7.8	7.7	7.7	7.8	7.9	7.7	7.9	7.9	7.8	7.8	7.8
GH-ER2	7.8	7.9	7.8	7.8	7.9	7.7	7.6	7.8	7.7	7.6	7.8	7.8	7.7	7.8	7.8
FR-FRCPI	8.0	8.1	8.0	7.9	7.8	7.9	7.8	7.9	7.8	7.9	7.9	7.9	7.9	7.9	7.9
GH-FRI	8.0	8.1	8.0	7.9	7.8	8.0	7.8	8.0	7.9	7.9	7.9	8.0	7.8	7.9	7.8
CM-MC2	8.1	8.2	8.1	8.0	7.9	7.9	7.8	8.0	8.0	8.0	8.0	8.0	7.8	7.9	7.9
Technician Initials	K	K	K	JW	A	K	K	K	K	K	EMM	JS	ML	KJ	KDC

pH

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
(control)	7.2	7.1	7.3	7.2	7.3	7.2	7.1	7.3	7.4	7.3	7.2	7.1	7.1	7.2	
FR-VFRI	7.7	7.6	7.7	7.7	7.7	7.9	7.7	8.0	8.0	7.8	7.8	7.7	7.7	7.8	
CM-MCA	7.8	7.5	7.8	7.8	7.7	7.8	7.7	7.9	8.0	7.9	7.8	7.8	7.8	7.9	
GH-ER2	7.8	7.6	7.9	7.9	7.8	7.9	7.7	7.9	7.9	7.8	7.9	7.8	7.6	7.7	
FR-FRCPI	7.9	7.7	7.8	7.7	7.7	7.9	7.7	7.9	7.9	7.9	7.8	7.8	7.8	7.8	
GH-FRI	7.9	7.9	7.9	7.9	7.9	7.8	7.7	7.8	7.8	7.8	7.8	7.7	7.7	7.8	
CM-MC2	7.9	7.7	7.9	7.8	7.8	7.8	7.7	7.9	7.9	7.7	7.8	8.0	7.9	8.0	
Technician Initials	K	K	A	JS	K	K	K	K	K	K	K	K	K	K	

pH meter/probe: 3 13

Comments: \_\_\_\_\_

Reviewed by: JGH

Date Reviewed: sep. 7/17

Chronic *H. azteca* Sediment Toxicity Test Data Sheet  
 Freshwater Sediment Water Quality

*waters only*

Client: Teck  
 WO #: 170736  
 Sample ID: See below

Start Date: Jul 26/17  
 Termination Date: AUG 23 /17  
 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	8.3	8.2	8.2	6.2	5.8	5.2	8.2	5.8	5.8	5.9	5.8	6.0	6.0	6.1	6.5
FR-UFR1	8.5	7.2	7.0	6.3	5.7	5.2	7.1	6.2	5.9	6.0	6.0	6.2	6.2	6.0	6.2
CM-MC1	8.5	7.4	7.1	6.4	5.8	5.2	7.0	6.4	5.1	6.1	6.0	6.3	6.0	6.0	6.6
GH-ER2	8.5	7.4	7.0	6.4	5.8	5.2	7.0	6.5	5.1	5.9	5.1	5.9	5.9	6.1	6.8
FR-FRCPI	8.3	7.4	7.1	6.4	6.0	5.0	6.9	6.4	5.3	5.4	5.2	6.2	5.9	6.2	6.8
GH-FR1	8.5	7.4	7.1	6.5	6.0	4.9	6.9	6.3	5.3	5.7	4.8	6.0	6.1	6.0	6.9
CM-MC2	8.5	7.4	7.1	6.4	6.1	4.9	6.9	6.3	5.4	5.9	4.8	5.9	6.2	6.1	6.7
Technician Initials	K	K	BN	JW	R	K	K	K	K	K	EMM	JS	ML	KJL	KJL

Dissolved oxygen (mg/L)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Control	7.0	6.8	6.6	6.6	6.7	6.0	6.0	6.0	5.2	6.2	6.5	5.0	5.2	5.5	
FR-UFR1	7.1	6.7	6.4	6.5	6.6	6.5	7.1	6.8	6.0	6.0	6.4	5.5	5.9	5.9	
CM-MC1	6.9	6.8	6.5	6.4	6.5	6.7	7.1	7.0	6.0	5.8	6.4	6.1	5.6	6.7	
GH-ER2	6.8	6.7	6.5	6.4	6.4	6.7	7.1	7.1	6.2	5.9	6.5	6.2	5.6	5.5	
FR-FRCPI	6.9	6.9	6.4	6.5	6.5	6.4	6.6	6.5	5.2	5.7	6.5	6.2	5.2	4.6	
GH-FR1	6.7	6.8	6.6	6.5	6.6	5.6	6.5	4.4	5.4	6.8	5.0	5.0	4.8		
CM-MC2	6.9	6.8	6.6	6.5	6.6	5.9	6.9	5.3	5.8	6.9	6.8	6.0	6.7		
Technician Initials	KJL	KJL	BN	JS	KJL	K	K	K	K	M	JL	K	K	K	

DO meter/probe: 3 13

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: JCh

Date Reviewed: Sept. 7/17

**H. azteca Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment 14<sup>h</sup>d Survival and Weight

*h*  
*water only 28-d*

Client: Teck  
 Work Order No: 170736  
 Sample ID: see below

Start Date: July 26/17  
 Termination Date: Aug 23/17  
 Test Organism: Hyalella azteca  
 Balance: 1

Sample ID	Pan No. <sup>03</sup> Blue	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment <i>W</i>	1	A	6	0	4	<i>h</i>	1011.59	1017.62	6	<i>h</i>
	2	B	9	0	1		1038.46	1046.19	9	
	3	C	9 <sup>①</sup>	0	1		1023.85	1026.40	9	
	4	D	9	0	1		1012.93	1019.50	9	
	5	E	8	0	2	<i>h</i>	1009.18	1014.57	8	
PR-UPEI	6	A	<i>h</i> 9.5	0	5	<i>h</i>	1006.79	1010.24	5	
	7	B	7	0	3		1020.74	1026.36	7	
	8	C	9	0	1		1032.20	1038.21	9	
	9	D	9	0	1		1033.32	1038.53	9	
	10	E	6	0	4	<i>h</i>	1020.40	1025.66	6	
CM-MCI	11	A	8	0	2	<i>h</i>	1019.03	1021.99	8	
	12	B	8	0	2		1008.66	1012.49	8	
	13	C	4	0	6		1033.43	1034.34	4	
	14	D	6	0	4		1020.00	1023.03	6	
	15	E	7	0	3		1026.46	1031.36	7	
GHI-ER2	16	A	8	0	2		1020.02	1026.14	8	
	17	B	7	0	3		1045.53	1050.38	7	
	18	C	6	0	4		1029.17	1034.54	6	
	19	D	8	0	2		1023.96	1029.57	8	
	20	E	5	0	5	<i>h</i>	1010.89	1012.28	5	<i>h</i>

Comments: ① Hyal appear <sup>h</sup> smaller than other reps. 10% Reweigh: # 5. 1014.65 # 24. 1030.04  
(mg) # 16. 1026.20

Reviewed by: JOU

Date Reviewed: Sept. 7/17

*H. azteca* Sediment Toxicity Test Data Sheet  
 Freshwater Sediment 14<sup>hr</sup> Survival and Weight  
*water only 28-d*

Client: Teck  
 Work Order No: 170736  
 Sample ID: See below

Start Date: July 26/17  
 Termination Date: Aug 23/17  
 Test Organism: Hyalella azteca  
 Balance: 1

Sample ID	23 Pan No. <i>Blue</i>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	21	A	7	0	7	<i>ku</i>	1017.23	1022.51	7	<i>ku</i>
<i>FR-FRCPI</i>	22	B	6	0	6		1013.43	1018.18	6	
	23	C	5	0	5		1012.19	1015.71	5	
	24	D	7	0	7		1024.13	1030.02	7	
	25	E	9	0	9		1004.98	1011.91	9	
	26	A	7	0	7		1008.05	1013.86	7	
<i>GH-FRI</i>	27	B	2	0	2		1015.39	1016.79	2	
	28	C	8	0	8		1017.99	1023.82	8	
	29	D	7	0	7		1012.60	1018.36	7	
	30	E	8	0	8	↓	1022.97	1028.56	8	↓
<i>CM-MC2</i>	31	A	0	0	10	<i>ku</i>	1020.13	-	0	<i>ku</i>
	32	B	0	0	10		1019.59	-	0	
	33	C	0	0	10		1013.39	-	0	
	34	D	0	0	10		1016.79	-	0	
	35	E	0	0	10	↓	1028.20	-	0	↓
		A								
		B								
		C								
		D								
		E								

Comments: \_\_\_\_\_

Reviewed by: *JOH*

Date Reviewed: *sep. 13/17*

Client: Teck

W.O.#: 170736

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FR-DFR1	July 25/17	July 31/17	50	8.1	8.3	158	50	8.3	166	J5
CM-MC1	↓	↓	↓	<sup>75</sup> 8.1 7.7	<sup>75</sup> 8.3 7.9	158 <sup>75</sup> 150	50	<sup>75</sup> 8.3 7.2	<sup>75</sup> 166 144	↓
GH-ER2	↓	↓	↓	7.7	8.0	148	50	7.5	150	↓
FR-FRCP1	↓	↓	↓	10.5	10.7	206	100	6.0	600	↓
GH-FR1	↓	↓	↓	10.4	10.6	204	100	5.5	550	↓
CM-MC2	↓	↓	↓	9.8	10.0	192	100	5.6	560	↓
FR-UF1	Aug 2/17	AUG 3/17	50	7.8	8.0	152	50	10.7	214	K
CM-MC1	↓	↓	↓	7.3	7.5	142	50	8.5	170	↓
GH-ER2	↓	↓	↓	7.2	7.4	140	50	9.4	188	↓
FR-FRCP1	↓	↓	↓	10.6	10.8	208	100	6.1	610	↓
GH-FR1	↓	↓	↓	10.3	10.5	202	100	5.5	550	↓
CM-MC2	↓	↓	↓	10.1	10.3	198	100	5.3	530	↓

Notes: ① Diluted to 100ml w/ D.I. water.

Reviewed by: JGh

Date Reviewed: sep-7/17

Client: TECK

W.O.#: 170736

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FR.UFP1	Aug 8/17	AUG 8/17	50	8.1	8.3	158	50	9.4	188	K
CM.MC1	↓	↓	↓	8.1	8.2	160	50	7.3 <del>7.2</del> <sup>7.2</sup>	146	↓
CH.EP2	↓	↓	↓	7.8	7.9	154	50	7.9	158	↓
FR.FRPC1	↓	↓	↓	10.9	11.1	214	100	6.9	690	↓
CH.FP3	↓	↓	↓	10.8 <sup>6</sup>	10.8	208	100	4.6	460	↓
CM.MC2	↓	↓	↓	10.4	10.6	204	100	5.4	540	↓
FR.UFP1	Aug 16/17	AUG 16/17	50	8.0	8.1	158	50	9.5	190	↓
CM.MC1	↓	↓	↓	7.4	7.6	144	50	7.7 <sup>5</sup>	150	↓
CH.EP2	↓	↓	↓	7.5	7.6	148	50	7.7	154	↓
FR.FRPC1	↓	↓	↓	11.3	11.6	220	100	6.4	640	↓
CH.FP3	↓	↓	↓	10.3	10.5	202 <sup>202</sup>	100	5.0	500	↓
CM.MC2	↓	↓	↓	10.5	10.7	200	100	5.5	550	↓
1 <sup>st</sup> CONTROL	Aug 23/17	AUG 23/17	50	3.0	3.1	58	50	6.8	136	↓
FR.UFP1	↓	↓	↓	7.5	7.6	148	50	8.8 <sup>9</sup>	178	↓
CM.MC1	↓	↓	↓	6.5	6.6	128	50	7.2	144	↓
CH.EP2	↓	↓	↓	7.2	7.3	142	50	7.6	152	↓
FR.FRPC1	↓	↓	↓	9.5	9.7	186	100	6.0	600	↓
CH.FP3	↓	↓	↓	9.0	9.2	176	100	5.0	500	↓
CM.MC2	↓	↓	↓	8.9	9.0	176	100	5.3	530	↓

Notes: ① Sample diluted w/ DI water up to 100ml

Reviewed by: JOU

Date Reviewed: SEP - 7/17

**CETIS Summary Report**

Report Date: 31 Aug-17 11:49 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Batch ID: 10-1824-8789      Test Type: Survival-Growth      Analyst: Kania Lywe  
 Start Date: 26 Jul-17      Protocol: EPA/600/R-99/064 (2000)      Diluent: Reconstituted Water  
 Ending Date: 23 Aug-17      Species: Hyalella azteca      Brine: 3.3M  
 Duration: 28d 0h      Source: Aquatic Biosystems, CO      Age: 6-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-5799-1601	26 Jul-17	26 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C) ✓		Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C) ✓		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C) ✓		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C) ✓		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C) ✓		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	11h (18 °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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

**Test Acceptability**

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
07-6708-8772	Survival Rate	Control Resp	0.82	0.8 - NL	Yes	Passes Acceptability Criteria
18-9980-3202	Survival Rate	Control Resp	0.82	0.8 - NL	Yes	Passes Acceptability Criteria

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.7102	0.3742	1.046	0.2833	1.005	0.121	0.2706	38.11%	0.0%
FR_UFR1	5	0.7232	0.5778	0.8687	0.5789	0.8767	0.05239	0.1171	16.2%	-1.84%
CM_MC1	5	0.4562	0.2393	0.6732	0.2275	0.7	0.07813	0.1747	38.29%	35.76%
GH_ER2	5	0.6664	0.3787	0.9541	0.278	0.895	0.1036	0.2317	34.77%	6.16%
FR_FRCP1	5	0.7723	0.7097	0.8348	0.704	0.8414	0.02253	0.05037	6.52%	-8.74%
GH_FR1	5	0.7561	0.6749	0.8373	0.6988	0.83	0.02924	0.06539	8.65%	-6.46%

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.82	0.6581	0.9819	0.6	0.9	0.05831	0.1304	15.9%	0.0%
FR_UFR1	5	0.72	0.4979	0.9421	0.5	0.9	0.08	0.1789	24.85%	12.2%
CM_MC1	5	0.66	0.4522	0.8678	0.4	0.8	0.07483	0.1673	25.35%	19.51%
GH_ER2	5	0.68	0.5181	0.8419	0.5	0.8	0.05831	0.1304	19.17%	17.07%
FR_FRCP1	5	0.68	0.4958	0.8642	0.5	0.9	0.06633	0.1483	21.81%	17.07%
GH_FR1	5	0.64	0.3283	0.9517	0.2	0.8	0.1122	0.251	39.22%	21.95%
CM_MC2	5	0	0	0	0	0	0	0		100.0%

**CETIS Summary Report**

Report Date: 31 Aug-17 11:49 (p 2 of 2)  
 Test Code: 170736 | 08-5081-7061

**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
Control	1.005	0.8589	0.2833	0.73	0.6738
FR_UFR1	0.69	0.8029	0.6678	0.5789	0.8767
CM_MC1	0.37	0.4788	0.2275	0.505	0.7
GH_ER2	0.765	0.6929	0.895	0.7012	0.278
FR_FRCP1	0.7543	0.7917	0.704	0.8414	0.77
GH_FR1	0.83	0.7	0.7288	0.8229	0.6988
CM_MC2					

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.6	0.9	0.9	0.9	0.8
FR_UFR1	0.5	0.7	0.9	0.9	0.6
CM_MC1	0.8	0.8	0.4	0.6	0.7
GH_ER2	0.8	0.7	0.6	0.8	0.5
FR_FRCP1	0.7	0.6	0.5	0.7	0.9
GH_FR1	0.7	0.2	0.8	0.7	0.8
CM_MC2	0	0	0	0	0

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	6/10	9/10	9/10	9/10	8/10
FR_UFR1	5/10	7/10	9/10	9/10	6/10
CM_MC1	8/10	8/10	4/10	6/10	7/10
GH_ER2	8/10	7/10	6/10	8/10	5/10
FR_FRCP1	7/10	6/10	5/10	7/10	9/10
GH_FR1	7/10	2/10	8/10	7/10	8/10
CM_MC2	0/10	0/10	0/10	0/10	0/10



**CETIS Analytical Report**

Report Date: 31 Aug-17 11:50 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-6708-8772	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 31 Aug-17 11:38	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 7-3w 6-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-5799-1601	26 Jul-17	26 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)		Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	11h (18 °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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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	0.171	0.1710	Exact	Non-Significant Effect
Control		CM_MC1	0.05477	0.2191	Exact	Non-Significant Effect
Control		GH_ER2	0.08258	0.2477	Exact	Non-Significant Effect
Control		FR_FRCP1	0.08258	0.2477	Exact	Non-Significant Effect
Control		GH_FR1	0.03523	0.1762	Exact	Non-Significant Effect
Control		CM_MC2	0	<0.0001	Exact	Significant Effect

**Test Acceptability Criteria**

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.82	0.8 - NL	Yes	Passes Acceptability Criteria

**Data Summary**

Sample Code		NR	R	NR + R	Prop NR	Prop R	%Effect
Control	Negative Contr	41	9	50	0.82	0.18	0.0%
FR_UFR1		36	14	50	0.72	0.28	12.2%
CM_MC1		33	17	50	0.66	0.34	19.51%
GH_ER2		34	16	50	0.68	0.32	17.07%
FR_FRCP1		34	16	50	0.68	0.32	17.07%
GH_FR1		32	18	50	0.64	0.36	21.95%
CM_MC2		0	50	50	0	1	100.0%

**CETIS Analytical Report**

Report Date: 31 Aug-17 11:50 (p 2 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

Analysis ID: 07-6708-8772  
 Analyzed: 31 Aug-17 11:38

Endpoint: Survival Rate  
 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

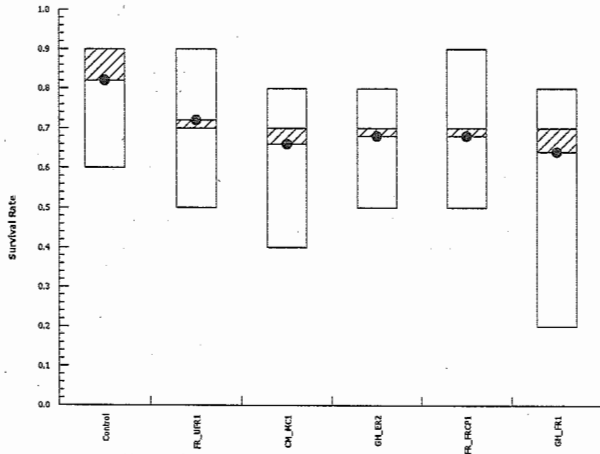
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.6	0.9	0.9	0.9	0.8
FR_UFR1	0.5	0.7	0.9	0.9	0.6
CM_MC1	0.8	0.8	0.4	0.6	0.7
GH_ER2	0.8	0.7	0.6	0.8	0.5
FR_FRCP1	0.7	0.6	0.5	0.7	0.9
GH_FR1	0.7	0.2	0.8	0.7	0.8
CM_MC2	0	0	0	0	0

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	6/10	9/10	9/10	9/10	8/10
FR_UFR1	5/10	7/10	9/10	9/10	6/10
CM_MC1	8/10	8/10	4/10	6/10	7/10
GH_ER2	8/10	7/10	6/10	8/10	5/10
FR_FRCP1	7/10	6/10	5/10	7/10	9/10
GH_FR1	7/10	2/10	8/10	7/10	8/10
CM_MC2	0/10	0/10	0/10	0/10	0/10

**Graphics**



**CETIS Analytical Report**

Report Date: 31 Aug-17 11:50 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

Analysis ID: 05-4092-9014	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 31 Aug-17 11:43	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 10-1824-8789	Test Type: Survival-Growth	Analyst: Kania Lywe
Start Date: 26 Jul-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 23 Aug-17	Species: Hyalella azteca	Brine: 7.3‰
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 8-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	11h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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	0.3329	0.9987	Exact	Non-Significant Effect
FR_UFR1		GH_ER2	0.4138	0.8275	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.4138	0.8275	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.2603	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Reference Sed	36	14	50	0.72	0.28	0.0%
CM_MC1	33	17	50	0.66	0.34	8.33%
GH_ER2	34	16	50	0.68	0.32	5.56%
FR_FRCP1	34	16	50	0.68	0.32	5.56%
GH_FR1	32	18	50	0.64	0.36	11.11%
CM_MC2	0	50	50	0	1	100.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.5	0.7	0.9	0.9	0.6
CM_MC1	0.8	0.8	0.4	0.6	0.7
GH_ER2	0.8	0.7	0.6	0.8	0.5
FR_FRCP1	0.7	0.6	0.5	0.7	0.9
GH_FR1	0.7	0.2	0.8	0.7	0.8
CM_MC2	0	0	0	0	0

**CETIS Analytical Report**

Report Date: 31 Aug-17 11:50 (p 2 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

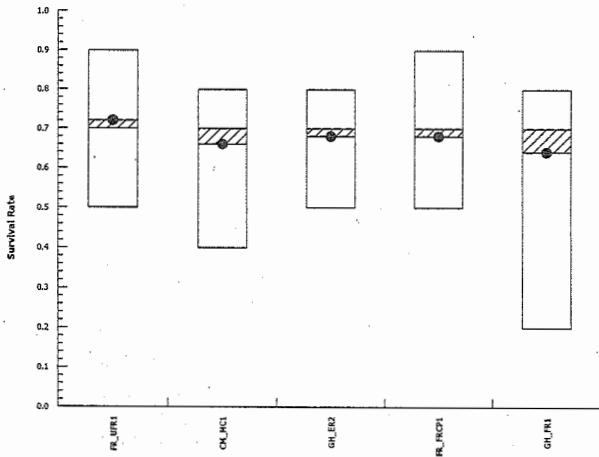
Analysis ID: 05-4092-9014      Endpoint: Survival Rate  
 Analyzed: 31 Aug-17 11:43      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	5/10	7/10	9/10	9/10	6/10
CM_MC1	8/10	8/10	4/10	6/10	7/10
GH_ER2	8/10	7/10	6/10	8/10	5/10
FR_FRCP1	7/10	6/10	5/10	7/10	9/10
GH_FR1	7/10	2/10	8/10	7/10	8/10
CM_MC2	0/10	0/10	0/10	0/10	0/10

**Graphics**



**CETIS Analytical Report**

Report Date: 19 Oct-17 10:10 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

<b>Analysis ID:</b> 03-1267-7492	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 19 Oct-17 10:10	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	11h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.5848	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	0.4165	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
FR_UFR1	36	14	50	0.72	0.28	-5.88%	
CM_MC1	33	17	50	0.66	0.34	2.94%	
GH_ER2	Reference Sed	34	16	50	0.68	0.32	0.0%
FR_FRCP1		34	16	50	0.68	0.32	0.0%
GH_FR1		32	18	50	0.64	0.36	5.88%
CM_MC2		0	50	50	0	1	100.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.5	0.7	0.9	0.9	0.6
CM_MC1	0.8	0.8	0.4	0.6	0.7
GH_ER2	0.8	0.7	0.6	0.8	0.5
FR_FRCP1	0.7	0.6	0.5	0.7	0.9
GH_FR1	0.7	0.2	0.8	0.7	0.8
CM_MC2	0	0	0	0	0

# CETIS Analytical Report

Report Date: 19 Oct-17 10:10 (p 2 of 2)  
Test Code: 170736 | 08-5081-7061

## Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 03-1267-7492  
Analyzed: 19 Oct-17 10:10

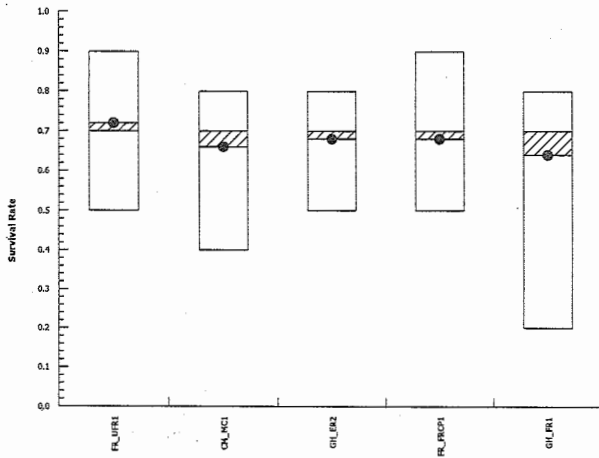
Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	5/10	7/10	9/10	9/10	6/10
CM_MC1	8/10	8/10	4/10	6/10	7/10
GH_ER2	8/10	7/10	6/10	8/10	5/10
FR_FRCP1	7/10	6/10	5/10	7/10	9/10
GH_FR1	7/10	2/10	8/10	7/10	8/10
CM_MC2	0/10	0/10	0/10	0/10	0/10

### Graphics



**CETIS Analytical Report**

Report Date: 19 Oct-17 10:18 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-0761-1914	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 19 Oct-17 10:17	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	11h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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	1	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	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
FR_UFR1	36	14	50	0.72	0.28	-9.09%	
CM_MC1	Reference Sed	33	17	50	0.66	0.34	0.0%
GH_ER2		34	16	50	0.68	0.32	-3.03%
FR_FRCP1		34	16	50	0.68	0.32	-3.03%
GH_FR1		32	18	50	0.64	0.36	3.03%
CM_MC2		0	50	50	0	1	100.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.5	0.7	0.9	0.9	0.6
CM_MC1	0.8	0.8	0.4	0.6	0.7
GH_ER2	0.8	0.7	0.6	0.8	0.5
FR_FRCP1	0.7	0.6	0.5	0.7	0.9
GH_FR1	0.7	0.2	0.8	0.7	0.8
CM_MC2	0	0	0	0	0

# CETIS Analytical Report

Report Date: 19 Oct-17 10:18 (p 2 of 2)  
Test Code: 170736 | 08-5081-7061

## Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

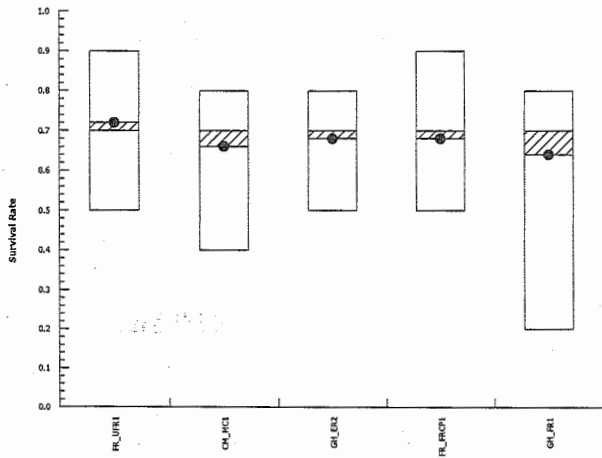
Analysis ID: 08-0761-1914      Endpoint: Survival Rate  
Analyzed: 19 Oct-17 10:17      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	5/10	7/10	9/10	9/10	6/10
CM_MC1	8/10	8/10	4/10	6/10	7/10
GH_ER2	8/10	7/10	6/10	8/10	5/10
FR_FRCP1	7/10	6/10	5/10	7/10	9/10
GH_FR1	7/10	2/10	8/10	7/10	8/10
CM_MC2	0/10	0/10	0/10	0/10	0/10

### Graphics





**CETIS Analytical Report**

Report Date: 31 Aug-17 11:49 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

<b>Analysis ID:</b> 06-0808-7906	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 31 Aug-17 11:40	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b> 7.5‰
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 6-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	03-5799-1601	26 Jul-17	26 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)		Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °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_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	36.2%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control		FR_UFR1	-0.1198	2.362	0.257	8	0.8663	CDF	Non-Significant Effect
		CM_MC1	2.331	2.362	0.257	8	0.0531	CDF	Non-Significant Effect
		GH_ER2	0.4019	2.362	0.257	8	0.6888	CDF	Non-Significant Effect
		FR_FRCP1	-0.57	2.362	0.257	8	0.9492	CDF	Non-Significant Effect
		GH_FR1	-0.4212	2.362	0.257	8	0.9283	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3366506	0.06733012	5	2.27	0.0798	Non-Significant Effect
Error	0.711909	0.02966287	24			
Total	1.04856		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	13.27	15.09	0.0209	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9223	0.9031	0.0307	Normal Distribution

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	5	0.7102	0.3742	1.046	0.73	0.2833	1.005	0.121	38.11%	0.0%
FR_UFR1	5	0.7232	0.5778	0.8687	0.69	0.5789	0.8767	0.05239	16.2%	-1.84%
CM_MC1	5	0.4562	0.2393	0.6732	0.4788	0.2275	0.7	0.07813	38.29%	35.76%
GH_ER2	5	0.6664	0.3787	0.9541	0.7012	0.278	0.895	0.1036	34.77%	6.16%
FR_FRCP1	5	0.7723	0.7097	0.8348	0.77	0.704	0.8414	0.02253	6.52%	-8.74%
GH_FR1	5	0.7561	0.6749	0.8373	0.7288	0.6988	0.83	0.02924	8.65%	-6.46%

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

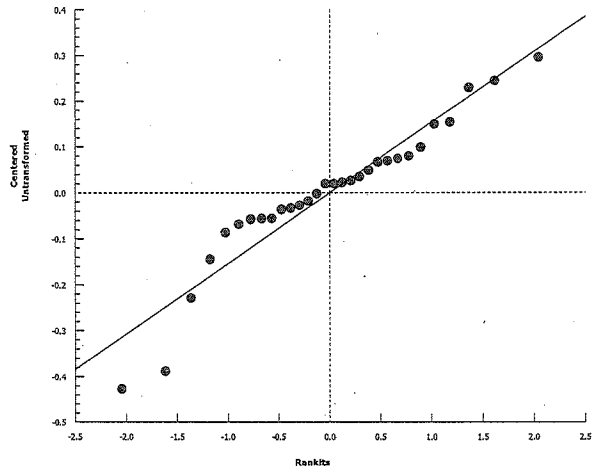
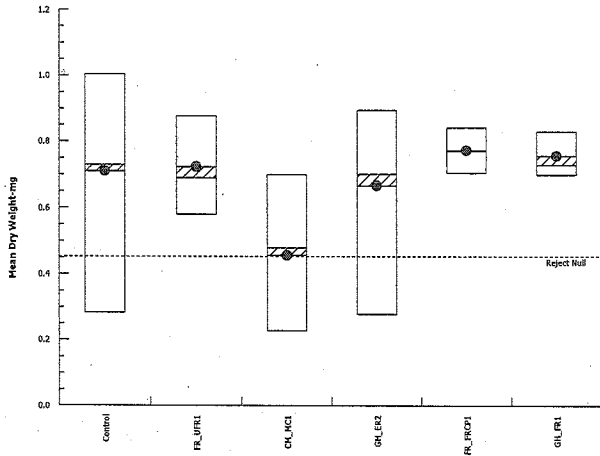
Analysis ID: 06-0808-7906      Endpoint: Mean Dry Weight-mg  
 Analyzed: 31 Aug-17 11:40      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	1.005	0.8589	0.2833	0.73	0.6738
FR_UFR1	0.69	0.8029	0.6678	0.5789	0.8767
CM_MC1	0.37	0.4788	0.2275	0.505	0.7
GH_ER2	0.765	0.6929	0.895	0.7012	0.278
FR_FRCP1	0.7543	0.7917	0.704	0.8414	0.77
GH_FR1	0.83	0.7	0.7288	0.8229	0.6988

Graphics



**CETIS Analytical Report**

Report Date: 31 Aug-17 11:50 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-4379-2197	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 31 Aug-17 11:43	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b> $\frac{7}{8}$ JW
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> $\frac{7}{8}$ -8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	29.2%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision( $\alpha$ :5%)
FR_UFR1		CM_MC1	2.917	2.305	0.211	8	0.0143	CDF	Significant Effect
		GH_ER2	0.6207	2.305	0.211	8	0.5495	CDF	Non-Significant Effect
		FR_FRCP1	-0.5357	2.305	0.211	8	0.9277	CDF	Non-Significant Effect
		GH_FR1	-0.3586	2.305	0.211	8	0.8955	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	0.3314458	0.08286145	4	3.956	0.0159	Significant Effect
Error	0.4189662	0.02094831	20			
Total	0.750412		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variances	Bartlett Equality of Variance	10.2	13.28	0.0371	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9353	0.8877	0.1151	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	0.7232	0.5778	0.8687	0.69	0.5789	0.8767	0.05239	16.2%	0.0%
CM_MC1	5	0.4562	0.2393	0.6732	0.4788	0.2275	0.7	0.07813	38.29%	36.92%
GH_ER2	5	0.6664	0.3787	0.9541	0.7012	0.278	0.895	0.1036	34.77%	7.86%
FR_FRCP1	5	0.7723	0.7097	0.8348	0.77	0.704	0.8414	0.02253	6.52%	-6.78%
GH_FR1	5	0.7561	0.6749	0.8373	0.7288	0.6988	0.83	0.02924	8.65%	-4.54%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.69	0.8029	0.6678	0.5789	0.8767
CM_MC1	0.37	0.4788	0.2275	0.505	0.7
GH_ER2	0.765	0.6929	0.895	0.7012	0.278
FR_FRCP1	0.7543	0.7917	0.704	0.8414	0.77
GH_FR1	0.83	0.7	0.7288	0.8229	0.6988

# CETIS Analytical Report

Report Date: 31 Aug-17 11:50 (p 2 of 2)  
Test Code: 170736 | 08-5081-7061

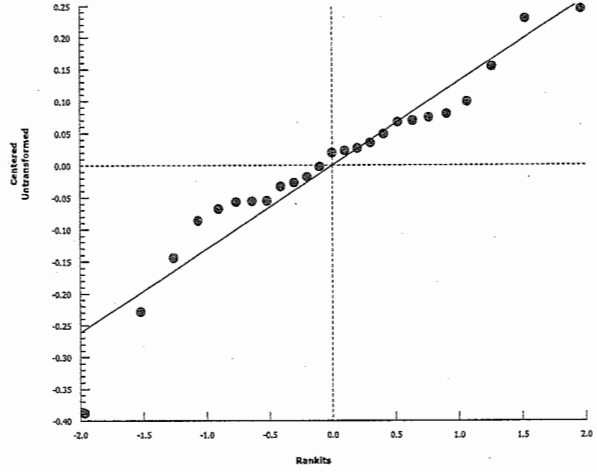
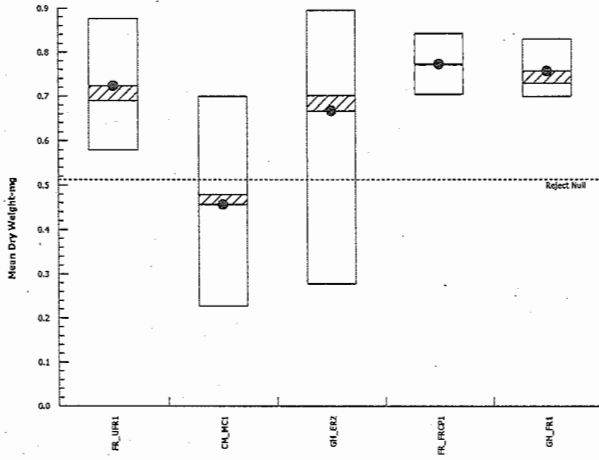
## Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 11-4379-2197      Endpoint: Mean Dry Weight-mg  
Analyzed: 31 Aug-17 11:43      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 19 Oct-17 10:13 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 01-1670-6555	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 19 Oct-17 10:12	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	31.7%	

**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	-0.6207	2.305	0.211	8	0.9400	CDF	Non-Significant Effect
	CM_MC1	2.296	2.305	0.211	8	0.0508	CDF	Non-Significant Effect
	FR_FRCP1	-1.156	2.305	0.211	8	0.9841	CDF	Non-Significant Effect
	GH_FR1	-0.9794	2.305	0.211	8	0.9747	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3314458	0.08286145	4	3.956	0.0159	Significant Effect
Error	0.4189662	0.02094831	20			
Total	0.750412		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.2	13.28	0.0371	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9353	0.8877	0.1151	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	0.7232	0.5778	0.8687	0.69	0.5789	0.8767	0.05239	16.2%	0.0%
CM_MC1	5	0.4562	0.2393	0.6732	0.4788	0.2275	0.7	0.07813	38.29%	36.92%
GH_ER2	5	0.6664	0.3787	0.9541	0.7012	0.278	0.895	0.1036	34.77%	7.86%
FR_FRCP1	5	0.7723	0.7097	0.8348	0.77	0.704	0.8414	0.02253	6.52%	-6.78%
GH_FR1	5	0.7561	0.6749	0.8373	0.7288	0.6988	0.83	0.02924	8.65%	-4.54%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.69	0.8029	0.6678	0.5789	0.8767
CM_MC1	0.37	0.4788	0.2275	0.505	0.7
GH_ER2	0.765	0.6929	0.895	0.7012	0.278
FR_FRCP1	0.7543	0.7917	0.704	0.8414	0.77
GH_FR1	0.83	0.7	0.7288	0.8229	0.6988

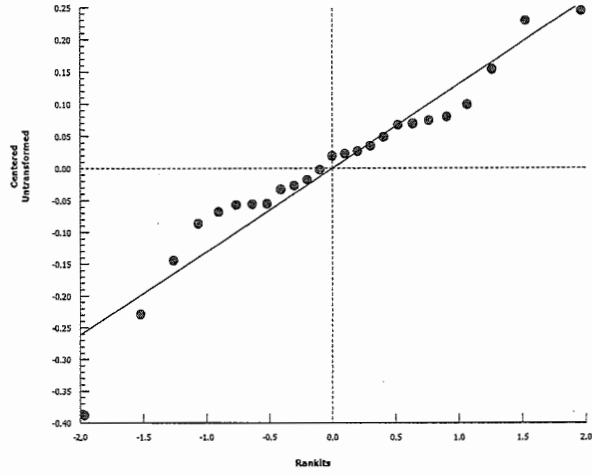
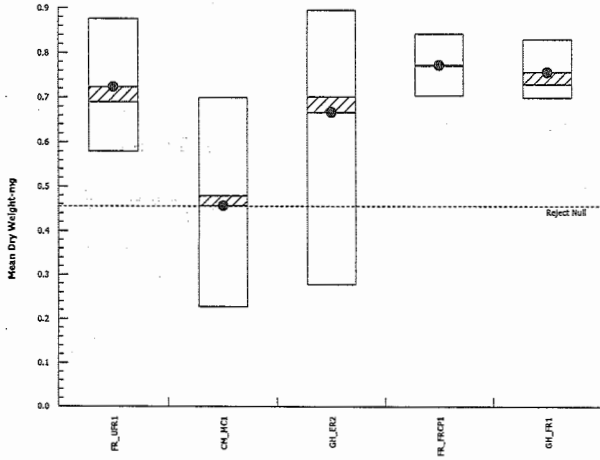
Hyaella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 01-1670-6555      Endpoint: Mean Dry Weight-mg  
Analyzed: 19 Oct-17 10:12      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 19 Oct-17 10:18 (p 1 of 2)  
 Test Code: 170736 | 08-5081-7061

**Hyalella 28-d Survival and Growth Sediment Test** Nautilus Environmental

<b>Analysis ID:</b> 14-7018-5256	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 19 Oct-17 10:18	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-1824-8789	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 26 Jul-17	<b>Protocol:</b> EPA/600/R-99/064 (2000)	<b>Diluent:</b> Reconstituted Water
<b>Ending Date:</b> 23 Aug-17	<b>Species:</b> Hyalella azteca	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 7-8d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	12h (15.9 °C)	Teck Coal	Teck Coal Q3
CM_MC1	21-3074-8472	25 Jul-17 08:30	26 Jul-17 08:15	16h (14.2 °C)		
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	13h (15 °C)		
FR_FRCP1	16-6684-6283	25 Jul-17 09:08	26 Jul-17 08:15	15h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	15h (15 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	46.2%	

**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	-2.917	2.305	0.211	8	0.9999	CDF	Non-Significant Effect
		GH_ER2	-2.296	2.305	0.211	8	0.9995	CDF	Non-Significant Effect
		FR_FRCP1	-3.452	2.305	0.211	8	1.0000	CDF	Non-Significant Effect
		GH_FR1	-3.275	2.305	0.211	8	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3314458	0.08286145	4	3.956	0.0159	Significant Effect
Error	0.4189662	0.02094831	20			
Total	0.750412		24			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.2	13.28	0.0371	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9353	0.8877	0.1151	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	0.7232	0.5778	0.8687	0.69	0.5789	0.8767	0.05239	16.2%	0.0%
CM_MC1	5	0.4562	0.2393	0.6732	0.4788	0.2275	0.7	0.07813	38.29%	36.92%
GH_ER2	5	0.6664	0.3787	0.9541	0.7012	0.278	0.895	0.1036	34.77%	7.86%
FR_FRCP1	5	0.7723	0.7097	0.8348	0.77	0.704	0.8414	0.02253	6.52%	-6.78%
GH_FR1	5	0.7561	0.6749	0.8373	0.7288	0.6988	0.83	0.02924	8.65%	-4.54%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.69	0.8029	0.6678	0.5789	0.8767
CM_MC1	0.37	0.4788	0.2275	0.505	0.7
GH_ER2	0.765	0.6929	0.895	0.7012	0.278
FR_FRCP1	0.7543	0.7917	0.704	0.8414	0.77
GH_FR1	0.83	0.7	0.7288	0.8229	0.6988

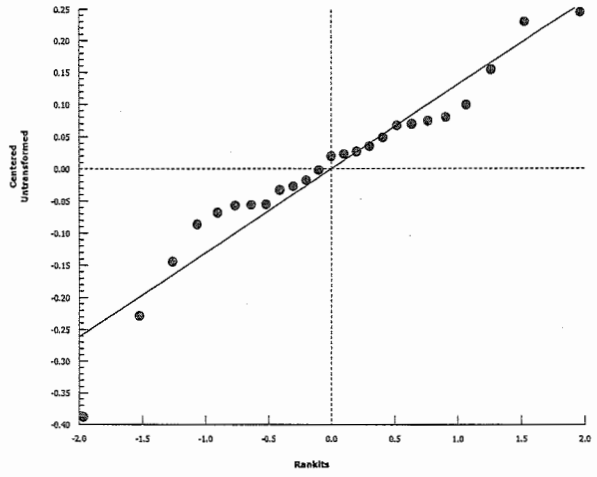
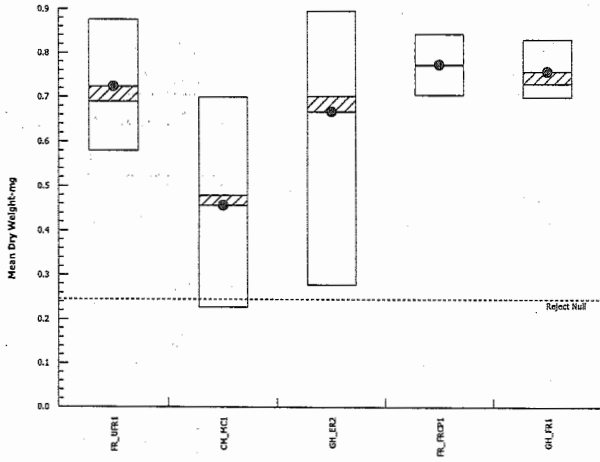
Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

Analysis ID: 14-7018-5256      Endpoint: Mean Dry Weight-mg  
Analyzed: 19 Oct-17 10:18      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**APPENDIX D – *Pimephales promelas* Toxicity Test Data**

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Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/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-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		1328 (20µg)		1331 (20µg)	
	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
a	15	0	15	0	14	1	15	0	15	0
b	15	0	15	0	15	0	15	0	15	0
c	15	0	15	0	14	1	15	0	14	1
d	14	1	14	1	15	0	14	1	15	0
e	29	1	29	1	30	0	29	1	29	1
f	29	1	29	1	30	0	29	1	29	1

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL-UNT			CTL-Cu (10µg)			CTL-Cu (20µg)			1328 (20µg)		
	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	1	15	14	1	15	14	0	15	14	1	15
b	15	0	15	13	2	15	13	2	15	14	1	15
c	15	0	15	9	6	15	13	1	15	13	2	15
d	15	0	15	14	0	15	14	1	15	13	1	15
e	28	1		29	0		28	2		27	2	
f	28	1		28	4		29	1		27	2	

replicate	1331 (20µg)		
	Day 2		
	Alive Embryos	Dead Embryos	Cull to 15
a	13	2	15
b	14	1	15
c	14	0	15
d	13	2	15
e	28	1	
f	27	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:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1328 (20µg/L), 1331 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		1328 (20µg)		1331 (20µg)	
	Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	0	15	6	9	1	13 <sup>20</sup>	1	14	10	5
b	2	13	2	13	6	9	9	6	6	9
c	1	14	3	12	5	10	6	9	6	9
d	3	12	6	9	9	6	4	9	12	3

Comments/Observations: CTL-Cu(20) 1 dead hatchling

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		1328 (20µg)		1331 (20µg)	
	Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	0	15 <sup>20</sup>	0	14	0	14	0	15	1	14
b	0	15	0	13 <sup>15</sup>	0	15	1	14	2	13
c	0	15	2	13	0	14	1	14	0	15
d	0	14	0	15	1	14	0	15	0	15

Comments/Observations: CTL-Cu(10µg) A - 1 dead hatchling  
CTL-UNT B - 1 dead hatchling CTL-Cu(20µg) - 1 dead egg

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		1328 (20µg)		1331 (20µg)	
	Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15		14		14		15		15	
b	15		14		15		15		15	
c	15		13		14 (1)		14		14 (1)	
d	14		15		15		15		15 (1)	

Comments/Observations: CTL-Cu(10µg) B - 1 dead hatchling 1328(20µg) C - 1 dead hatchling 1331(20µg) - C - 1 dead hatchling each

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		1328 (20µg)		1331 (20µg)	
	Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15		14		14		15		15 (1)	
b	14		14		15 (1)		15		15	
c	15		12		14 (1)		14		13	
d	14		15		15		15 (1)		14 (1)	

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 7	Day 7	Day 7	Day 7	Day 7
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15(1)
b	13	14	15(1)	15	15
c	15	12	13	13	13
d	14	15	15(1)	15(1)	14(1)

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 8	Day 8	Day 8	Day 8	Day 8
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15(1)
b	13	14	15(1)	15	15
c	15	12	13	13	13
d	14	15(1)	15(1)	15(1)	14(1)

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 9	Day 9	Day 9	Day 9	Day 9
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15
b	13	14	15	15	15
c	15	12	13	13	13
d	14	15	15	15	14

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 10	Day 10	Day 10	Day 10	Day 10
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15
b	13	14	15	13	15
c	15	12	13	13	12
d	14	15	15	15	12(1)

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

replicate	Number of Alive Embryos and Hatched Organisms				
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 11	Day 11	Day 11	Day 11	Day 11
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15
b	13	14	15	13	15
c	15	12	13	13	12
d	14	15	15	*4	12(1)

Comments/Observations: *\* microbial growth*

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 12	Day 12	Day 12	Day 12	Day 12
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	<del>15</del> 15	14	14	15	15
b	13	14	15	13	15
c	13 <sup>+</sup>	12	13	13	12
d	14	15(1)	15	4	11(1)

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 13	Day 13	Day 13	Day 13	Day 13
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15
b	13	14	15	13	15
c	13	12	13	13	12
d	14	15(1)	15	4	11(1)

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 14	Day 14	Day 14	Day 14	Day 14
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	14
b	* 12(1)	14	15(1)	13	15
c	* 12(1)	12	13	13	12
d	* 13	15(2)	15	4	10 11(1)

Comments/Observations:

*\* microbial death*

*\* \* Only counted 12 - no body*  
*\* \* \* 1 fish area to side of jar*

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT Day 15	CTL-Cu (10µg) Day 15	CTL-Cu (20µg) Day 15	1328 (20µg) Day 15	1331 (20µg) Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	15
b	12(1)	14	15(1)	15	15
c	12(1)	12(1)	13	13	12
d	15 13 (1)	15(2)	15	4	12(1)

Comments/Observations:

	CTL-UNT Day 16	CTL-Cu (10µg) Day 16	CTL-Cu (20µg) Day 16	1328 (20µg) Day 16	1331 (20µg) Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14 + 3(1)	14	15	15
b	12(1)	14	14	13*	15
c	12	12	13	13	12
d	13	13(1) or 14(1)	15	4	11(1)

Comments/Observations:

\*only use 13, no dead!

	CTL-UNT Day 17	CTL-Cu (10µg) Day 17	CTL-Cu (20µg) Day 17	1328 (20µg) Day 17	1331 (20µg) Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	14
b	12(1)	14	14(1)	13	15
c	12	12	13	13	12
d	13	13	14	4	11(1)

Comments/Observations:

	CTL-UNT Day 18	CTL-Cu (10µg) Day 18	CTL-Cu (20µg) Day 18	1328 (20µg) Day 18	1331 (20µg) Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	15	14	14	15	14
b	12(1)	14	14(1)	13	15
c	12	12	13	12	12
d	13	13	14	4	11

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

replicate	Number of Alive Embryos and Hatched Organisms				
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 19	Day 19	Day 19	Day 19	Day 19
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	14	15	14
b	12(1)	14	14	13	15
c	12	12	13	12	12
d	13	13	14	4	11(1)

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 20	Day 20	Day 20	Day 20	Day 20
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	14	15	14
b	12	14	13	13	15
c	12	12	13	12	12
d	13	13	14	4	10

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 21	Day 21	Day 21	Day 21	Day 21
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	14	15	14
b	AP 13 12	13	13	13	15
c	AP 12	12	13	12	12
d	13	13	14	4	9 10 9

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 22	Day 22	Day 22	Day 22	Day 22
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	14	14	15	14
b	12	13	13	13	15(1)
c	12	12	13	12	12
d	13	13	14	4	9 10 9

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

		Number of Alive Embryos and Hatched Organisms				
		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
		Day 23	Day 23	Day 23	Day 23	Day 23
replicate		Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a		13	14	14	15	14
b		12	13	13	13	15
c		12	12	13	12	12
d		13	13	14	4	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
		Day 24	Day 24	Day 24	Day 24	Day 24
replicate		Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a		13	14	14	15	14
b		12	13	13	13(1)	15
c		12	12	13	12	12
d		13	13	14	4	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
		Day 25	Day 25	Day 25	Day 25	Day 25
replicate		Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a		12	14	14	15	14
b		12	<del>12</del> 12	13	12	15
c		12	12	13	12	12
d		13	13	14	4	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
		Day 26	Day 26	Day 26	Day 26	Day 26
replicate		Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a		12	14	14	15	14
b		12	12	13	12	15
c		12	12	13	12	12
d		13	13	14	4	8

Comments/Observations:



Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

replicate	Number of Alive Embryos and Hatched Organisms				
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 27	Day 27	Day 27	Day 27	Day 27
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	14	14	15	14
b	12	12	13	12	15
c	11	12	13	12	12
d	13	13	14	4	8

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 28	Day 28	Day 28	Day 28	Day 28
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	13	12	15	14
b	12	11	12	12	15
c	11	12	13	12	12
d	13	13	14	4	8

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 29	Day 29	Day 29	Day 29	Day 29
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	13	14	13	14
b	12	11	12	12	15
c	11	12	13	12	12
d	13	13	14	4	8

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 30	Day 30	Day 30	Day 30	Day 30
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	13	13	13	13
b	12	11	8	12	15
c	11	12	13	12	12
d	13	13	14	4	8

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

replicate	Number of Alive Embryos and Hatched Organisms				
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 31	Day 31	Day 31	Day 31	Day 31
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	13	13	13	13
b	12	11	8	11	15
c	10	12	13	12	12
d	13	12	14	4	8

Comments/Observations:

replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1328 (20µg)	1331 (20µg)
	Day 32	Day 32	Day 32	Day 32	Day 32
	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	12	13	13	15 <sup>13</sup>	13
b	12	11	8	11	13
c	10	12	13	12	12
d	13	12	14	4	8

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)		
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)		
	pH (units)						
0	8.3	8.3	8.3	8.3	8.3		
1	8.2	8.2	8.2	8.2	8.2		
2	8.3	8.3	8.3	8.1	8.1		
3	8.4	8.4	8.4	8.4	8.3		
4	8.2	8.3	8.4	8.2	8.3		
5	8.4	8.4	8.4	8.3	8.3		
6	8.2	8.2	8.3	8.3	8.2		
7	8.4	8.4	8.4	8.3	8.4		
8	8.3	8.4	8.4	8.3	8.3		

\* 8.27µg

← Switch →

**Old Solutions**

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)		
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)		
	pH (units)						
0							
1	8.1	8.1	8.1	8.1	8.1		
2	8.3	8.4	8.4	8.4	8.3		
3	8.0	8.1	8.1	8.0	8.0		
4	8.3	8.3	8.3	8.1	8.1		
5	8.3	8.4	8.4	8.1	8.2		
6	8.2	8.2	8.2	8.0	8.0		
7	8.2	8.2	8.3	8.1	8.1		
8	8.2	8.0	8.2	8.0	8.0		

**Conductance (µS/cm)**

0	422	432	428	875	842		
1	423	422	420	886	872		
2	411	420	421	825	822		
3	408	424	425	835	862		
4	423	430	429	890	861		
5	403	421	435	886	857		
6	419	422	422	895	864		
7	397	416	431	896	858		
8	378	421	404	894	804		

\* 888

← Switch →

**Conductance (µS/cm)**

0							
1	423	422	422	860	856		
2	400	416	418	838	832		
3	404	422	422	846	853		
4	416	432	429	847	862		
5	425	435	423	879	862		
6	411	434	446	859	868		
7	420	431	434	858	865		
8	409	416	450	850	834		

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0	7.3	7.3	7.3	7.3	7.3		
1	7.2	7.2	7.3	7.3	7.3		
2	7.0	7.0	7.0	7.0	6.9		
3	7.2	7.2	7.2	7.3	7.3		
4	7.3	7.3	7.3	7.3	7.3		
5	7.2	7.2	7.3	7.2	7.3		
6	7.3	7.3	7.3	7.3	7.7		
7	7.3	7.2	7.3	7.3	7.3		
8	7.2	7.2	7.3	7.3	7.3		

\* 7.3

← Switch →

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0							
1	7.0	6.9	6.9	7.1	6.9		
2	7.3	7.3	7.3	7.3	7.3		
3	7.0	7.1	7.1	7.0	7.1		
4	7.0	7.0	6.9	7.2	7.2		
5	7.1	7.1	7.1	7.0	7.1		
6	7.0	7.0	7.0	7.1	7.1		
7	6.8	6.9	6.9	7.0	6.9		
8	6.9	7.0	6.9	7.0	7.0		

**Temperature (°C)**

0	24.0	24.2	24.2	23.5	23.8		
1	24.4	24.7	24.4	23.6	23.8		
2	24.5	24.5	24.2	24.1	24.0		
3	24.4	24.2	24.5	23.9	23.8		
4	24.6	24.7	24.7	23.9	23.8		
5	24.4	24.6	24.6	23.9	23.7		
6	23.9	23.8	24.3	24.0	24.0		
7	24.4	24.4	24.3	23.9	23.9		
8	24.8	24.8	24.0	23.9	23.8		

← Switch →

**Temperature (°C)**

0							
1	23.8	23.6	23.8	23.7	23.7		
2	24.1	24.2	24.0	23.9	23.9		
3	23.9	23.6	23.6	23.7	23.7		
4	24.0	24.1	24.0	23.5	23.5		
5	23.9	23.9	23.9	24.3	24.3		
6	23.6	24.0	24.3	24.4	24.5		
7	24.3	24.8	24.6	24.9	24.8		
8	24.6	24.7	25.2	25.0	24.8		

**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:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

New Solutions					
Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
pH (units)					
9	8.2	8.3	8.3	8.1	8.2
10	8.2	8.2	8.2	8.2	8.2
11	8.1	8.1	8.7	8.2	8.2
12	8.3	8.3	8.4	8.4	8.5
13	8.1	8.2	8.2	8.3	8.3
14	8.1	8.2	8.1	8.0	8.1
15	8.2	8.2	8.2	8.3	8.3
16	8.2	8.2	8.2	8.2	8.3
17	8.2	8.2	8.2	8.1	8.2
Conductance (µS/cm)					
9	430	432	428	1017	900
10	433	440	438	1016	901
11	450	439	435	1020	900
12	382	409	410	1000	794
13	400	409	411	1012	803
14	347	420	424	1101	970
15	411	426	427	1106	869
16	388	377	413	1107	838
17	366	388	408	1101	842
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
11	7.3	7.3	7.3	7.3	7.5
12	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.5
15	7.2	7.4	7.4	7.3	7.3
16	7.3	7.2	7.2	7.3	7.3
17	7.3	7.2	7.2	7.3	7.3
Temperature (°C)					
9	23.9	24.0	24.0	23.9	24.1
10	23.9	23.9	24.0	24.2	24.2
11	23.9	24.0	24.1	24.1	24.2
12	24.2	24.2	24.3	24.1	24.1
13	24.1	24.1	24.1	24.2	24.2
14	24.2	24.1	24.2	24.1	24.6
15	24.0	24.0	24.0	24.0	24.0
16	24.4	24.9	24.7	23.7	23.8
17	24.7	25.0	24.9	23.9	23.9

Old Solutions					
CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)	
pH (units)					
9	7.9	8.0	8.1	8.0	7.9
10	8.0	8.1	8.2	8.0	8.0
11	8.1	8.1	8.2	8.0	8.0
12	8.2	8.2	8.2	8.1	8.1
13	8.0	8.0	8.0	8.0	8.1
14	7.9	8.0	7.9	7.9	8.0
15	8.1	8.1	8.0	8.1	8.1
16	8.1	8.0	8.0	8.1	8.1
17	7.9	8.0	8.0	7.9	7.9
Conductance (µS/cm)					
9	395	425	415	943	901
10	395	422	409	958	901
11	400	419	394	964	798
12	384	420	392	983	819
13	405	417	394	973	910
14	399	414	394	952	817
15	420	440	428	1085	987
16	382	420	423	1102	870
17	357	415	424	1026	868
Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.2	7.0	7.1	7.1	7.1
10	6.9	6.9	6.7	6.8	6.7
11	6.6	6.5	6.5	6.5	6.5
12	6.3	6.4	6.5	6.8	6.8
13	6.3	6.3	6.3	6.3	6.3
14	6.7	6.8	6.6	6.4	6.4
15	6.6	6.6	6.5	6.4	6.5
16	6.5	6.5	6.6	6.5	6.3
17	6.5	6.4	6.4	6.3	6.0
Temperature (°C)					
9	23.5	23.5	23.5	23.5	23.9
10	23.5	23.5	23.5	23.5	23.5
11	23.5	23.5	23.5	23.5	23.5
12	24.4	24.4	24.2	23.9	23.9
13	23.5	23.5	23.5	23.5	23.5
14	23.5	23.5	23.5	23.5	23.7
15	24.1	24.0	24.0	24.0	24.1
16	23.9	23.9	24.1	24.0	24.1
17	23.6	23.5	23.5	24.5	24.0

**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:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
	pH (units)				
18	8.2	8.2	8.2	8.2	8.2
19	8.3	8.3	8.3	8.3	8.3
20	8.4	8.3	8.3	8.2	8.4
21	8.3	8.3	8.3	8.3	8.4
22	8.3	8.3	8.4	8.4	8.4
23	8.2	8.2	8.2	8.2	8.2
24	8.2	8.2	8.2	8.2	8.2
25	8.1	8.1	8.1	8.1	8.2
26	8.1	8.1	8.1	8.2	8.2

**Old Solutions**

CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
	pH (units)			
18	7.9	7.9	7.9	8.0
19	8.2	8.2	8.2	8.2
20	8.1	8.1	8.2	8.1
21	8.0	8.1	8.1	8.1
22	8.1	8.1	8.1	8.2
23	7.7	7.8	7.8	7.8
24	7.8	8.0	8.0	7.9
25	7.8	7.9	7.9	7.9
26	8.0	8.0	8.1	7.9

**Conductance (µS/cm)**

18	372	389	405	1100	974
19	368	377	390	1076	930
20	369	377	385	1044	799
21	369	377	384	1050	808
22	369	417	406	1035	920
23	394	410	405	1038	946
24	379	403	406	1051	945
25	379	399	409	1053	945
26	349	390	400	1060	959

**Conductance (µS/cm)**

18	392	391	420	1078	869
19	385	393	404	1057	923
20	377	386	377	1037	855
21	392	389	363	1035	839
22	381	398	398	1020	838
23	394	420	412	1008	921
24	401	422	414	1032	948
25	389	418	416	1028	949
26	381	408	414	1008	939

**Dissolved Oxygen (mg/L) (40-100% saturation)**

18	7.3	7.3	7.3	7.3	7.5
19	7.3	7.3	7.3	7.3	7.3
20	7.2	7.2	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.2	7.3	7.3
23	7.3	7.2	7.2	7.3	7.3
24	7.3	7.2	7.2	7.3	7.3
25	7.3	7.2	7.2	7.3	7.3
26	7.3	7.3	7.3	7.3	7.3

**Dissolved Oxygen (mg/L) (40-100% saturation)**

18	6.5	6.4	6.8	6.3	6.3
19	6.9	6.6	6.6	7.0	6.6
20	6.8	7.0	6.9	7.0	6.8
21	6.7	6.6	6.5	6.6	6.5
22	6.9	6.6	6.4	6.3	6.3
23	6.1	6.1	6.2	6.3	6.2
24	6.5	6.5	6.4	6.4	6.4
25	6.7	6.8	6.7	6.7	6.8
26	6.5	6.5	6.6	6.6	6.6

**Temperature (°C)**

18	24.0	24.0	24.0	24.1	24.1
19	23.9	24.2	23.9	23.9	23.7
20	23.9	23.8	24.0	23.9	23.8
21	24.1	23.9	23.8	23.6	23.6
22	24.2	24.3	24.6	23.7	23.7
23	24.1	24.1	24.2	23.8	23.9
24	24.0	24.9	24.9	23.9	23.5
25	24.6	24.6	24.6	23.8	23.8
26	24.0	24.1	24.0	24.3	24.1

**Temperature (°C)**

18	24.0	24.1	24.1	24.0	24.0
19	24.2	24.2	24.1	24.3	24.3
20	23.8	24.1	24.2	24.2	24.1
21	23.8	24.3	24.2	24.2	24.2
22	23.6	23.8	23.9	23.8	23.7
23	23.9	23.9	24.0	24.1	24.0
24	24.1	24.1	24.1	24.0	24.0
25	24.0	23.9	23.8	23.9	23.9
26	23.9	23.8	23.9	23.9	23.9

**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:**

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/L)

New Solutions					
Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)
Day					
pH (units)					
27	8.1	8.1	8.1	8.1	8.1
28	8.3	8.3	8.3	8.3	8.3
29	8.2	8.2	8.2	8.1	8.1
30	8.3	8.3	8.3	8.3	8.3
31	8.3	8.3	8.1	8.2	8.3
32					

Conductance (µS/cm)					
27	370	392	410	1090	980
28	380	386	404	1140	993
29	375	390	400	1108	1025
30	375	390	389	1126	1112
31	403	419	365	1140	997
32					

Dissolved Oxygen (mg/L) (40-100% saturation)					
27	7.3	7.3	7.3	7.3	7.3
28	7.3	7.3	7.3	7.3	7.3
29	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.2	7.3
32					

Temperature (°C)					
27	24.2	24.2	24.2	24.2	24.2
28	24.3	24.2	24.2	24.1	24.0
29	24.2	24.1	24.1	24.1	24.1
30	23.9	23.9	23.9	23.9	24.0
31	25.2	24.9	24.7	25.7	23.3
32					

Old Solutions					
CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	1617-1328 (20µg)	1617-1331 (20µg)	
pH (units)					
27	8.0	8.0	8.1	8.1	8.1
28	7.8	7.9	8.0	7.8	7.9
29	7.8	7.8	7.9	7.8	7.9
30	7.9	8.0	8.0	8.1	8.1
31	7.9	8.0	8.0	7.9	7.9
32	8.2	8.2	8.2	8.0	8.0

Conductance (µS/cm)					
27	383	382	417	1095	860
28	386	421	409	1022	911
29	416	398	409	1079	973
30	398	399	402	1129	991
31	397	482	401	1049	993
32	410	422	390	1097	1006

Dissolved Oxygen (mg/L) (40-100% saturation)					
27	6.3	6.3	6.3	6.2	6.2
28	7.3	7.3	7.3	7.3	7.2
29	6.9	6.8	6.8	6.8	6.8
30	6.4	6.3	6.3	6.3	6.3
31	6.5	6.5	6.4	6.5	6.5
32	6.5	6.5	6.5	6.7	6.3

Temperature (°C)					
27	24.4	24.5	24.5	24.5	24.5
28	23.9	23.8	23.9	23.8	24.1
29	23.9	24.0	23.9	23.9	23.9
30	24.2	24.2	24.2	24.1	24.2
31	24.0	24.0	24.2	24.2	24.2
32	23.7	23.7	23.7	23.7	23.7

**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:

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/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	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	10	N	1	10	N	1	11	N
	2	12	↓	2	9	↓	2	9	↓	2	10	↓
	3	11	↓	3	11	↓	3	10	↓	3	11	↓
	4	10	↓	4	11	↓	4	11	↓	4	12	↓
	5	9	↓	5	10	↓	5	12	↓	5	10	↓
	6	12	↓	6	9	↓	6	10	↓	6	9	↓
	7	10	↓	7	10	↓	7	9	↓	7	10	↓
	8	11	↓	8	10	↓	8	10	↓	8	11	↓
	9	10	↓	9	11	↓	9	9	↓	9	12	↓
	10	9	↓	10	9	↓	10	9	↓	10	10	↓
	11	10	↓	11	9	↓	11	-	-	11	9	↓
	12	11	↓	12	12	↓	12	-	-	12	10	↓
	13	-	-	13	-	-	13	-	-	13	10	↓
	14	-	-	14	-	-	14	-	-	14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

CTL-Cu (10µg)	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	10	N	1	10	N	1	10	N
	2	11	↓	2	9	↓	2	11	↓	2	9	↓
	3	11	↓	3	11	↓	3	10	↓	3	10	↓
	4	10	↓	4	10	↓	4	9	↓	4	9	↓
	5	10	↓	5	9	↓	5	10	↓	5	9	↓
	6	10	↓	6	10	↓	6	9	↓	6	11	↓
	7	9	↓	7	10	↓	7	10	↓	7	10	↓
	8	10	↓	8	9	↓	8	10	↓	8	10	↓
	9	9	↓	9	11	↓	9	11	↓	9	9	↓
	10	10	↓	10	10	↓	10	10	↓	10	10	↓
	11	9	↓	11	9	↓	11	9	↓	11	10	↓
	12	10	↓	12	-	-	12	10	↓	12	10	↓
	13	10	↓	13	-	-	13	-	-	13	-	-
	14	-	-	14	-	-	14	-	-	14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/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-Cu (20µg)	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	10	N	1	9	N	1	10	N
	2	11	↓	2	10	↓	2	10	↓	2	10	↓
	3	9	↓	3	10	↓	3	10	↓	3	10	↓
	4	9	↓	4	10	↓	4	10	↓	4	10	↓
	5	10	↓	5	10	↓	5	10	↓	5	10	↓
	6	9	↓	6	10	↓	6	10	↓	6	10	↓
	7	10	↓	7	10	↓	7	10	↓	7	10	↓
	8	9	↓	8	10	↓	8	10	↓	8	10	↓
	9	9	↓	9	10	↓	9	10	↓	9	10	↓
	10	10	↓	10	10	↓	10	10	↓	10	10	↓
	11	11	↓	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

1617-1328  
(20µg)

1617-1328 (20µg)	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	9	N	1	9	N	1	9	N	1	11	N
	2	10	↓	2	10	↓	2	10	↓	2	12	↓
	3	9	↓	3	10	↓	3	10	↓	3	13	↓
	4	9	↓	4	10	↓	4	10	↓	4	11	↓
	5	10	↓	5	10	↓	5	10	↓	5	11	↓
	6	9	↓	6	10	↓	6	10	↓	6	11	↓
	7	10	↓	7	10	↓	7	10	↓	7	11	↓
	8	9	↓	8	10	↓	8	10	↓	8	11	↓
	9	10	↓	9	10	↓	9	10	↓	9	11	↓
	10	9	↓	10	10	↓	10	10	↓	10	11	↓
	11	10	↓	11	10	↓	11	10	↓	11	11	↓
	12	10	↓	12	10	↓	12	10	↓	12	11	↓
	13	10	↓	13	10	↓	13	10	↓	13	11	↓
	14	11	↓	14	10	↓	14	10	↓	14	11	↓
	15	11	↓	15	10	↓	15	10	↓	15	11	↓

Comments



Method FMD 32 Day ELS Client NAU104 Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1617-1328 (20µg/L), 1617-1331 (20µg/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.  
1617-  
1331  
(20µg)

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	10	N	1	9	N	1	9	N
2	9	↓	2	9	↓	2	10	↓	2	8	↓
3	9	↓	3	10	↓	3	9	↓	3	7	↓
4	8	↓	4	9	↓	4	8	↓	4	10	↓
5	10	↓	5	9	↓	5	9	↓	5	8	↓
6	9	↓	6	10	↓	6	10	↓	6	9	↓
7	11	↓	7	11	↓	7	8	↓	7	9	↓
8	9	↓	8	9	↓	8	9	↓	8	9	↓
9	10	↓	9	9	↓	9	9	↓	9	-	-
10	9	↓	10	10	↓	10	8	↓	10	-	-
11	10	↓	11	10	↓	11	10	↓	11	-	-
12	9	↓	12	9	↓	12	11	↓	12	-	-
13	9	↓	13	8	↓	13	-	-	13	-	-
14	-	-	14	-	-	14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

1617-1326 = GH\_FR1  
 1617-1327 = GH\_ER2  
 1617-1328 = FR\_FRPC1  
 1617-1329 = FR\_UFR1  
 1617-1330 = CM\_MC1  
 1617-1331 = CM\_MC2

### Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

#### Number of Alive Embryos and Hatched Organisms

replicate	1617-1326		1617-1327		1617-1328		1617-1329		1617-1330		1617-1331	
	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	14	1
b	15	0	14	1	15	0	15	0	14	1	15	0
c	15	0	15	0	14	1	15	0	15	0	14	1
d	15	0	14	1	14	1	15	0	14	1	15	0
e	30	0	29	1	29	1	27	3	30	0	28	2
f	29	1	30	0	29	1	29	1	30	0	30	0

Comments/Observations:

#### Number of Alive Embryos and Hatched Organisms

replicate	1617-1326			1617-1327			1617-1328			1617-1329		
	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	14	1	15	15	0	15	13	2	15
b	14	1	15	14	0	15	14	1	15	14	1	15
c	12	3	15	14	1	15	12	3	15	15	0	15
d	14	1	15	13	2	15	13	1	15	14	1	15
e	28	2		27	2		30	0		26	1	
f	28	1		28	1		30	0		28	1	

replicate	1617-1330			1617-1331		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	14	1	15	14	0	15
b	14	0	15	15	0	15
c	14	1	15	14	0	15
d	14	0	15	15	0	15
e	27	3		24	4	
f	28	2		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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	1617-1326		1617-1327		1617-1328		1617-1329		1617-1330		1617-1331	
	Day 3		Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	7	8	11	4	9	9 <sup>W</sup>	9	6	5	10	5	10
b	8	7	8	7	9	6	9	6	3	12	5	10
c	8	7	7	7	4	9	6	9	3	12	8	7
d	6	9	5	9	8	7	10	5	4	11	7	8

Comments/Observations: 1327<sup>W</sup> - 1 dead hatched, 1327D - 1 dead hatched, 1328C - 2 dead embryo

replicate	1617-1326		1617-1327		1617-1328		1617-1329		1617-1330		1617-1331	
	Day 4		Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	2	13	0	15	0	15	1	14	0	15	0	15
b	0	15	1	14	0	15	0	15	0	15	0	15
c	0	15	0	14	1	12	2	12	0	13	1	14
d	0	15	0	14	3	11	0	15	1	14	0	15

Comments/Observations: 1617-1328D - one dead hatched, 1329C - 1 dead hatched, 1330C - 2 dead hatched

replicate	1617-1326		1617-1327		1617-1328		1617-1329		1617-1330		1617-1331	
	Day 5		Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15		15		15		14		15		15	
b	15		15		15		15		15		15	
c	15		14		12		13		13		14	
d	15		14		12		15		14		15	

Comments/Observations: 1328C - 1 dead hatched, 1328D - 2 dead eggs, 1329A - 1 dead egg, 1329C - 1 dead hatched, 1330D - 1 dead hatched, 1331C - 1 dead egg

replicate	1617-1326		1617-1327		1617-1328		1617-1329		1617-1330		1617-1331	
	Day 6		Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15		15		13*		14		15		14*	
b	15		15	14	15		14		15		15	
c	15		14		12		13		13		13*	
d	15		14		10*		15		14		15	

Comments/Observations: microbial growth

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	14	15	11 <sup>*</sup>	14	15	8 <sup>*</sup>
b	15	14(1)	14 <sup>*</sup>	14	15	15
c	15	14	9 <sup>*</sup>	10 <sup>*</sup>	13	9 <sup>*</sup>
d	15	14	6 <sup>*</sup>	15	14	12 <sup>*</sup>

Comments/Observations: microbial growth

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	12(1) <sup>*</sup>	15	3 <sup>*</sup>	13	15	8
b	15	14(1)	5 <sup>*</sup>	15 <sup>vs 14</sup>	15	15
c	15	14	8 <sup>*</sup>	10	13	9
d	15	14	5 <sup>*</sup>	15	14(1)	12

Comments/Observations: microbial growth

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	10	14	0	13	15	6
b	15	14(1)	4	14	15	9
c	15	14	8	10	13	8
d	15	14	3	15	14	11

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	10	14	0	13	15	5
b	15	14(1)	0	14	15	9
c	15	14	6 <sup>vs 7</sup>	10	13	8
d	15	14	2	15	14	11

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10ug/L)

**Number of Alive Embryos and Hatched Organisms**

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14	0	13	15	5
b	15	14(1)	0	14	15	8(1)
c	15	14	7	10	13	8
d	15	14	2	15	14	11

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14(1) <sup>SS</sup>	0	13	15	5
b	15	14(1)	0	14	15	8(1)
c	15	14	7	9	13	8
d	15	14	2	15(1) <sup>SS</sup>	14(1)	10(2)

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14	0	13	15	5
b	15	14(1)	0	14	15	8(1)
c	15	14	7	9	13	8
d	15	14	2	15	14(1)	10(2)

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14	0	13	15	4*
b	15	14(1)	0	14	15	8
c	15	14	7	9	12	8
d	15	14	2	15	14(1)	10(2)

Comments/Observations: \* Microbial growth on dead FM

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 15	Day 15	Day 15	Day 15	Day 15	Day 15
replicate	Alive Hatched						
a		6	14	/	13	15	4
b		15	14(1)	/	14	15	8
c		15	14	7	9	12	8
d		15	14	2	15	14(1)	10(2)

Comments/Observations:

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 16	Day 16	Day 16	Day 16	Day 16	Day 16
replicate	Alive Hatched						
a		6	14	/	13	15	4
b		15	14	/	14	15	8
c		15	14	7	9	12	8
d		15	14	2	15	12*	10

Comments/Observations: \* No dead bodies

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 17	Day 17	Day 17	Day 17	Day 17	Day 17
replicate	Alive Hatched						
a		6	14	0	13	15	4
b		15	14	0	14	15	8
c		15	14	7	9	12	8
d		15	14	2	15	12	10

Comments/Observations: SW

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 18	Day 18	Day 18	Day 18	Day 18	Day 18
replicate	Alive Hatched						
a		6	14	0	13	15	4
b		15	14	0	14	15	8
c		15	14	7	9	12	8
d		15	14	2	14	12	10

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14	0	13	14	4
b	15	14	0	14	15	8
c	15	14	7	9	12	8
d	15	14	2	14	12	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	6	14	0	13	14	4
b	15	14	0	14	15	8
c	15	14	7	9	12	8
d	15	14	2	14	12	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	5	14	0	13	14	4
b	15	14	0	13, 14	15	8
c	15	13	7	8	11	8
d	15	13	2	13	12	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	5	14	0	13	14	4
b	15	14	0	14	15	8
c	14	13	7	8	11	8
d	15	12	2	13	12	10

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	5	14	0	13	14	4
b	15	14	0	14	15	8
c	14	13	7	8	11	8
d	15	12	2	13	12	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	5	14	0	13	14	4
b	15	14	0	14	15	8
c	14	13	7	8	11	8
d	14	12	2	13	11	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	5	13	0	13	13	4
b	15	13	0	14	15	8
c	14	<del>12</del> 13	7	8	11	8
d	13	11	2	13	11/11	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	13	0	13	13	4
b	15	12	0	14	15	8
c	14	13	7	8	11	8
d	13	11	2	13	11	10

Comments/Observations:



Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

		Number of Alive Embryos and Hatched Organisms					
		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
replicate	Alive Hatched						
a		4	13	0	13	13	7
b		15	12	0	14	15	8
c		14	13	7	8	11	8
d		13	11	2	13	11	10

Comments/Observations:

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 28	Day 28	Day 28	Day 28	Day 28	Day 28
replicate	Alive Hatched						
a		4	12	0	13	13	7
b		14	9	0	14	14	8
c		14	13	7	8	11	8
d		12	10	2	13	<del>11</del> 9	10

Comments/Observations:

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 29	Day 29	Day 29	Day 29	Day 29	Day 29
replicate	Alive Hatched						
a		4	<del>8</del> 12	0	13	13	7
b		14	<del>12</del> 6	0	14	14	8
c		14	13	7	8	11	8
d		12	10	2	13	9	10

Comments/Observations:

		1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
		Day 30	Day 30	Day 30	Day 30	Day 30	Day 30
replicate	Alive Hatched						
a		4	12	0	13	13	7
b		14	6	0	14	14	8
c		14	13	7	8	11	8
d		12	10	2	<del>13</del> 12	8	10

Comments/Observations:

Method FMD 32 Day ELS Client NAU104 Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	12	0	13	13	4
b	14	6	0	14	14	8
c	14	13	7	8	11	8
d	12	9	2	12	8	10

Comments/Observations:

	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
	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	12	0	13	13	4
b	14	6	0	14	14	8
c	14	13	7	8	10	8
d	12	9	2	12	7	10

Comments/Observations:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µ)

**New Solutions**

Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
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Day	pH (units)					
0	8.5	8.2	8.4	8.3	8.2	8.1
1	8.1	8.1	8.2	8.1	8.0	8.1
2	8.3	8.3	8.3	8.3	8.2	8.3
3	8.1	8.2	8.1	8.2	8.2	8.3
4	8.2	8.2	8.3	8.3	8.3	8.2
5	8.3	8.3	8.3	8.3	8.3	8.3
6	8.2	8.3	8.3	8.3	8.3	8.3
7	8.3	8.4	8.3	8.4	8.4	8.3
8	8.3	8.3	8.3	8.4	8.3	8.3

**Conductance (µS/cm)**

0	762	279	875	340	272	874
1	747	290	877	339	298	843
2	718	280	797	331	272	780
3	741	284	853	340	273	821
4	761	295	873	348	299	837
5	764	288	871	347	298	836
6	778	303	884	340	299	844
7	787	294	1009	370	290	854
8	764	311	1000	381	297	859

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0	7.2	7.2	7.2	7.3	7.2	7.2
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	7.3	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	7.2	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	24.9	24.6	23.8	24.3	24.5	24.5
1	23.6	23.8	23.8	23.9	23.9	23.9
2	23.8	23.7	23.9	23.9	23.9	23.8
3	23.6	23.7	23.1	24.3	23.9	23.9
4	23.5	23.6	23.7	23.9	23.9	23.9
5	23.7	23.8	23.8	23.7	23.8	23.9
6	23.9	23.8	23.7	23.8	23.8	23.6
7	23.9	23.9	23.8	23.7	23.7	23.8
8	23.7	23.7	23.7	23.8	23.9	23.9

**Old Solutions**

1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
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Day	pH (units)					
0						
1	8.1	8.1	8.0	8.0	8.0	8.0
2	8.2	8.2	8.1	8.2	8.2	8.1
3	8.1	8.0	8.1	8.1	8.1	8.0
4	8.1	8.2	8.1	8.2	8.3	8.2
5	8.1	8.2	8.2	8.3	8.3	8.1
6	8.0	8.1	8.0	7.9	8.2	7.9
7	8.1	8.2	8.0	8.1	8.3	8.1
8	8.1	8.2	8.0	8.2	8.2	8.0

**Conductance (µS/cm)**

0						
1	752	307	857	361	299	815
2	719	273	791	317	271	745
3	760	275	836	343	298	828
4	752	310	842	366	312	820
5	755	320	840	360	384	840
6	756	324	848	397	318	829
7	763	321	857	382	316	822
8	770	321	854	376	307	845

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0						
1	6.9	6.9	6.8	6.8	6.8	6.9
2	6.9	6.9	6.9	6.8	7.0	7.1
3	7.0	7.0	7.0	7.1	7.1	7.1
4	7.2	7.2	7.2	7.2	7.2	7.2
5	7.2	7.2	7.2	7.2	7.2	7.1
6	6.9	6.9	6.9	6.9	6.9	6.9
7	6.5	6.5	6.7	6.7	6.7	6.8
8	6.9	7.0	6.9	6.9	6.9	6.9

**Temperature (°C)**

0						
1	23.9	23.8	23.9	23.7	23.6	23.7
2	24.1	23.9	24.1	24.1	24.1	23.7
3	23.6	23.5	23.5	23.5	23.6	23.7
4	23.5	23.5	23.5	23.5	23.5	23.7
5	23.7	23.8	23.7	24.1	23.9	24.3
6	23.6	23.6	23.9	23.8	24.7	23.9
7	24.0	24.6	24.6	24.6	24.6	24.6
8	25.4	25.4	25.5	24.9	24.9	24.9

**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:**



Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µ)

New Solutions						
Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day	pH (units)					
9	8.2	8.1	8.1	8.2	8.2	8.1
10	8.2	8.2	8.1	8.2	8.3	8.2
11	8.2	8.3	8.2	8.2	8.3	8.2
12	8.4	8.4	8.4	8.5	8.4	8.3
13	8.3	8.3	8.2	8.4	8.3	8.3
14	7.9	7.9	7.7	8.1	8.1	8.0
15	8.3	8.3	8.3	8.4	8.3	8.3
16	8.2	8.2	8.2	8.3	8.2	8.2
17	8.1	8.2	8.1	8.3	8.3	8.1
	Conductance (µS/cm)					
9	774	299	989	321	294	870
10	777	307	1001	359	294	876
11	783	295	994	353	293	850
12	785	298	1004	389	303	855
13	802	314	974	363	297	858
14	778	308	1096	363	301	963
15	825	293	1095	424	315	958
16	809	301	1078	356	295	944
17	815	298	1033	361	291	931
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.3	7.5	7.3	7.3	7.3	7.3
10	7.3	7.2	7.2	7.3	7.3	7.3
11	7.3	7.3	7.2	7.2	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	23.9	23.9	23.9	23.9	24.0	24.1 (24.1)
10	24.1	24.3	24.4	24.2	24.1	24.2 (24.2)
11	24.1	24.7	24.2	24.2	24.2	24.2
12	23.9	23.9	24.0	24.0	23.9	24.1
13	24.0	24.1	24.0	24.0	23.8	24.0
14	23.9	24.0	24.0	23.9	23.9	23.8
15	23.8	23.9	23.9	23.8	24.0	23.8
16	24.0	23.9	23.9	24.0	23.9	23.8
17	23.6	23.6	23.8	23.9	23.9	23.8

Old Solutions						
Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day	pH (units)					
9	8.1	8.0	8.0	8.0	8.0	8.0
10	8.0	8.2	8.1	8.1	8.2	8.0
11	8.2	8.2	8.0	8.2	8.3	8.0
12	8.3	8.3	8.1	8.2	8.3	8.1
13	8.0	8.0	8.0	8.2	8.2	8.1
14	8.0	8.0	8.0	8.1	8.1	8.0
15	8.1	8.1	8.1	8.1	8.1	8.1
16	8.0	8.0	7.9	8.1	8.0	8.1
17	8.0	8.1	7.9	8.1	8.1	8.0
	Conductance (µS/cm)					
9	788	251	950	376	313	923
10	782	335	953	408	321	824
11	782	345	964	400	314	834
12	811	348	973	407	304	838
13	866	338	990	408	323	849
14	805	333	985	390	316	876
15	826	347	1011	427	320	848
16	776	325	1094	375	306	947
17	827	367	1087	381	329	930
	Dissolved Oxygen (mg/L) (40-100% saturation)					
9	7.1	7.1	7.1	7.1	7.0	7.1
10	6.8	6.7	6.6	6.7	6.7	6.7
11	6.2	6.3	6.3	6.6	6.7	6.6
12	6.3	6.6	6.7	6.7	6.8	6.8
13	6.9	6.5	6.4	6.4	6.4	6.5
14	6.4	6.4	6.4	6.6	6.7	6.7
15	6.5	6.4	6.4	6.4	6.4	6.4
16	6.7	6.5	6.5	6.3	6.9	6.5
17	6.9	6.0	6.1	6.3	6.3	6.3
	Temperature (°C)					
9	23.5	23.5	23.5	23.5	23.5	23.5
10	23.5	23.5	23.5	23.5	23.5	23.5
11	23.5	23.5	23.5	23.5	23.5	23.5
12	24.4	24.3	24.2	24.2	24.3	24.2
13	23.5	23.5	23.5	23.5	23.5	23.5
14	23.6	23.6	23.6	23.5	23.5	23.5
15	23.8	24.0	24.0	24.0	24.0	24.0
16	23.9	24.3	24.4	24.5	24.1	24.4
17	23.6	23.7	23.6	23.6	23.6	23.6

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:

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µ)

**New Solutions**

Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day						
	pH (units)					
18	8.2	8.1	8.2	8.3	8.4	8.2
19	8.3	8.3	8.2	8.3	8.3	8.3
20	8.4	8.4	8.3	8.5	8.4	8.3
21	8.4	8.5	8.3	8.5	8.4	8.4
22	8.4	8.5	8.4	8.5	8.5	8.5
23	8.1	8.2	8.0	8.3	8.2	8.1
24	8.2	8.3	8.1	8.4	8.4	8.2
25	8.0	8.0	8.0	8.0	8.0	8.0
26	8.2	8.2	8.1	8.3	8.2	8.1
	Conductance (µS/cm)					
18	1818	315	1088	563	303	972
19	811	806	1081	359	301	919
20	801	890	920	347	293	926
21	781	311	1032	865	899	921
22	778	314	1024	346	330	918
23	809	336	1040	408	308	912
24	805	245	1051	384	304	912
25	826	365	1015	426	324	878
26	817	314	1056	366	297	906
	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	7.2	7.2	7.3
26	7.3	7.3	7.3	7.3	7.3	7.3
	Temperature (°C)					
18	23.9	24.1	24.1	24.1	24.1	24.1
19	24.0	24.2	24.1	23.7	23.9	23.7
20	23.9	23.9	23.9	23.8	23.8	23.8
21	23.8	23.8	23.8	23.8	23.6	23.6
22	23.7	23.7	23.8	23.9	23.9	23.8
23	23.6	23.7	23.7	23.7	23.6	23.7
24	23.7	23.9	23.9	22.9	23.9	23.9
25	24.0	23.9	23.9	24.0	24.0	24.0
26	24.1	24.1	24.1	24.2	24.0	24.0

8.4  
SS

7.3

**Old Solutions**

Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day						
	pH (units)					
18	8.1	8.2	8.0	8.0	8.1	7.9
19	8.3	8.2	8.1	8.3	8.4	8.1
20	8.2	8.2	8.3	8.3	8.3	8.1
21	8.1	8.2	8.1	8.3	8.2	8.1
22	8.2	8.3	8.2	8.3	8.4	8.2
23	7.7	7.8	7.7	7.8	7.9	7.8
24	7.9	8.0	7.8	7.9	8.0	8.0
25	7.8	7.9	8.0	7.9	7.9	8.0
26	7.9	8.0	7.9	8.0	8.0	8.0
	Conductance (µS/cm)					
18	829	547	1047	411	326	947
19	793	731	1010	411	324	917
20	789	351	105	420	325	921
21	796	333	1035	410	319	913
22	778	353	1006	402	311	903
23	806	357	1013	404	320	894
24	808	350	1011	407	319	879
25	820	355	1020	412	313	872
26	853	359	1006	414	316	879
	Dissolved Oxygen (mg/L) (40-100% saturation)					
18	6.0	6.5	6.3	6.3	6.2	6.2
19	6.6	6.7	6.6	6.7	6.6	6.7
20	7.2	7.0	7.0	6.9	6.8	6.7
21	7.0	6.9	6.7	6.8	6.7	6.6
22	6.5	6.5	6.6	6.7	6.7	6.6
23	6.0	5.9	5.9	6.2	6.1	5.9
24	6.4	6.4	6.4	6.4	6.4	6.1
25	6.7	6.7	6.7	6.6	6.6	6.6
26	6.7	6.5	6.2	6.2	6.1	6.1
	Temperature (°C)					
18	23.9	23.9	24.0	24.1	24.1	24.1
19	24.3	24.3	24.3	24.3	24.3	24.3
20	23.5	23.6	23.6	23.7	24.3	23.8
21	23.8	23.6	23.6	23.5	23.7	23.9
22	23.5	23.5	23.6	23.7	23.6	23.6
23	23.7	23.7	23.6	23.7	23.8	23.8
24	24.0	24.0	24.1	24.3	24.3	24.1
25	24.0	24.0	23.9	23.9	23.9	23.9
26	24.8	24.9	24.8	24.8	24.7	24.7

**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:**

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µ)

New Solutions						
Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day						
	pH (units)					
27	8.1	8.2	8.2	8.2	8.2	8.3
28	8.1	8.1	8.1	8.1	8.1	8.1
29	8.1	8.1	8.0	8.1	8.1	8.0
30	8.4	8.4	8.3	8.3	8.4	8.3
31	8.1	8.2	8.2	8.4	8.3	8.1
32						

Old Solutions						
Conc. (%)	1617-1326	1617-1327	1617-1328	1617-1329	1617-1330	1617-1331
Day						
	pH (units)					
27	8.0	8.0	8.0	8.0	8.0	8.0
28	8.2	8.2	8.2	8.4	8.4	8.3
29	8.0	7.9	7.9	8.0	8.1	7.9
30	8.2	8.2	8.1	8.2	8.2	8.2
31	8.0	8.0	7.9	8.2	8.2	7.9
32	8.1	8.1	8.0	8.1	8.3	8.0

Conductance (µS/cm)						
27	815	310	1048	373	310	961
28	818	398	1022	304	336	899
29	817	304	1150	363	299	1012
30	814	310	1148	374	200	973
31	797	366	1127	399	296	938
32						

Conductance (µS/cm)						
27	828	317	1062	388	328	955
28	814	308	1108	385	204	968
29	992	330	1050	400	322	916
30	841	382	1108	423	324	932
31	801	331	1141	307	307	988
32	813	340	1125	454	530	913

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	6.5	6.4	6.4	6.4	6.4	6.4
28	7.3	7.3	7.3	7.3	7.3	7.3
29	7.0	6.8	6.7	6.8	6.7	6.7
30	7.0	6.9	6.7	6.6	6.7	6.7
31	6.4	6.5	6.5	6.6	6.6	6.5
32	6.6	6.6	6.6	6.6	6.6	6.9

Temperature (°C)						
27	24.4	24.3	24.7	24.3	24.3	24.3
28	24.3	24.3	24.3	24.4	24.4	23.9
29	24.2	24.1	24.2	24.2	24.1	23.7
30	23.7	23.7	24.0	24.1	24.1	24.1
31	23.8	23.7	23.9	23.8	23.2	23.9
32						

Temperature (°C)						
27	25.1	25.0	25.0	25.1	25.1	25.1
28	25.9	24.1	24.1	24.1	24.1	24.1
29	24.0	24.0	24.1	24.1	24.1	24.1
30	24.0	24.0	24.1	24.2	24.1	24.1
31	24.3	24.3	24.7	24.7	24.3	24.3
32	24.6	24.1	24.1	23.9	23.9	24.3

**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:**

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg)

**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.

1617-1326	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	8	N	1	8	N	1	8	N
	2	11	↓	2	8	↓	2	8	↓	2	8	↓
	3	12	↓	3	8	↓	3	10	↓	3	8	↓
	4	10	↓	4	7	↓	4	9	↓	4	8	↓
	5	↓	↓	5	8	↓	5	7	↓	5	9	↓
	6	↓	↓	6	8	↓	6	7	↓	6	9	↓
	7	↓	↓	7	8	↓	7	8	↓	7	9	↓
	8	↓	↓	8	7	↓	8	8	↓	8	7	↓
	9	↓	↓	9	8	↓	9	8	↓	9	8	↓
	10	↓	↓	10	9	↓	10	8	↓	10	8	↓
	11	↓	↓	11	10	↓	11	8	↓	11	8	↓
	12	↓	↓	12	9	↓	12	8	↓	12	8	↓
	13	↓	↓	13	9	↓	13	8	↓	13	8	↓
	14	↓	↓	14	7	↓	14	7	↓	14	7	↓
	15	↓	↓	15	↓	↓	15	↓	↓	15	↓	↓

Comments

1617-1327	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	9	N	1	9	N	1	8	N	1	8	N
	2	11	↓	2	8	↓	2	8	↓	2	8	↓
	3	7	↓	3	8	↓	3	7	↓	3	8	↓
	4	8	↓	4	8	↓	4	7	↓	4	8	↓
	5	7	↓	5	7	↓	5	8	↓	5	9	↓
	6	7	↓	6	10	↓	6	8	↓	6	10	↓
	7	9	↓	7	↓	↓	7	8	↓	7	11	↓
	8	8	↓	8	↓	↓	8	10	↓	8	7	↓
	9	7	↓	9	↓	↓	9	11	↓	9	10	↓
	10	8	↓	10	↓	↓	10	9	↓	10	↓	↓
	11	8	↓	11	↓	↓	11	7	↓	11	↓	↓
	12	9	↓	12	↓	↓	12	8	↓	12	↓	↓
	13	↓	↓	13	↓	↓	13	8	↓	13	↓	↓
	14	↓	↓	14	↓	↓	14	↓	↓	14	↓	↓
	15	↓	↓	15	↓	↓	15	↓	↓	15	↓	↓

Comments

Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg)

**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.

1617-1328	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	7	N	1	14	N
2				2			2	9		2	10	
3				3			3	9		3		
4				4			4	9		4		
5				5			5	8		5		
6				6			6	8		6		
7				7			7	8		7		
8				8			8	8		8		
9				9			9	8		9		
10				10			10	8		10		
11				11			11	8		11		
12				12			12	8		12		
13				13			13	8		13		
14				14			14	8		14		
15				15			15	8		15		

Comments

1617-1329	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	6		N	1	8	N	1	8	N	1	5	N
2	9			2	8		2	10		2	5	
3	9			3	9		3	9		3	9	
4	7			4	8		4	10		4	8	
5	8			5	8		5	8		5	8	
6	8			6	8		6	9		6	8	
7	9			7	8		7	9		7	8	
8	9			8	2		8	7		8	9	
9	16			9	8		9	16		9	9	
10	9			10	8		10			10	9	
11	9			11	6		11			11	9	
12	9			12	8		12			12	8	
13	8			13	7		13			13		
14				14	9		14			14		
15				15			15			15		

Comments



Method FMD 32 Day ELS Client NAU104

Sample: 1617-1326, 1617-1327, 1617-1328, 1617-1329, 1617-1330, 1617-1331 (10µg)

**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.

1617-1330

Replicate # <u>D</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	8	N	1	9	N	1	8	N
2	8	↓	2	8	↓	2	8	↓	2	10	↓
3	8	↓	3	8	↓	3	9	↓	3	8	↓
4	8	↓	4	8	↓	4	8	↓	4	8	↓
5	8	↓	5	8	↓	5	8	↓	5	8	↓
6	7	↓	6	8	↓	6	8	↓	6	8	↓
7	10	↓	7	8	↓	7	9	↓	7	8	↓
8	8	↓	8	8	↓	8	9	↓	8	8	↓
9	8	↓	9	8	↓	9	8	↓	9	8	↓
10	8	↓	10	8	↓	10	9	↓	10	8	↓
11	8	↓	11	8	↓	11	8	↓	11	8	↓
12	8	↓	12	8	↓	12	8	↓	12	8	↓
13	8	↓	13	8	↓	13	8	↓	13	8	↓
14	8	↓	14	8	↓	14	8	↓	14	8	↓
15	8	↓	15	8	↓	15	8	↓	15	8	↓

Comments

1617-1331

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	9	N	1	8	N	1	9	N
2	12	↓	2	9	↓	2	9	↓	2	8	↓
3	10	↓	3	9	↓	3	9	↓	3	8	↓
4	12	↓	4	9	↓	4	12	↓	4	8	↓
5	8	↓	5	9	↓	5	10	↓	5	8	↓
6	8	↓	6	9	↓	6	9	↓	6	8	↓
7	8	↓	7	9	↓	7	9	↓	7	8	↓
8	8	↓	8	9	↓	8	9	↓	8	8	↓
9	8	↓	9	9	↓	9	9	↓	9	8	↓
10	8	↓	10	9	↓	10	9	↓	10	8	↓
11	8	↓	11	9	↓	11	9	↓	11	8	↓
12	8	↓	12	9	↓	12	9	↓	12	8	↓
13	8	↓	13	9	↓	13	9	↓	13	8	↓
14	8	↓	14	9	↓	14	9	↓	14	8	↓
15	8	↓	15	9	↓	15	9	↓	15	8	↓

Comments

# Organism Weights Bench Sheet

Client \_\_\_\_\_ Sample 32 day Organism FM Batch \_\_\_\_\_ Initial weights due: 2017/08/28  
 Final weights due: \_\_\_\_\_

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2017/08/26	AD	Mettler #1
Final Weight (mg):	dried pan + organisms	2017/08/31	CB	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 UNT		CTL-CU (10)		CTL-CU (20)		1326		1327		1328 (10)	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1016.68	1025.80	1027.92	1035.58	1025.09	1033.82	1026.75	1030.11	1009.53	1019.34	1042.14	/
b	1029.22	1038.57	1024.00	1030.73	1023.76	1028.90	998.83	1009.57	1023.34	1029.06	1053.85	/
c	1029.51	1038.89	1013.31	1020.06	1022.29	1028.50	1033.37	1042.85	1031.02	1041.82	1040.08	1047.40
d	1021.64	1032.31	1011.48	1018.04	1025.14	1033.26	1017.78	1026.86	1007.59	1017.25	1023.39	1035.62
e											1029.25	1025.62

### Concentration

Replicate	1328 (20)		1329		1330		1331 (10)		1331 (20)		Initial		Final	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1026.47	1021.12 <sup>CB</sup>	1032.79	1042.79	1031.09	1040.89	1008.26	1021.34 <sup>CB</sup>	1021.95	1034.99 <sup>*</sup>				
b	1031.49	1038.78	1009.44	1017.53	990.26	999.11	997.82	1008.70	1018.07	1027.09				
c	1019.15	1028.90	1003.39	1012.67	998.07	1007.78	1026.13	1037.21	1017.34	1026.71				
d	1021.37	1030.45 <sup>CB</sup>	1030.34	1038.93	1014.02	1020.90	1016.99	1027.36	1023.24	1030.07				
e		1024.50												

\* = 1033.80

\* = 1014.87

\* = 1030.32

### Balance Calibration Check:

	Initial	Final
first pan weighed:	CTL UNT A	1331 (20) D
weight of first pan:	1016.68	1030.07
first pan after all other pans weighed:	1016.77	1031.00

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

**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: 20170728FMELS

**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): 8.3  
conductance (µS/cm): 404  
dissolved oxygen (mg/L): 7.1  
NH<sub>4</sub><sup>+</sup> (mg/L): 0  
hardness (mg CaCO<sub>3</sub>/L): 141  
alkalinity (mg CaCO<sub>3</sub>/L): 120  
total residual chlorine (mg/L): <0.01

**Comments:** none.

The test data and results are authorized and verified correct.



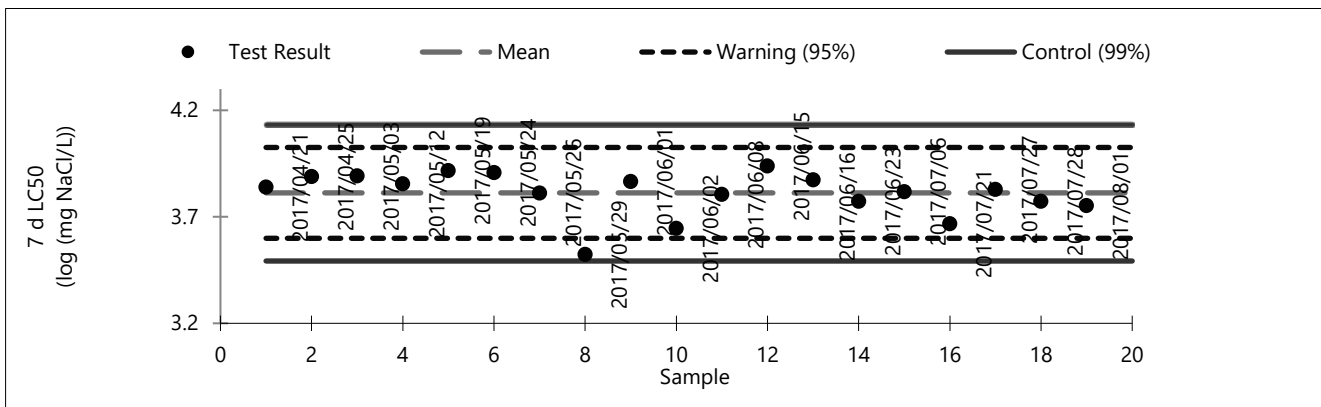
Senior Verifier

### Mortality Current Test

toxicant Sodium Chloride (NaCl)			
started on 2017/08/01		ended on 2017/08/08	
Result (7 d LC50):	3.75	log (mg NaCl/L); geometric mean	
Confidence Limits (95%)	lower	3.69	upper 3.82

### Historical Values

mean	3.81	sd	0.11	cv(%):	16.3
	lower	upper			
warning limits ( $\pm 2$ sd)	3.60	4.03	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.49	4.13	(99% confidence limits)		

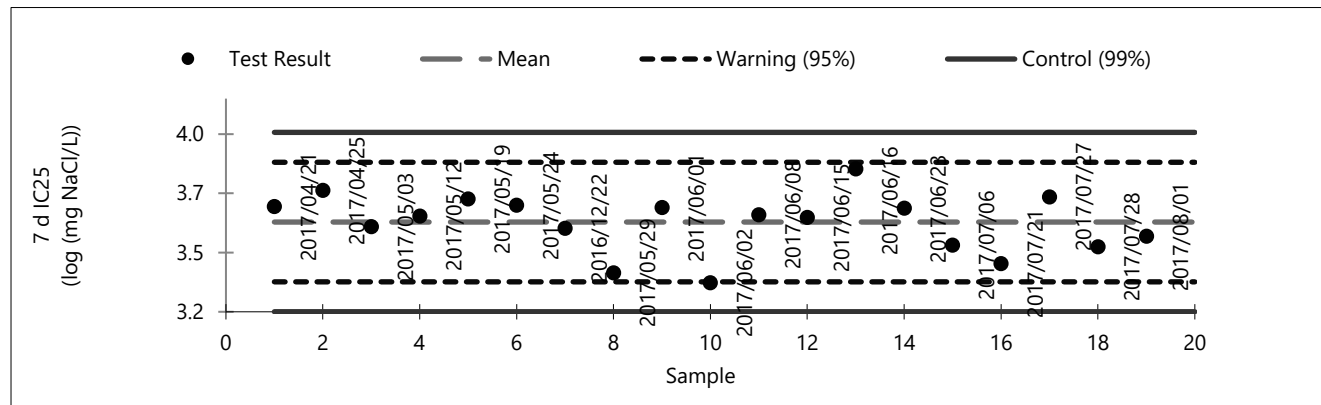


### Biomass

started on 2017/08/01				ended on 2017/08/08	
Result (7 d IC25):	3.52	log (mg NaCl/L); geometric mean			
Confidence Limits (95%)	lower	3.38	upper	3.62	

### Historical Values

mean	3.58	sd	0.13	cv(%):	19.3
	lower	upper			
warning limits ( $\pm 2$ sd)	3.33	3.83	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.20	3.96	(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**

Report Date: 17 Oct-17 16:37 (p 1 of 4)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	12h	Teck Coal	Teck Coal Q3
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA		
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA		
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C) ✓		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C) ✓		
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C) ✓		
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C) ✓		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C) ✓		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C) ✓		
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

- FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites
- All samples & reference sites spiked w/ 10 ug/L Cu
- FR\_FRCP1 & CM\_MC2 spiked w/ 20 ug/L Cu as well as 10 ug/L Cu

**CETIS Summary Report**

Report Date: 06 Nov-17 16:32 (p 2 of 4)  
 Test Code: 170737a | 07-5325-2191

**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	4	1	1	1	1	1	0	0	0.0%	0.0%
Cu Ctrl 10 ug/L	4	1	1	1	1	1	0	0	0.0%	0.0%
Cu Ctrl 20 ug/L	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	1.67%
FR_UFR1	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	1.67%
GH_ER2	4	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC1	4	1	1	1	1	1	0	0	0.0%	0.0%
FR_FRCP1	4	0.9333	0.8108	1	0.8667	1	0.03849	0.07698	8.25%	6.67%
GH_FR1	4	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC2	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	1.67%
FR_FRCP1 20 ug	4	1	1	1	1	1	0	0	0.0%	0.0%
CM_MC2 (20 ug)	4	1	1	1	1	1	0	0	0.0%	0.0%

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	10.2	9.801	10.59	9.9	10.42	0.124	0.248	2.43%	0.0%
Cu Ctrl 10 ug/L	4	9.852	9.72	9.984	9.75	9.923	0.04161	0.08323	0.84%	3.38%
Cu Ctrl 20 ug/L	4	9.618	9.254	9.982	9.357	9.846	0.1143	0.2287	2.38%	5.67%
FR_UFR1	4	8.257	7.454	9.059	7.833	8.875	0.2522	0.5044	6.11%	19.02%
GH_ER2	4	8.416	8.004	8.828	8.167	8.778	0.1294	0.2588	3.08%	17.46%
CM_MC1	4	8.118	7.526	8.71	7.643	8.429	0.1861	0.3723	4.59%	20.38%
FR_FRCP1	4	5.286	-4.602	15.17	0	12	3.107	6.214	117.6%	48.16%
GH_FR1	4	8.887	6.604	11.17	7.833	11	0.7175	1.435	16.15%	12.84%
CM_MC2	4	9.356	7.505	11.21	8.3	11	0.5817	1.163	12.43%	8.24%
FR_FRCP1 20 ug	4	9.895	7.927	11.86	9.25	11.75	0.6184	1.237	12.5%	2.95%
CM_MC2 (20 ug)	4	9.159	8.559	9.76	8.625	9.462	0.1888	0.3776	4.12%	10.17%

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.642	0.5674	0.7166	0.608	0.7113	0.02343	0.04687	7.3%	0.0%
Cu Ctrl 10 ug/L	4	0.4617	0.4089	0.5144	0.4373	0.5107	0.01658	0.03315	7.18%	28.09%
Cu Ctrl 20 ug/L	4	0.47	0.2933	0.6467	0.3427	0.582	0.05551	0.111	23.62%	26.79%
FR_UFR1	4	0.5993	0.5111	0.6875	0.5393	0.6667	0.02772	0.05543	9.25%	6.65%
GH_ER2	4	0.5998	0.3619	0.8377	0.3813	0.72	0.07476	0.1495	24.93%	6.57%
CM_MC1	4	0.5873	0.4435	0.7312	0.4587	0.6533	0.0452	0.0904	15.39%	8.52%
FR_FRCP1	4	0.1592	-0.2071	0.5254	0	0.488	0.1151	0.2302	144.6%	75.21%
GH_FR1	4	0.5443	0.1963	0.8923	0.224	0.716	0.1094	0.2187	40.18%	15.21%
CM_MC2	4	0.649	0.4257	0.8723	0.4407	0.7387	0.07016	0.1403	21.62%	-1.09%
FR_FRCP1 20 ug	4	0.4583	0.1667	0.7499	0.2087	0.65	0.09163	0.1833	39.98%	28.61%
CM_MC2 (20 ug)	4	0.5598	0.4406	0.6791	0.4553	0.6247	0.03747	0.07494	13.39%	12.8%

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.7833	0.6499	0.9168	0.6667	0.8667	0.04194	0.08389	10.71%	0.0%
Cu Ctrl 10 ug/L	4	0.8	0.7134	0.8866	0.7333	0.8667	0.02722	0.05443	6.8%	-2.13%
Cu Ctrl 20 ug/L	4	0.8	0.5127	1	0.5333	0.9333	0.09027	0.1805	22.57%	-2.13%
FR_UFR1	4	0.7833	0.5043	1	0.5333	0.9333	0.08767	0.1753	22.38%	0.0%
GH_ER2	4	0.6667	0.3312	1	0.4	0.8667	0.1054	0.2108	31.62%	14.89%
CM_MC1	4	0.7333	0.3979	1	0.4667	0.9333	0.1054	0.2108	28.75%	6.38%
FR_FRCP1	4	0.15	0	0.5005	0	0.4667	0.1101	0.2203	146.8%	80.85%
GH_FR1	4	0.7333	0.2283	1	0.2667	0.9333	0.1587	0.3174	43.28%	6.38%
CM_MC2	4	0.5	0.233	0.767	0.2667	0.6667	0.08389	0.1678	33.55%	36.17%
FR_FRCP1 20 ug	4	0.6667	0.2336	1	0.2667	0.8667	0.1361	0.2722	40.82%	14.89%
CM_MC2 (20 ug)	4	0.7667	0.5141	1	0.5333	0.8667	0.07935	0.1587	20.7%	2.13%

**CETIS Summary Report**

Report Date: 06 Nov-17 16:32 (p 3 of 4)  
 Test Code: 170737a | 07-5325-2191

**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	1
Cu Ctrl 10 ug/L	1	1	1	1
Cu Ctrl 20 ug/L	1	1	0.9333	1
FR_UFR1	0.9333	1	1	1
GH_ER2	1	1	1	1
CM_MC1	1	1	1	1
FR_FRCP1	1	1	0.8667	0.8667
GH_FR1	1	1	1	1
CM_MC2	1	1	0.9333	1
FR_FRCP1 20 ug	1	1	1	1
CM_MC2 (20 ug)	1	1	1	1

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	10.42	10.08	9.9	10.38
Cu Ctrl 10 ug/L	9.923	9.818	9.917	9.75
Cu Ctrl 20 ug/L	9.846	9.5	9.769	9.357
FR_UFR1	8.462	7.857	8.875	7.833
GH_ER2	8.167	8.333	8.385	8.778
CM_MC1	8	7.643	8.4	8.429
FR_FRCP1	0	0	9.143	12
GH_FR1	11	8.5	8.214	7.833
CM_MC2	11	8.875	9.25	8.3
FR_FRCP1 20 ug	9.308	9.273	9.25	11.75
CM_MC2 (20 ug)	9.385	9.462	9.167	8.625

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.608	0.6233	0.6253	0.7113
Cu Ctrl 10 ug/L	0.5107	0.4487	0.45	0.4373
Cu Ctrl 20 ug/L	0.582	0.3427	0.414	0.5413
FR_UFR1	0.6667	0.5393	0.6187	0.5727
GH_ER2	0.654	0.3813	0.72	0.644
CM_MC1	0.6533	0.59	0.6473	0.4587
FR_FRCP1	0	0	0.488	0.1487
GH_FR1	0.224	0.716	0.632	0.6053
CM_MC2	0.4407	0.7253	0.7387	0.6913
FR_FRCP1 20 ug	0.4887	0.486	0.65	0.2087
CM_MC2 (20 ug)	0.558	0.6013	0.6247	0.4553

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8	0.8	0.6667	0.8667
Cu Ctrl 10 ug/L	0.8667	0.7333	0.8	0.8
Cu Ctrl 20 ug/L	0.8667	0.5333	0.8667	0.9333
FR_UFR1	0.8667	0.9333	0.5333	0.8
GH_ER2	0.8	0.4	0.8667	0.6
CM_MC1	0.8667	0.9333	0.6667	0.4667
FR_FRCP1	0	0	0.4667	0.1333
GH_FR1	0.2667	0.9333	0.9333	0.8
CM_MC2	0.2667	0.5333	0.5333	0.6667
FR_FRCP1 20 ug	0.8667	0.7333	0.8	0.2667
CM_MC2 (20 ug)	0.8667	0.8667	0.8	0.5333

**CETIS Summary Report**Report Date: 06 Nov-17 16:32 (p 4 of 4)  
Test Code: 170737a | 07-5325-2191**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	15/15	15/15	15/15
Cu Ctrl 10 ug/L	15/15	15/15	15/15	15/15
Cu Ctrl 20 ug/L	15/15	15/15	14/15	15/15
FR_UFR1	14/15	15/15	15/15	15/15
GH_ER2	15/15	15/15	15/15	15/15
CM_MC1	15/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	13/15	13/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	15/15
FR_FRCP1 20 ug	15/15	15/15	15/15	15/15
CM_MC2 (20 ug)	15/15	15/15	15/15	15/15

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	12/15	10/15	13/15
Cu Ctrl 10 ug/L	13/15	11/15	12/15	12/15
Cu Ctrl 20 ug/L	13/15	8/15	13/15	14/15
FR_UFR1	13/15	14/15	8/15	12/15
GH_ER2	12/15	6/15	13/15	9/15
CM_MC1	13/15	14/15	10/15	7/15
FR_FRCP1	0/15	0/15	7/15	2/15
GH_FR1	4/15	14/15	14/15	12/15
CM_MC2	4/15	8/15	8/15	10/15
FR_FRCP1 20 ug	13/15	11/15	12/15	4/15
CM_MC2 (20 ug)	13/15	13/15	12/15	8/15



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:41 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 06-3655-7218	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 15:55	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)		
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)		
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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%)
Cu Ctrl 10 ug/L		FR_UFR1	0.5	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		GH_ER2	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		CM_MC1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		FR_FRCP1	0.05936	0.3562	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10 ug/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 10 ug/L Negative Contr	60	0	60	1 ✓	0	0.0%
FR_UFR1	59	1	60	0.9833 ✓	0.01667	1.67%
GH_ER2	60	0	60	1 ✓	0	0.0%
CM_MC1	60	0	60	1 ✓	0	0.0%
FR_FRCP1	56	4	60	0.9333 ✓	0.06667	6.67%
GH_FR1	60	0	60	1 ✓	0	0.0%
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 10 ug/L	1	1	1	1
FR_UFR1	0.9333	1	1	1
GH_ER2	1	1	1	1
CM_MC1	1	1	1	1
FR_FRCP1	1	1	0.8667	0.8667
GH_FR1	1	1	1	1
CM_MC2	1	1	0.9333	1

# CETIS Analytical Report

Report Date: 17 Oct-17 16:41 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 06-3655-7218  
Analyzed: 17 Oct-17 15:55

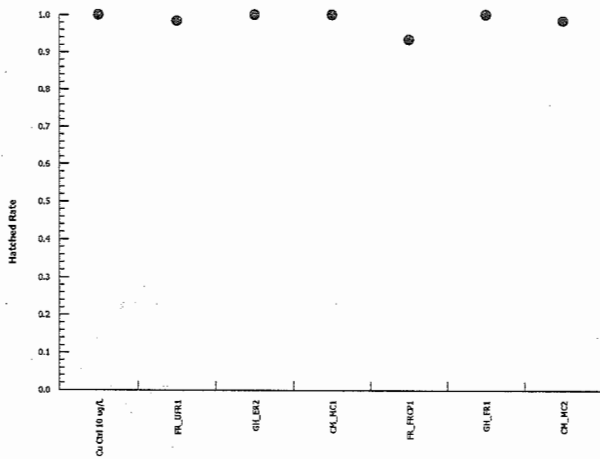
Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10 ug/L	15/15	15/15	15/15	15/15
FR_UFR1	14/15	15/15	15/15	15/15
GH_ER2	15/15	15/15	15/15	15/15
CM_MC1	15/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	13/15	13/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	15/15

### Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:45 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 21-1494-3948	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 15:58	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)		
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)		
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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%)
Cu Ctrl 10 ug/L		FR_UFR1	0.5	0.5000	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		GH_ER2	0.07392	0.2957	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		CM_MC1	0.2589	0.7767	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		FR_FRCP1	0	<0.0001	Exact	Significant Effect
Cu Ctrl 10 ug/L		GH_FR1	0.2589	0.7767	Exact	Non-Significant Effect
Cu Ctrl 10 ug/L		CM_MC2	0.0005091	0.0025	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10 ug/L Negative Contr	48	12	60	0.8	0.2	0.0%
FR_UFR1	47	13	60	0.7833	0.2167	2.08%
GH_ER2	40	20	60	0.6667	0.3333	16.67%
CM_MC1	44	16	60	0.7333	0.2667	8.33%
FR_FRCP1	9	51	60	0.15	0.85	81.25%
GH_FR1	44	16	60	0.7333	0.2667	8.33%
CM_MC2	30	30	60	0.5	0.5	37.5%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10 ug/L	0.8667 ✓	0.7333 ✓	0.8 ✓	0.8 ✓
FR_UFR1	0.8667 ✓	0.9333 ✓	0.5333 ✓	0.8 ✓
GH_ER2	0.8 ✓	0.4 ✓	0.8667 ✓	0.6 ✓
CM_MC1	0.8667 ✓	0.9333 ✓	0.6667 ✓	0.4667 ✓
FR_FRCP1	0	0	0.4667 ✓	0.1333 ✓
GH_FR1	0.2667 ✓	0.9333 ✓	0.9333 ✓	0.8 ✓
CM_MC2	0.2667 ✓	0.5333 ✓	0.5333 ✓	0.6667 ✓

# CETIS Analytical Report

Report Date: 17 Oct-17 16:46 (p 2 of 2)  
 Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

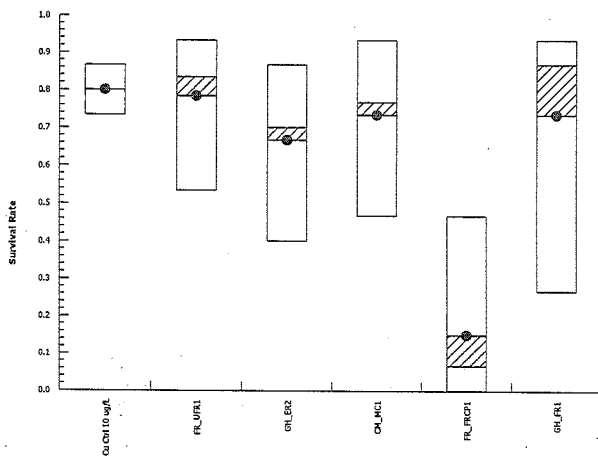
Analysis ID: 21-1494-3948      Endpoint: Survival Rate  
 Analyzed: 17 Oct-17 15:58      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10 ug/L	13/15	11/15	12/15	12/15
FR_UFR1	13/15	14/15	8/15	12/15
GH_ER2	12/15	6/15	13/15	9/15
CM_MC1	13/15	14/15	10/15	7/15
FR_FRCP1	0/15	0/15	7/15	2/15
GH_FR1	4/15	14/15	14/15	12/15
CM_MC2	4/15	8/15	8/15	10/15

### Graphics



**CETIS Analytical Report**

Report Date: 06 Nov-17 15:20 (p 9 of 10)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 01-6295-6721      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 06 Nov-17 15:19      Analysis: Parametric-Control vs Treatments      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)		
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)		
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10 ug/L	Lab Control (10 ug/L)	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	55.8%	

**Dunnnett Multiple Comparison Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10 ug/L	FR_UFR1	-1.308	2.448	0.258	6	0.9949	CDF	Non-Significant Effect
	GH_ER2	-1.312	2.448	0.258	6	0.9950	CDF	Non-Significant Effect
	CM_MC1	-1.194	2.448	0.258	6	0.9928	CDF	Non-Significant Effect
	FR_FRCP1	2.873	2.448	0.258	6	0.0210	CDF	Significant Effect
	GH_FR1	-0.7852	2.448	0.258	6	0.9768	CDF	Non-Significant Effect
	CM_MC2	-1.779	2.448	0.258	6	0.9989	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.6712636	0.1118773	6	5.046	0.0024	Significant Effect
Error	0.4655628	0.02216966	21			
Total	1.136826		27			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	11.84	16.81	0.0656	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9396	0.8975	0.1081	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10 ug/L	4	0.4617	0.4089	0.5144	0.4493	0.4373	0.5107	0.01658	7.18%	0.0%
FR_UFR1	4	0.5993	0.5111	0.6875	0.5957	0.5393	0.6667	0.02772	9.25%	-29.82%
GH_ER2	4	0.5998	0.3619	0.8377	0.649	0.3813	0.72	0.07476	24.93%	-29.93%
CM_MC1	4	0.5873	0.4435	0.7312	0.6187	0.4587	0.6533	0.0452	15.39%	-27.22%
FR_FRCP1	4	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	65.52%
GH_FR1	4	0.5443	0.1963	0.8923	0.6187	0.224	0.716	0.1094	40.18%	-17.91%
CM_MC2	4	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	-40.58%

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

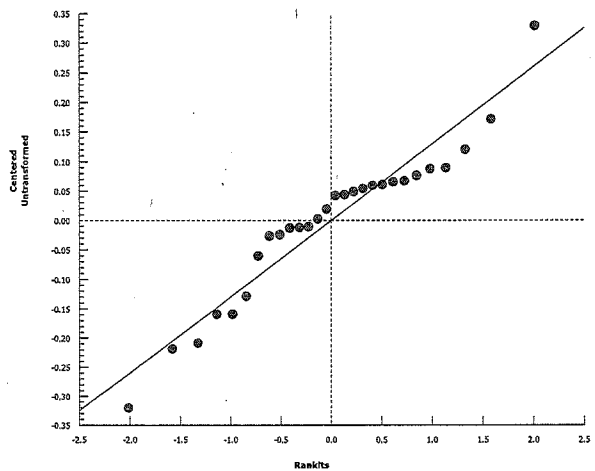
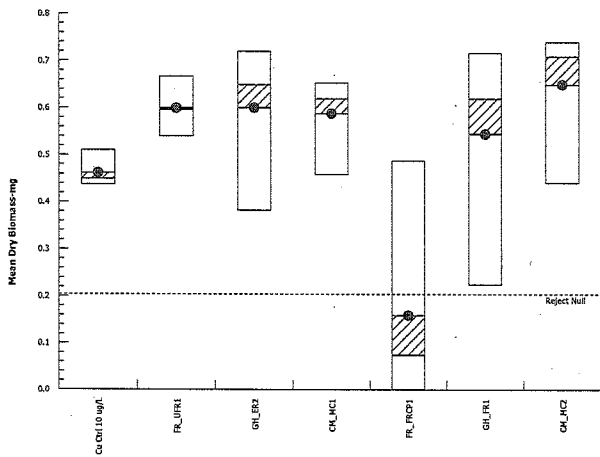
Analysis ID: 01-6295-6721      Endpoint: Mean Dry Biomass-mg  
 Analyzed: 06 Nov-17 15:19      Analysis: Parametric-Control vs Treatments

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 10 ug/L	0.5107	0.4487	0.45	0.4373
FR_UFR1	0.6667	0.5393	0.6187	0.5727
GH_ER2	0.654	0.3813	0.72	0.644
CM_MC1	0.6533	0.59	0.6473	0.4587
FR_FRCP1	0	0	0.488	0.1487
GH_FR1	0.224	0.716	0.632	0.6053
CM_MC2	0.4407	0.7253	0.7387	0.6913

Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:43 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 21-1902-6602	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 15:57	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)		Teck Coal Q3
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)		
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)		
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10 ug/L	Lab Control (10 ug/L)	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

**Nemenyi-Damico-Wolfe Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10 ug/L		FR_UFR1	50	49.8	3		0.0489	Asymp	Significant Effect
		GH_ER2	46	49.8	3		0.0749	Asymp	Non-Significant Effect
		CM_MC1	57	49.8	3		0.0212	Asymp	Significant Effect
		FR_FRCP1	-2	61	3		0.8868	Asymp	Non-Significant Effect
		GH_FR1	38	49.8	3		0.1572	Asymp	Non-Significant Effect
		CM_MC2	18	49.8	3		0.5398	Asymp	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Treatment Effect	Fligner-Wolfe	329		0.0104	Significant Overall Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	15.02297	2.503828	6	3.026	0.0300	Significant Effect
Error	15.71985	0.8273603	19			
Total	30.74281		25			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	21.47	16.81	0.0015	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9152	0.8912	0.0347	Normal Distribution

**CETIS Analytical Report**

Report Date: 17 Oct-17 16:43 (p 2 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 21-1902-6602      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 15:57      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

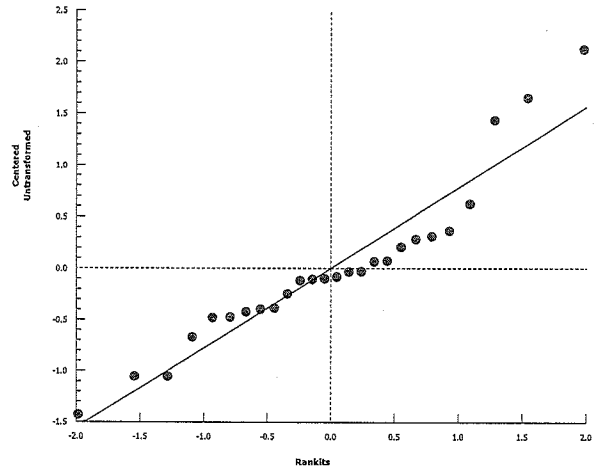
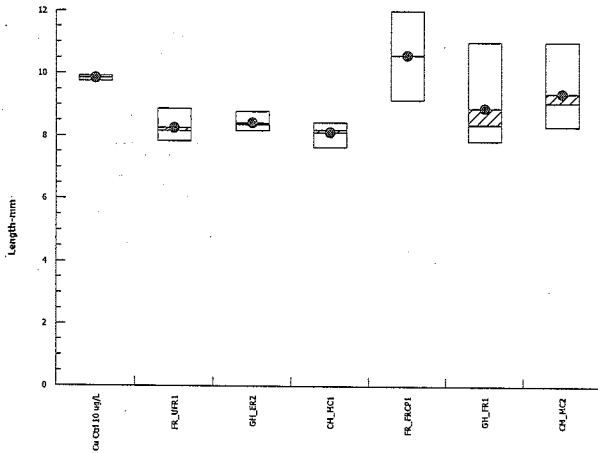
**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 10 ug/L	4	9.852 ✓	9.72	9.984	9.867	9.75	9.923	0.04162	0.84%	0.0%
FR_UFR1	4	8.257 ✓	7.454	9.059	8.159	7.833	8.875	0.2522	6.11%	16.19%
GH_ER2	4	8.416 ✓	8.004	8.827	8.359	8.167	8.778	0.1294	3.08%	14.58%
CM_MC1	4	8.118 ✓	7.526	8.71	8.2	7.643	8.429	0.1861	4.59%	17.6%
FR_FRCP1	2	10.57 ✓	-7.58	28.72	10.57	9.143	12	1.429	19.11%	-7.3%
GH_FR1	4	8.887 ✓	6.604	11.17	8.357	7.833	11	0.7175	16.15%	9.8%
CM_MC2	4	9.356 ✓	7.505	11.21	9.063	8.3	11	0.5817	12.43%	5.03%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10 ug/L	9.923	9.818	9.917	9.75
FR_UFR1	8.462	7.857	8.875	7.833
GH_ER2	8.167	8.333	8.385	8.778
CM_MC1	8	7.643	8.4	8.429
FR_FRCP1	9.143	12		
GH_FR1	11	8.5	8.214	7.833
CM_MC2	11	8.875	9.25	8.3

**Graphics**





**CETIS Analytical Report**

Report Date: 18 Oct-17 14:33 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 20-5413-3350	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Oct-17 14:32	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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		FR_FRCP1	0.1822	0.5465	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.7521	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Negative Contr	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1	56	4	60	0.9333	0.06667	5.09%
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
FR_UFR1	0.9333	1	1	1
FR_FRCP1	1	1	0.8667	0.8667
GH_FR1	1	1	1	1
CM_MC2	1	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	14/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	13/15	13/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	15/15

# CETIS Analytical Report

Report Date: 18 Oct-17 14:33 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

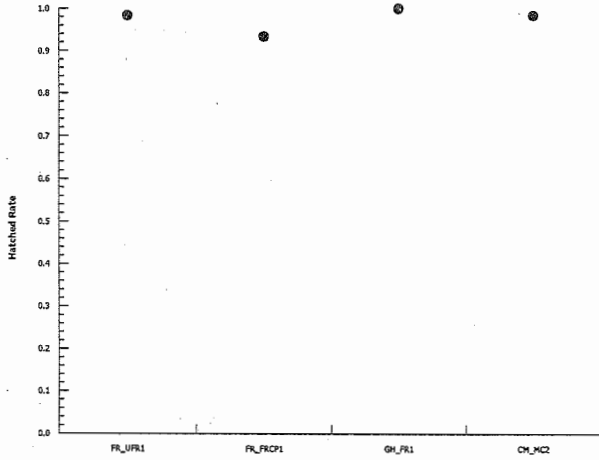
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5413-3350      Endpoint: Hatched Rate  
Analyzed: 18 Oct-17 14:32      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Oct-17 14:34 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-4610-3775	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Oct-17 14:32	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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		FR_FRCP1	0	<0.0001	Exact	Significant Effect
FR_UFR1		GH_FR1	0.3351	0.3351	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.001068	0.0021	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
FR_UFR1	Negative Contr	47	13	60	0.7833	0.2167	0.0%
FR_FRCP1		9	51	60	0.15	0.85	80.85%
GH_FR1		44	16	60	0.7333	0.2667	6.38%
CM_MC2		30	30	60	0.5	0.5	36.17%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.8667 ✓	0.9333 ✓	0.5333 ✓	0.8 ✓
FR_FRCP1	0	0	0.4667 ✓	0.1333 ✓
GH_FR1	0.2667 ✓	0.9333 ✓	0.9333 ✓	0.8 ✓
CM_MC2	0.2667 ✓	0.5333 ✓	0.5333 ✓	0.6667 ✓

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	13/15	14/15	8/15	12/15
FR_FRCP1	0/15	0/15	7/15	2/15
GH_FR1	4/15	14/15	14/15	12/15
CM_MC2	4/15	8/15	8/15	10/15

# CETIS Analytical Report

Report Date: 18 Oct-17 14:34 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

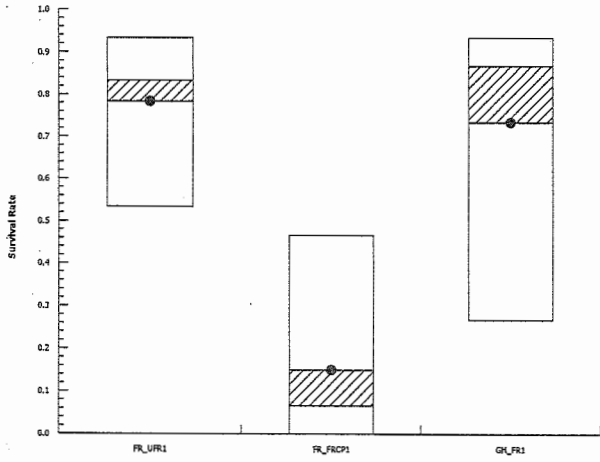
Nautilus Environmental

Analysis ID: 11-4610-3775  
Analyzed: 18 Oct-17 14:32

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 06 Nov-17 15:20 (p 1 of 10)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 07-0123-1124      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 06 Nov-17 14:59      Analysis: Parametric-Control vs Treatments      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	47.4%	

**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	3.542	2.287	0.284	6	0.0053	CDF	Significant Effect
	GH_FR1	0.4426	2.287	0.284	6	0.5710	CDF	Non-Significant Effect
	CM_MC2	-0.3996	2.287	0.284	6	0.8685	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.5984808	0.1994936	3	6.458	0.0075	Significant Effect
Error	0.3706816	0.03089013	12			
Total	0.9691624		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.694	11.34	0.1957	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9639	0.8408	0.7321	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	0.5993	0.5111	0.6875	0.5957	0.5393	0.6667	0.02772	9.25%	0.0%
FR_FRCP1	4	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	73.44%
GH_FR1	4	0.5443	0.1963	0.8923	0.6187	0.224	0.716	0.1094	40.18%	9.18%
CM_MC2	4	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	-8.29%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.6667	0.5393	0.6187	0.5727
FR_FRCP1	0	0	0.488	0.1487
GH_FR1	0.224	0.716	0.632	0.6053
CM_MC2	0.4407	0.7253	0.7387	0.6913

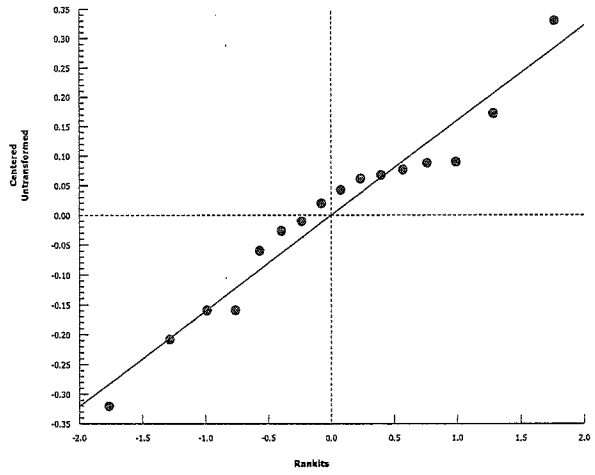
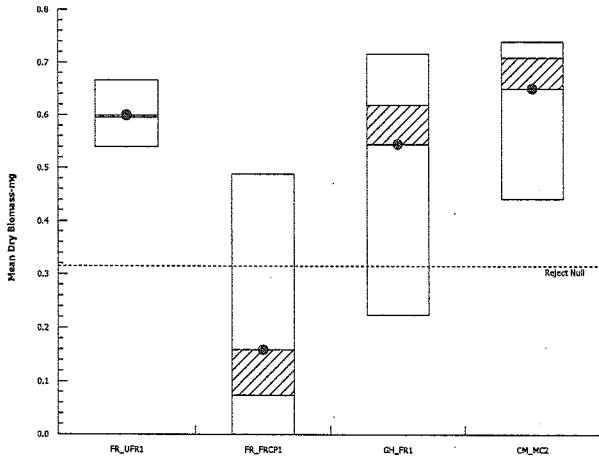
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-0123-1124      Endpoint: Mean Dry Biomass-mg  
Analyzed: 06 Nov-17 14:59      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Oct-17 14:34 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 05-7238-3972	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Oct-17 14:32	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	01-4359-9130	25 Jul-17 11:41	26 Jul-17 08:15	60h (15.9 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_Q_03072017_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	24.8%	

**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	-2.176	2.356	2.506	4	0.9978	CDF	Non-Significant Effect
		GH_FR1	-0.7256	2.356	2.046	6	0.9375	CDF	Non-Significant Effect
		CM_MC2	-1.266	2.356	2.046	6	0.9812	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	7.614021	2.538007	3	1.683	0.2332	Non-Significant Effect
Error	15.08253	1.508253	10			
Total	22.69655		13			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.084	11.34	0.3789	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.911	0.8239	0.1628	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	8.257	7.454	9.059	8.159	7.833	8.875	0.2522	6.11%	0.0%
FR_FRCP1	2	10.57	-7.58	28.72	10.57	9.143	12	1.429	19.11%	-28.03%
GH_FR1	4	8.887	6.604	11.17	8.357	7.833	11	0.7175	16.15%	-7.63%
CM_MC2	4	9.356	7.505	11.21	9.063	8.3	11	0.5817	12.43%	-13.32%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	8.462	7.857	8.875	7.833
FR_FRCP1	9.143	12		
GH_FR1	11	8.5	8.214	7.833
CM_MC2	11	8.875	9.25	8.3

# CETIS Analytical Report

Report Date: 18 Oct-17 14:34 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

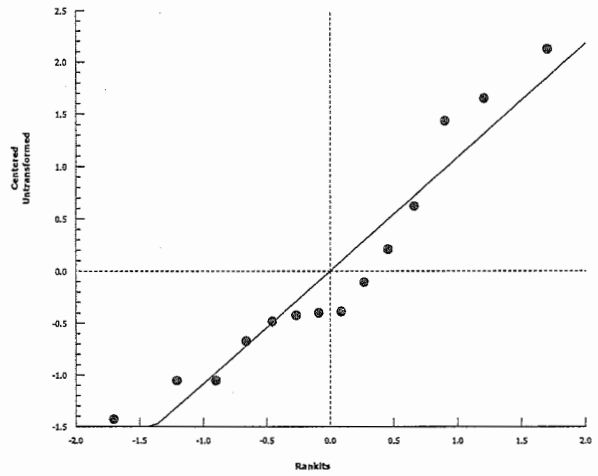
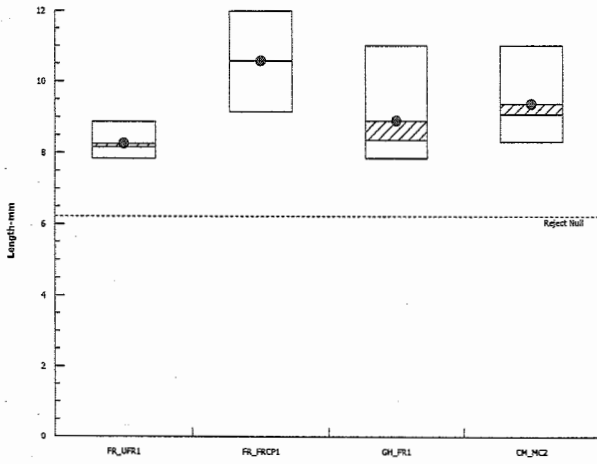
## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-7238-3972      Endpoint: Length-mm  
Analyzed: 18 Oct-17 14:32      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics





**CETIS Analytical Report**

Report Date: 18 Oct-17 14:33 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 00-8740-1214	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Oct-17 14:32	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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_FRCP1	0.05936	0.1781	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.5	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Receiving Wate	60	0	60	1	0	0.0%
FR_FRCP1	56	4	60	0.9333	0.06667	6.67%
GH_FR1	60	0	60	1	0	0.0%
CM_MC2	59	1	60	0.9833	0.01667	1.67%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1	1	1	1
FR_FRCP1	1	1	0.8667	0.8667
GH_FR1	1	1	1	1
CM_MC2	1	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	15/15	15/15	15/15	15/15
FR_FRCP1	15/15	15/15	13/15	13/15
GH_FR1	15/15	15/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	15/15

**CETIS Analytical Report**

Report Date: 18 Oct-17 14:33 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

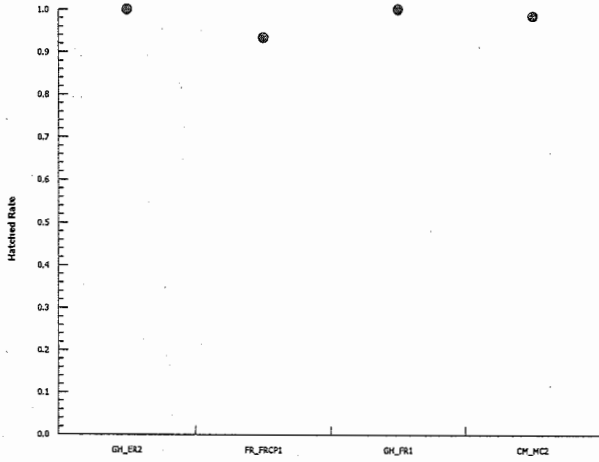
Nautilus Environmental

Analysis ID: 00-8740-1214  
Analyzed: 18 Oct-17 14:32

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Oct-17 14:35 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 18-9674-0301	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Oct-17 14:32	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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_FRCP1	0	<0.0001	Exact	Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.04759	0.0952	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Receiving Wate	40	20	60	0.6667	0.3333	0.0%
FR_FRCP1	9	51	60	0.15	0.85	77.5%
GH_FR1	44	16	60	0.7333	0.2667	-10.0%
CM_MC2	30	30	60	0.5	0.5	25.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.8	0.4	0.8667	0.6
FR_FRCP1	0	0	0.4667	0.1333
GH_FR1	0.2667	0.9333	0.9333	0.8
CM_MC2	0.2667	0.5333	0.5333	0.6667

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	12/15	6/15	13/15	9/15
FR_FRCP1	0/15	0/15	7/15	2/15
GH_FR1	4/15	14/15	14/15	12/15
CM_MC2	4/15	8/15	8/15	10/15

Fathead Minnow 32-d Survival and Growth Test

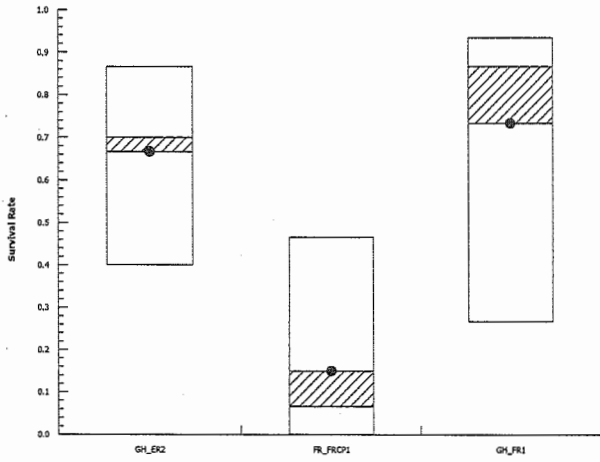
Nautilus Environmental

Analysis ID: 18-9674-0301  
Analyzed: 18 Oct-17 14:32

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 06 Nov-17 15:20 (p 3 of 10)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test** Nautilus Environmental

Analysis ID: 18-0882-3627	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 06 Nov-17 15:00	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	51.0%	

**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	3.298	2.287	0.306	6	0.0083	CDF	Significant Effect
		GH_FR1	0.4153	2.287	0.306	6	0.5829	CDF	Non-Significant Effect
		CM_MC2	-0.3679	2.287	0.306	6	0.8609	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.5989248	0.1996416	3	5.591	0.0124	Significant Effect
Error	0.4285283	0.03571069	12			
Total	1.027453		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	0.9941	11.34	0.8027	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9362	0.8408	0.3050	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	4	0.5998	0.3619	0.8377	0.649	0.3813	0.72	0.07476	24.93%	0.0%
FR_FRCP1	4	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	73.46%
GH_FR1	4	0.5443	0.1963	0.8923	0.6187	0.224	0.716	0.1094	40.18%	9.25%
CM_MC2	4	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	-8.2%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.654	0.3813	0.72	0.644
FR_FRCP1	0	0	0.488	0.1487
GH_FR1	0.224	0.716	0.632	0.6053
CM_MC2	0.4407	0.7253	0.7387	0.6913

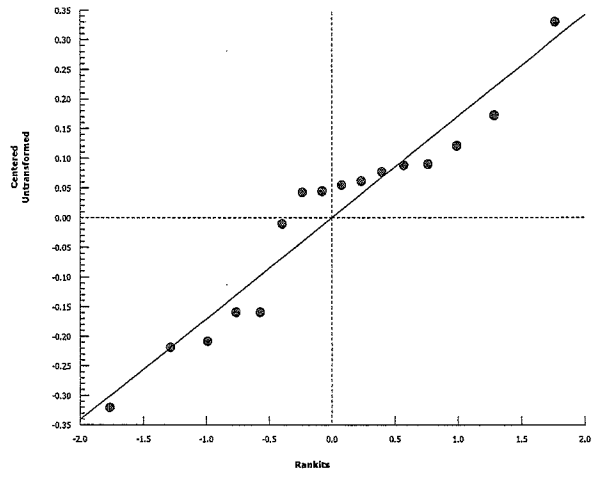
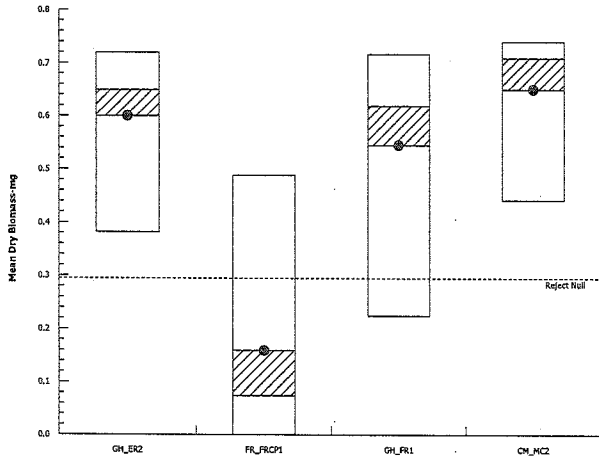
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-0882-3627      Endpoint: Mean Dry Biomass-mg  
Analyzed: 06 Nov-17 15:00      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Oct-17 14:34 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 04-1290-4960	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Oct-17 14:32	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	19-8157-3983	25 Jul-17 11:15	26 Jul-17 08:15	61h (15 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-07-25_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	23.9%	

**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	-2.066	2.356	2.459	4	0.9972	CDF	Non-Significant Effect
		GH_FR1	-0.5531	2.356	2.007	6	0.9112	CDF	Non-Significant Effect
		CM_MC2	-1.104	2.356	2.007	6	0.9727	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	6.637924	2.212641	3	1.524	0.2680	Non-Significant Effect
Error	14.52026	1.452026	10			
Total	21.15819		13			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.077	11.34	0.1079	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9092	0.8239	0.1536	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	4	8.416	8.004	8.827	8.359	8.167	8.778	0.1294	3.08%	0.0%
FR_FRCP1	2	10.57	-7.58	28.72	10.57	9.143	12	1.429	19.11%	-25.62%
GH_FR1	4	8.887	6.604	11.17	8.357	7.833	11	0.7175	16.15%	-5.6%
CM_MC2	4	9.356	7.505	11.21	9.063	8.3	11	0.5817	12.43%	-11.18%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	8.167	8.333	8.385	8.778
FR_FRCP1	9.143	12		
GH_FR1	11	8.5	8.214	7.833
CM_MC2	11	8.875	9.25	8.3

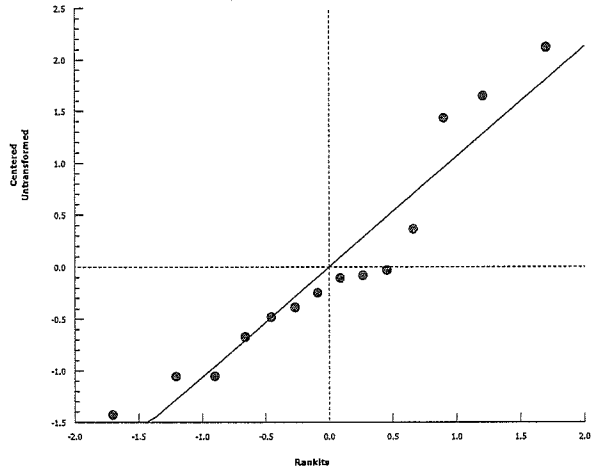
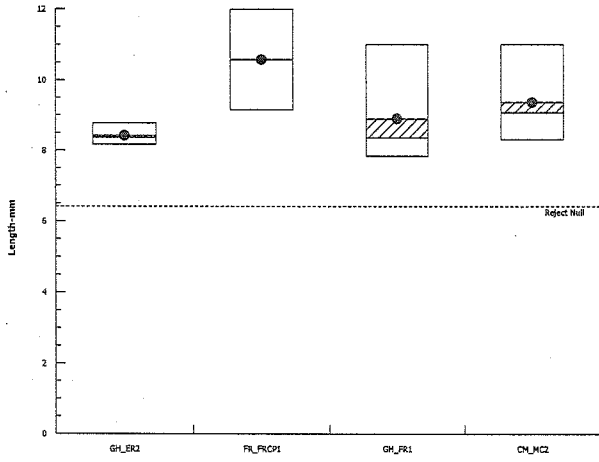
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-1290-4960      Endpoint: Length-mm  
Analyzed: 18 Oct-17 14:32      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics







**CETIS Analytical Report**

Report Date: 17 Oct-17 16:41 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

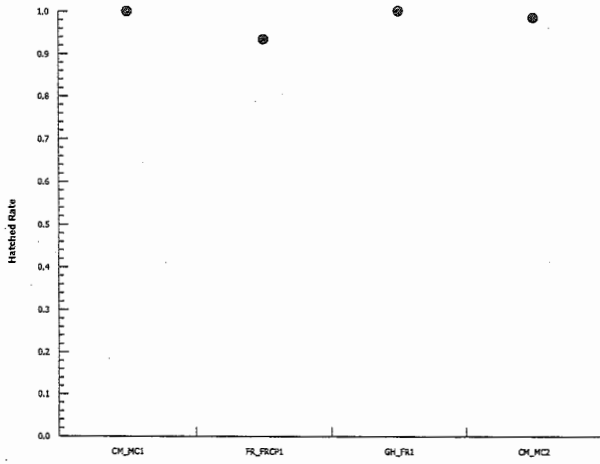
Nautilus Environmental

Analysis ID: 01-2386-4522  
Analyzed: 17 Oct-17 16:25

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

**Graphics**



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:46 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 00-2746-8100	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 16:25	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_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_FRCP1	0	<0.0001	Exact	Significant Effect
CM_MC1		GH_FR1	0.5817	0.5817	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.007116	0.0142	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1 Receiving Wate	44	16	60	0.7333	0.2667	0.0%
FR_FRCP1	9	51	60	0.15	0.85	79.55%
GH_FR1	44	16	60	0.7333	0.2667	0.0%
CM_MC2	30	30	60	0.5	0.5	31.82%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.8667	0.9333	0.6667	0.4667
FR_FRCP1	0	0	0.4667	0.1333
GH_FR1	0.2667	0.9333	0.9333	0.8
CM_MC2	0.2667	0.5333	0.5333	0.6667

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	13/15	14/15	10/15	7/15
FR_FRCP1	0/15	0/15	7/15	2/15
GH_FR1	4/15	14/15	14/15	12/15
CM_MC2	4/15	8/15	8/15	10/15

**CETIS Analytical Report**

Report Date: 17 Oct-17 16:46 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

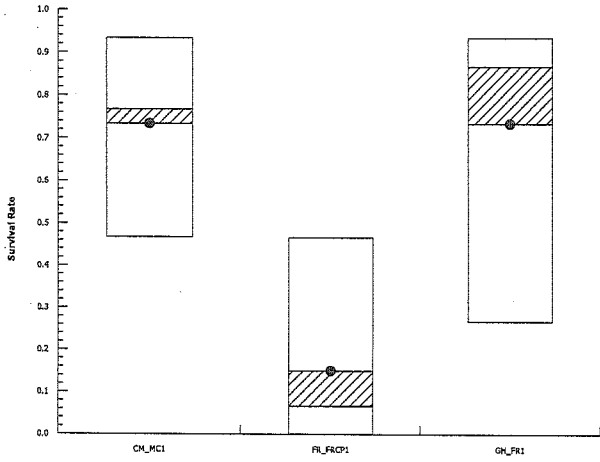
**Nautilus Environmental**

Analysis ID: 00-2746-8100  
Analyzed: 17 Oct-17 16:25

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

**Graphics**



**CETIS Analytical Report**

Report Date: 06 Nov-17 15:20 (p 5 of 10)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 15-9566-8041	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 06 Nov-17 15:01	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	49.4%	

**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	3.376	2.287	0.290	6	0.0072	CDF	Significant Effect
		GH_FR1	0.3391	2.287	0.290	6	0.6157	CDF	Non-Significant Effect
		CM_MC2	-0.4862	2.287	0.290	6	0.8876	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.5882202	0.1960734	3	6.096	0.0092	Significant Effect
Error	0.3859823	0.03216519	12			
Total	0.9742025		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.543	11.34	0.4676	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9484	0.8408	0.4647	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	0.5873	0.4435	0.7312	0.6187	0.4587	0.6533	0.0452	15.39%	0.0%
FR_FRCP1	4	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	72.9%
GH_FR1	4	0.5443	0.1963	0.8923	0.6187	0.224	0.716	0.1094	40.18%	7.32%
CM_MC2	4	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	-10.5%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.6533	0.59	0.6473	0.4587
FR_FRCP1	0	0	0.488	0.1487
GH_FR1	0.224	0.716	0.632	0.6053
CM_MC2	0.4407	0.7253	0.7387	0.6913

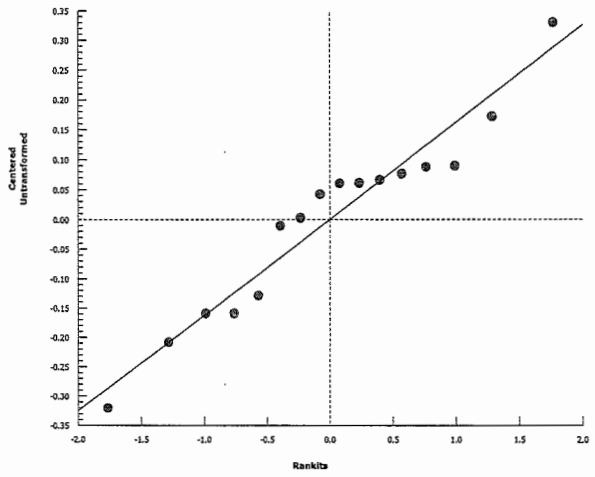
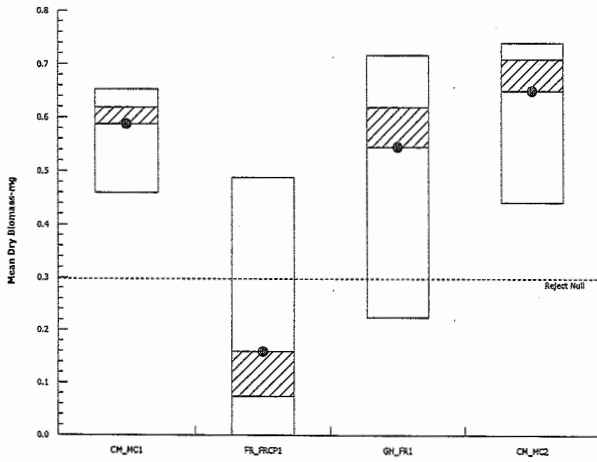
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 15-9566-8041      Endpoint: Mean Dry Biomass-mg  
Analyzed: 06 Nov-17 15:01      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:43 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 02-9535-7709	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 17 Oct-17 16:25	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	07-1515-6148	25 Jul-17 08:30	26 Jul-17 08:15	64h (14.2 °C)	Teck Coal	Teck Coal Q3
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)		
GH_FR1	03-2461-8737	25 Jul-17 09:26	26 Jul-17 08:15	63h (15 °C)		Teck Coal Q3
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20170725_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-07-25_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	24.9%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	-2.334	2.356	2.477	4	0.9985	CDF	Non-Significant Effect
		GH_FR1	-0.896	2.356	2.022	6	0.9566	CDF	Non-Significant Effect
		CM_MC2	-1.443	2.356	2.022	6	0.9876	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	8.585695	2.861898	3	1.942	0.1868	Non-Significant Effect
Error	14.73506	1.473506	10			
Total	23.32076		13			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.396	11.34	0.2217	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9145	0.8239	0.1830	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	4	8.118	7.526	8.71	8.2	7.643	8.429	0.1861	4.59%	0.0%
FR_FRCP1	2	10.57	-7.58	28.72	10.57	9.143	12	1.429	19.11%	-30.22%
GH_FR1	4	8.887	6.604	11.17	8.357	7.833	11	0.7175	16.15%	-9.47%
CM_MC2	4	9.356	7.505	11.21	9.063	8.3	11	0.5817	12.43%	-15.26%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	8	7.643	8.4	8.429
FR_FRCP1	9.143	12		
GH_FR1	11	8.5	8.214	7.833
CM_MC2	11	8.875	9.25	8.3

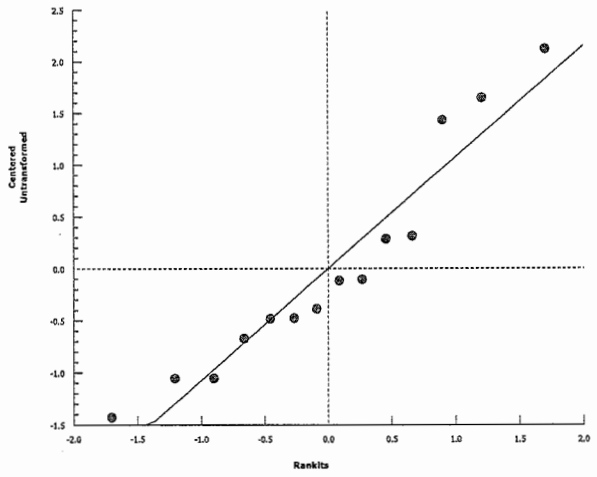
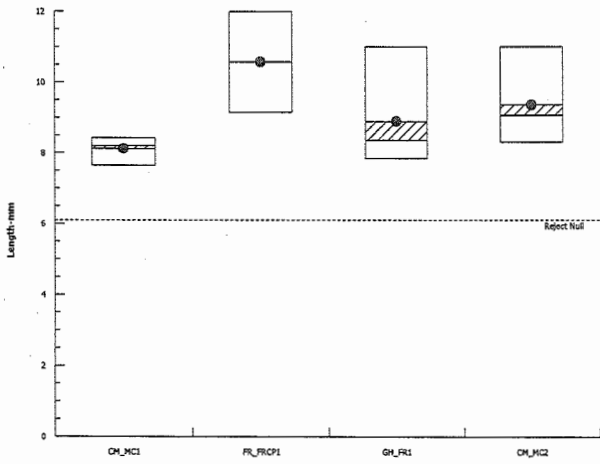
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-9535-7709      Endpoint: Length-mm  
Analyzed: 17 Oct-17 16:25      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 17 Oct-17 16:41 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 20-9690-8229      Endpoint: Hatched Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 16:07      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 ug/L	Lab Control (20 ug/L)	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 20 ug/L		FR_FRCP1 20 ug	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20 ug/L		CM_MC2 (20 ug)	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20 ug/L Negative Contr	59	1	60	0.9833	0.01667	0.0%
FR_FRCP1 20 ug	60	0	60	1	0	-1.7%
CM_MC2 (20 ug)	60	0	60	1	0	-1.7%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	1	1	0.9333	1
FR_FRCP1 20 ug	1	1	1	1
CM_MC2 (20 ug)	1	1	1	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	15/15	15/15	14/15	15/15
FR_FRCP1 20 ug	15/15	15/15	15/15	15/15
CM_MC2 (20 ug)	15/15	15/15	15/15	15/15

# CETIS Analytical Report

Report Date: 17 Oct-17 16:41 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

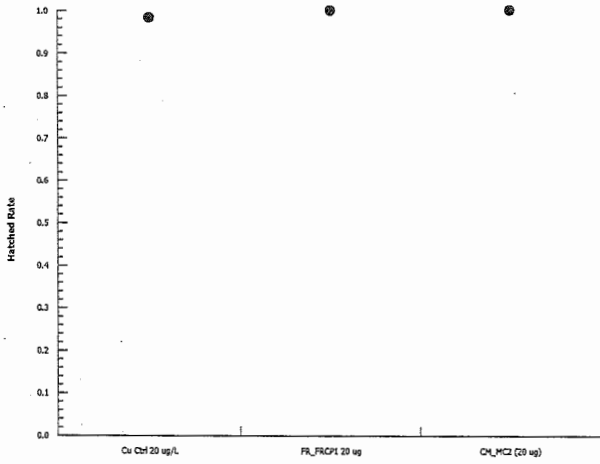
Nautilus Environmental

Analysis ID: 20-9690-8229  
Analyzed: 17 Oct-17 16:07

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:46 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 14-2545-0070	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 16:07	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 20 ug/L		FR_FRCP1 20 ug	0.07392	0.1478	Exact	Non-Significant Effect
Cu Ctrl 20 ug/L		CM_MC2 (20 ug)	0.4125	0.4125	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20 ug/L Negative Contr	48	12	60	0.8	0.2	0.0%
FR_FRCP1 20 ug	40	20	60	0.6667	0.3333	16.67%
CM_MC2 (20 ug)	46	14	60	0.7667	0.2333	4.17%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	0.8667	0.5333	0.8667	0.9333
FR_FRCP1 20 ug	0.8667	0.7333	0.8	0.2667
CM_MC2 (20 ug)	0.8667	0.8667	0.8	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	13/15	8/15	13/15	14/15
FR_FRCP1 20 ug	13/15	11/15	12/15	4/15
CM_MC2 (20 ug)	13/15	13/15	12/15	8/15

# CETIS Analytical Report

Report Date: 17 Oct-17 16:46 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

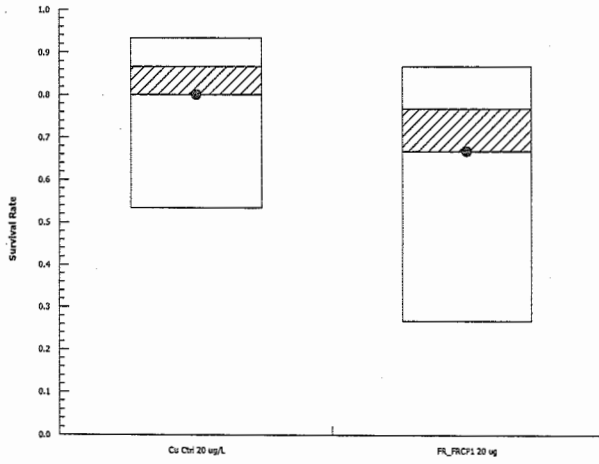
Nautilus Environmental

Analysis ID: 14-2545-0070  
Analyzed: 17 Oct-17 16:07

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:44 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 09-8273-6703      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 16:07      Analysis: Parametric-Control vs Treatments      Official Results: Yes  
 Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	43.0%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20 ug/L		FR_FRCP1 20 ug	0.1259	2.18	0.202	6	0.6165	CDF	Non-Significant Effect
		CM_MC2 (20 ug)	-0.9693	2.18	0.202	6	0.9233	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02467535	0.01233768	2	0.7183	0.5135	Non-Significant Effect
Error	0.1545859	0.01717621	9			
Total	0.1792613		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.035	9.21	0.3614	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9624	0.8025	0.8179	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20 ug/L	4	0.47	0.2933	0.6467	0.4777	0.3427	0.582	0.05551	23.62%	0.0%
FR_FRCP1 20 ug	4	0.4583	0.1667	0.7499	0.4873	0.2087	0.65	0.09163	39.98%	2.48%
CM_MC2 (20 ug)	4	0.5598	0.4406	0.6791	0.5797	0.4553	0.6247	0.03747	13.39%	-19.11%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	0.582	0.3427	0.414	0.5413
FR_FRCP1 20 ug	0.4887	0.486	0.65	0.2087
CM_MC2 (20 ug)	0.558	0.6013	0.6247	0.4553

# CETIS Analytical Report

Report Date: 17 Oct-17 16:44 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

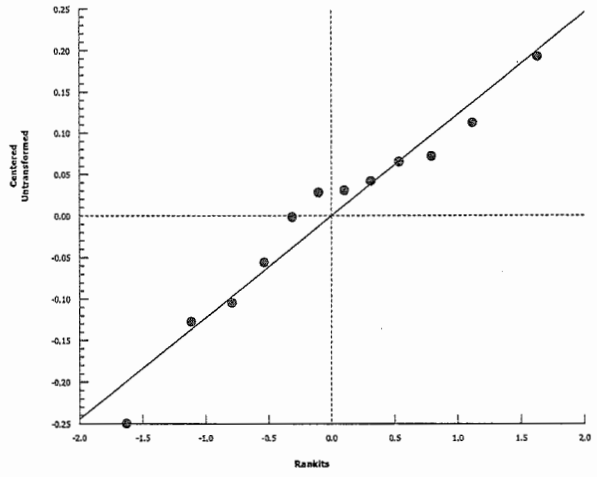
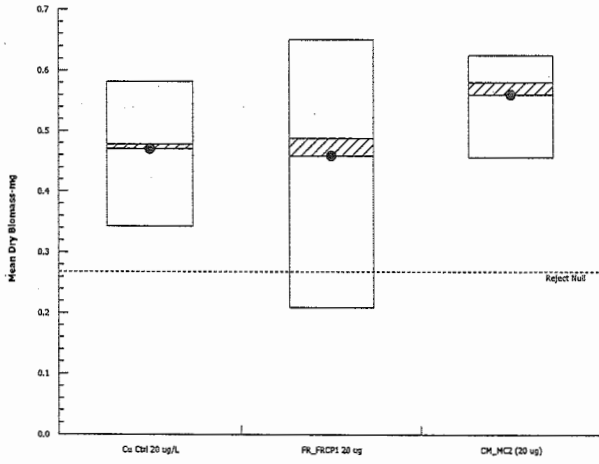
## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-8273-6703      Endpoint: Mean Dry Biomass-mg  
Analyzed: 17 Oct-17 16:07      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 02 Nov-17 10:10 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 16-3860-9330	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 02 Nov-17 10:08	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 ug/L	Lab Control (20 ug/L)	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.2%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20 ug/L		FR_FRCP1 20 ug	14	11	0	6	0.2042	Asymp	Non-Significant Effect
		CM_MC2 (20 ug)	12	11	0	6	0.0738	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.104372	0.5521861	2	0.9606	0.4187	Non-Significant Effect
Error	5.173745	0.5748606	9			
Total	6.278117		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.35	9.21	0.0254	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7964	0.8025	0.0085	Non-normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20 ug/L	4	9.618	9.254	9.982	9.635	9.357	9.846	0.1143	2.38%	0.0%
FR_FRCP1 20 ug	4	9.895	7.927	11.86	9.29	9.25	11.75	0.6184	12.5%	-2.88%
CM_MC2 (20 ug)	4	9.159	8.559	9.76	9.276	8.625	9.462	0.1888	4.12%	4.77%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 ug/L	9.846	9.5	9.769	9.357
FR_FRCP1 20 ug	9.308	9.273	9.25	11.75
CM_MC2 (20 ug)	9.385	9.462	9.167	8.625

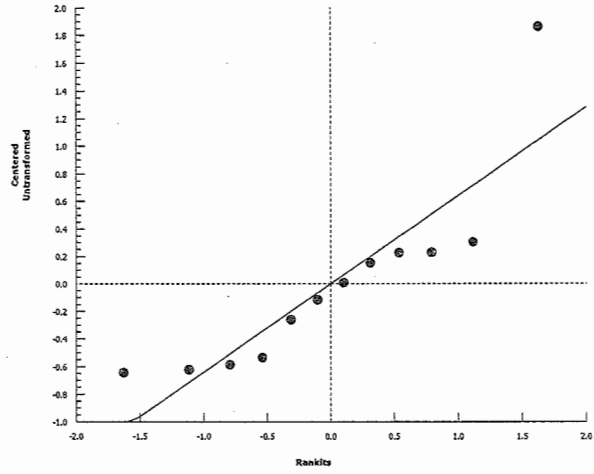
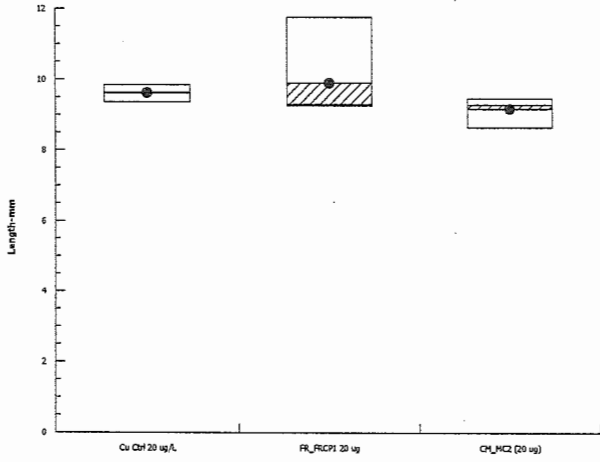
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-3860-9330      Endpoint: Length-mm  
Analyzed: 02 Nov-17 10:08      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 17 Oct-17 17:15 (p 1 of 1)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 10-6327-2390	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 17 Oct-17 16:31	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 (20 ug)	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Unamended Sa	59	1	60	0.9833	0.01667	0.0%
CM_MC2 (20 ug)	60	0	60	1	0	-1.7%

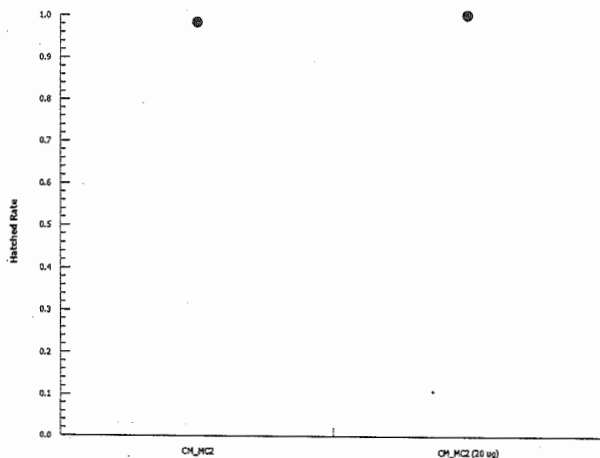
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	0.9333	1
CM_MC2 (20 ug)	1	1	1	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	14/15	15/15
CM_MC2 (20 ug)	15/15	15/15	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:45 (p 1 of 1)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-1303-8669	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 16:31	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 (20 ug)	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2 Unamended Sa	30	30	60	0.5	0.5	0.0%
CM_MC2 (20 ug)	46	14	60	0.7667	0.2333	-53.33%

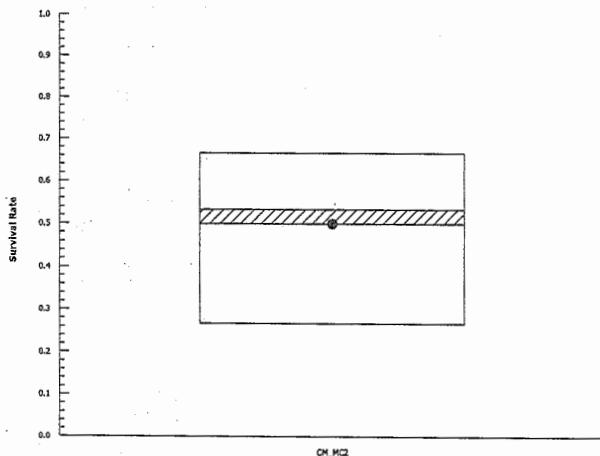
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.2667	0.5333	0.5333	0.6667
CM_MC2 (20 ug)	0.8667	0.8667	0.8	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	4/15	8/15	8/15	10/15
CM_MC2 (20 ug)	13/15	13/15	12/15	8/15

**Graphics**



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:45 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 20-4965-4114	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 17 Oct-17 16:31	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	23.8%	

**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 (20 ug)	1.121	1.943	0.155	6	0.1525	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01590233	0.01590233	1	1.257	0.3051	Non-Significant Effect
Error	0.07591072	0.01265179	6			
Total	0.09181305		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	3.505	47.47	0.3304	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8182	0.6451	0.0447	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	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	0.0%
CM_MC2 (20 ug)	4	0.5598	0.4406	0.6791	0.5797	0.4553	0.6247	0.03747	13.39%	13.74%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.4407	0.7253	0.7387	0.6913
CM_MC2 (20 ug)	0.558	0.6013	0.6247	0.4553

# CETIS Analytical Report

Report Date: 17 Oct-17 16:45 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

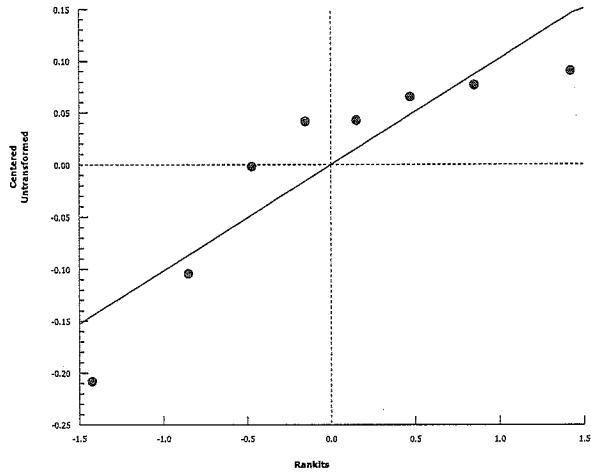
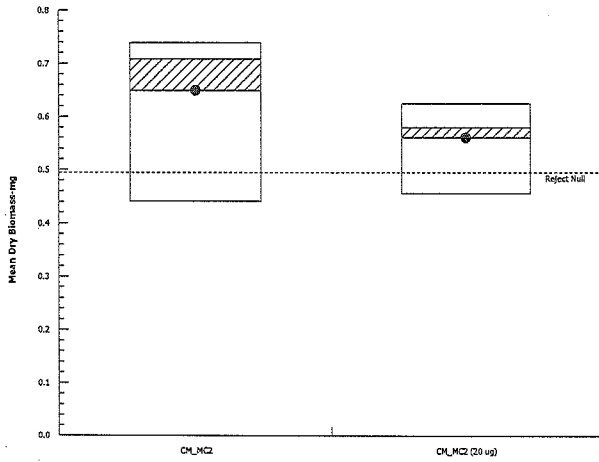
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-4965-4114      Endpoint: Mean Dry Biomass-mg  
Analyzed: 17 Oct-17 16:31      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:43 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 05-0774-4908      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 16:31      Analysis: Parametric-Two Sample      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.7%	

**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 (20 ug)	0.3218	1.943	1.188	6	0.3793	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.07745653	0.07745653	1	0.1035	0.7585	Non-Significant Effect
Error	4.488114	0.748019	6			
Total	4.56557		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	9.495	47.47	0.0970	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9167	0.6451	0.4037	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	9.356 ✓	7.505	11.21	9.063	8.3	11	0.5817	12.43%	0.0%
CM_MC2 (20 ug)	4	9.159 ✓	8.559	9.76	9.276	8.625	9.462	0.1888	4.12%	2.1%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	11	8.875	9.25	8.3
CM_MC2 (20 ug)	9.385	9.462	9.167	8.625

# CETIS Analytical Report

Report Date: 17 Oct-17 16:43 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

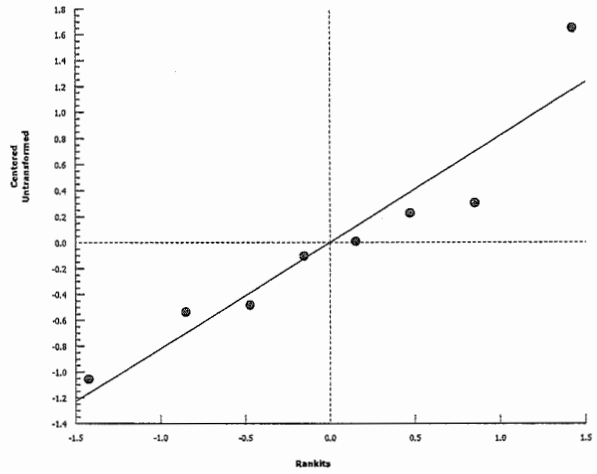
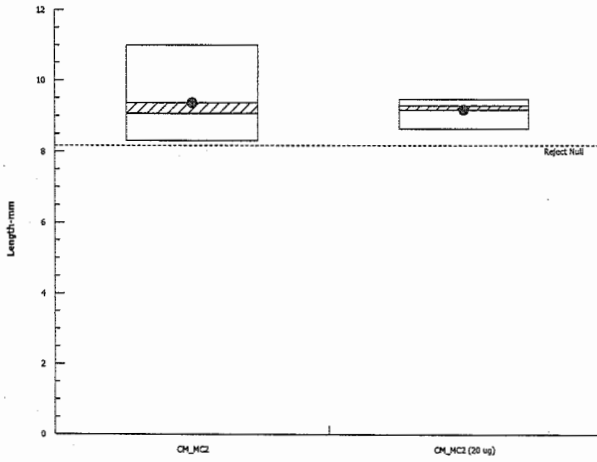
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-0774-4908      Endpoint: Length-mm  
Analyzed: 17 Oct-17 16:31      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:42 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 21-0331-6174	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:39	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 (20 ug)	0.5	0.5000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	59	1	60	0.9833	0.01667	0.0%
CM_MC2 (20 ug)	60	0	60	1	0	-1.7%

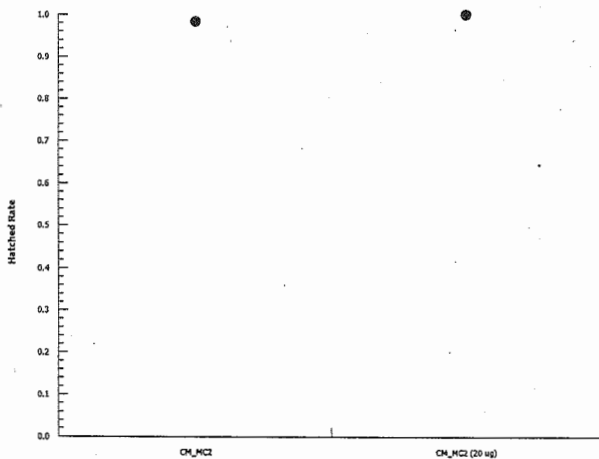
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	0.9333	1
CM_MC2 (20 ug)	1	1	1	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	14/15	15/15
CM_MC2 (20 ug)	15/15	15/15	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:41 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 00-9247-9578	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:39	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

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 (20 ug)	0.002116	0.0021	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	30	30	60	0.5	0.5	0.0%
CM_MC2 (20 ug)	46	14	60	0.7667	0.2333	-53.33%

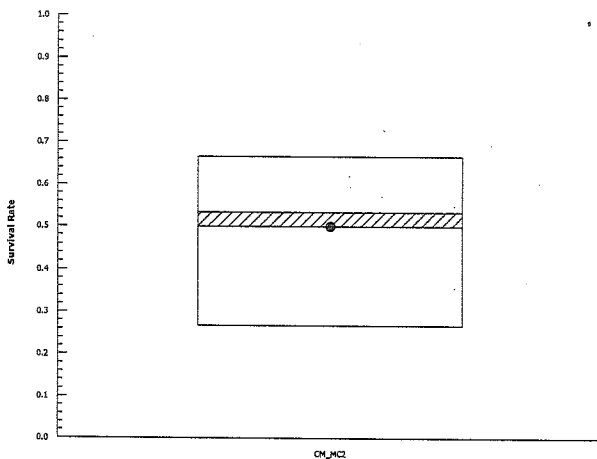
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.2667	0.5333	0.5333	0.6667
CM_MC2 (20 ug)	0.8667	0.8667	0.8	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	4/15	8/15	8/15	10/15
CM_MC2 (20 ug)	13/15	13/15	12/15	8/15

**Graphics**





**CETIS Analytical Report**

Report Date: 10 Nov-17 10:41 (p 1 of 4)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 17-0862-3872	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:39	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	23.8%	

**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 (20 ug)	-1.121	1.943	0.155	6	0.8475	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01590233	0.01590233	1	1.257	0.3051	Non-Significant Effect
Error	0.07591072	0.01265179	6			
Total	0.09181305		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	3.505	47.47	0.3304	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8182	0.6451	0.0447	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	0.649	0.4257	0.8723	0.7083	0.4407	0.7387	0.07016	21.62%	0.0%
CM_MC2 (20 ug)	4	0.5598	0.4406	0.6791	0.5797	0.4553	0.6247	0.03747	13.39%	13.74%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0.4407	0.7253	0.7387	0.6913
CM_MC2 (20 ug)	0.558	0.6013	0.6247	0.4553

# CETIS Analytical Report

Report Date: 10 Nov-17 10:41 (p 2 of 4)  
Test Code: 170737a | 07-5325-2191

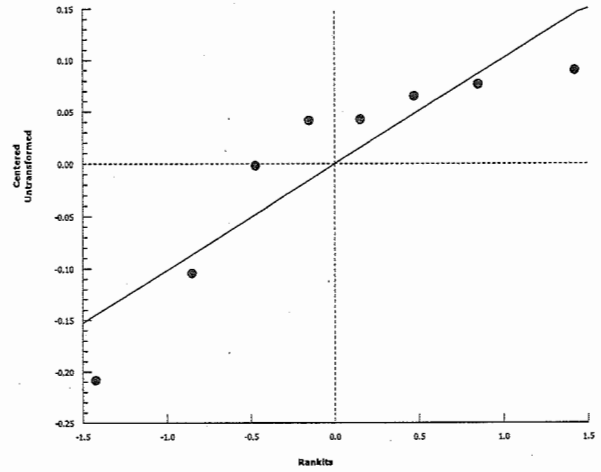
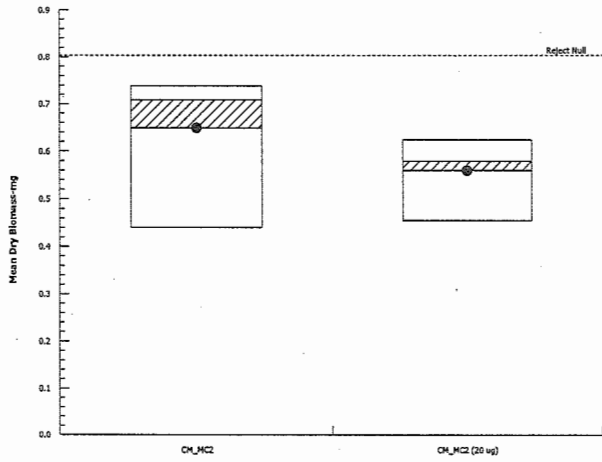
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-0862-3872      Endpoint: Mean Dry Biomass-mg  
Analyzed: 10 Nov-17 10:39      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:42 (p 1 of 4)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 18-3079-1173	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:39	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	07-0766-8842	25 Jul-17 13:05	26 Jul-17 08:15	59h (18 °C)	Teck Coal	Teck Coal Q3
CM_MC2 (20 ug)	20-8575-7797	25 Jul-17 13:05	26 Jul-17 08:15	59h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20170725_N		
CM_MC2 (20 ug)	Water Sample	Teck Coal	CM_MC2_WS_20170725_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	12.7%	

**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 (20 ug)	-0.3218	1.943	1.188	6	0.6207	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.07745653	0.07745653	1	0.1035	0.7585	Non-Significant Effect
Error	4.488114	0.748019	6			
Total	4.56557		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	9.495	47.47	0.0970	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9167	0.6451	0.4037	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	4	9.356	7.505	11.21	9.063	8.3	11	0.5817	12.43%	0.0%
CM_MC2 (20 ug)	4	9.159	8.559	9.76	9.276	8.625	9.462	0.1888	4.12%	2.1%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	11	8.875	9.25	8.3
CM_MC2 (20 ug)	9.385	9.462	9.167	8.625

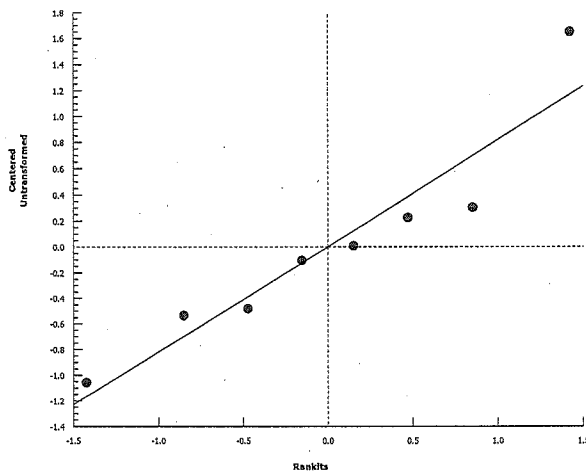
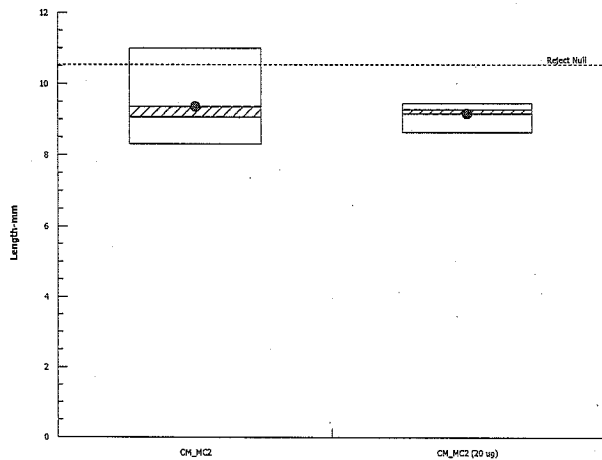
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-3079-1173     Endpoint: Length-mm  
Analyzed: 10 Nov-17 10:39     Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:40 (p 1 of 1)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 19-5737-7667      Endpoint: Hatched Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 16:30      Analysis: Single 2x2 Contingency Table      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Pearcy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

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 20 ug	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	56	4	60	0.9333	0.06667	0.0%
FR_FRCP1 20 ug	60	0	60	1	0	-7.14%

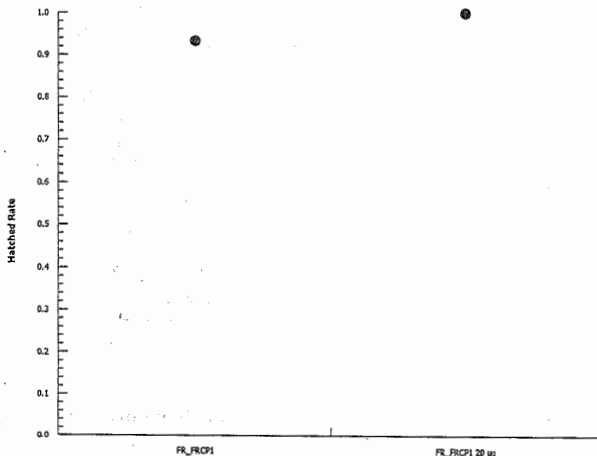
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1	1	0.8667	0.8667
FR_FRCP1 20 ug	1	1	1	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	15/15	15/15	13/15	13/15
FR_FRCP1 20 ug	15/15	15/15	15/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 17 Oct-17 16:45 (p 1 of 1)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test** **Nautilus Environmental**

<b>Analysis ID:</b> 09-9418-4451	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 16:30	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

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 20 ug	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1 Unamended Sa	9	51	60	0.15	0.85	0.0%
FR_FRCP1 20 ug	40	20	60	0.6667	0.3333	-344.4%

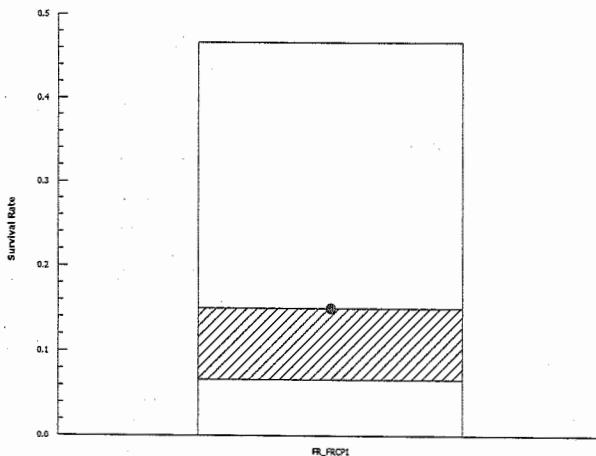
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0	0	0.4667	0.1333
FR_FRCP1 20 ug	0.8667 ✓	0.7333 ✓	0.8 ✓	0.2667 ✓

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0/15	0/15	7/15	2/15
FR_FRCP1 20 ug	13/15	11/15	12/15	4/15

**Graphics**



**CETIS Analytical Report**

Report Date: 06 Nov-17 15:25 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

<b>Analysis ID:</b> 12-6798-1587	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 06 Nov-17 15:02	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	180.0%	

**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 20 ug	-2.034	1.943	0.286	6	0.9559	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1790028	0.1790028	1	4.136	0.0882	Non-Significant Effect
Error	0.2596681	0.04327802	6			
Total	0.4386709		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.577	47.47	0.7172	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9487	0.6451	0.6984	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	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	0.0%
FR_FRCP1 20 ug	4	0.4583	0.1667	0.7499	0.4873	0.2087	0.65	0.09163	39.98%	-188.0%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0	0	0.488	0.1487
FR_FRCP1 20 ug	0.4887	0.486	0.65	0.2087

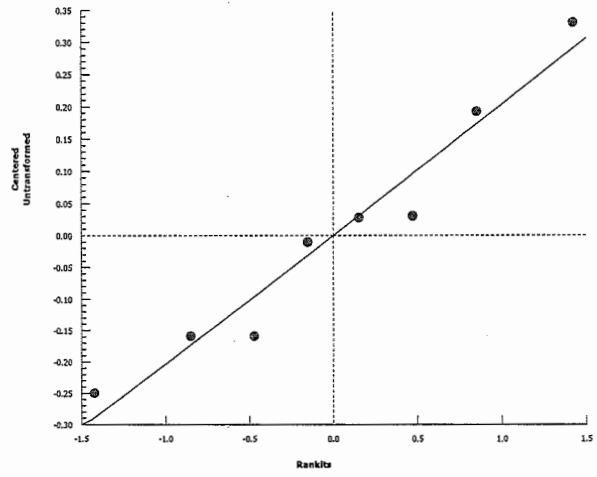
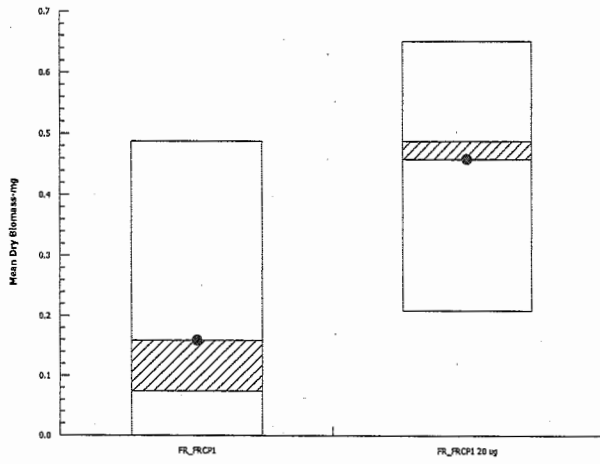
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-6798-1587      Endpoint: Mean Dry Biomass-mg  
Analyzed: 06 Nov-17 15:02      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 17 Oct-17 16:43 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 00-0232-3768	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 17 Oct-17 16:30	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	25.7%	

**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 20 ug	0.5304	2.132	2.718	4	0.3119	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.6098853	0.6098853	1	0.2814	0.6239	Non-Significant Effect
Error	8.670835	2.167709	4			
Total	9.280721		5			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.668	55.55	0.4018	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8385	0.43	0.1267	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	2	10.57	-7.58	28.72	10.57	9.143	12	1.429	19.11%	0.0%
FR_FRCP1 20 ug	4	9.895 ✓	7.927	11.86	9.29	9.25	11.75	0.6184	12.5%	6.4%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	9.143	12		
FR_FRCP1 20 ug	9.308	9.273	9.25	11.75

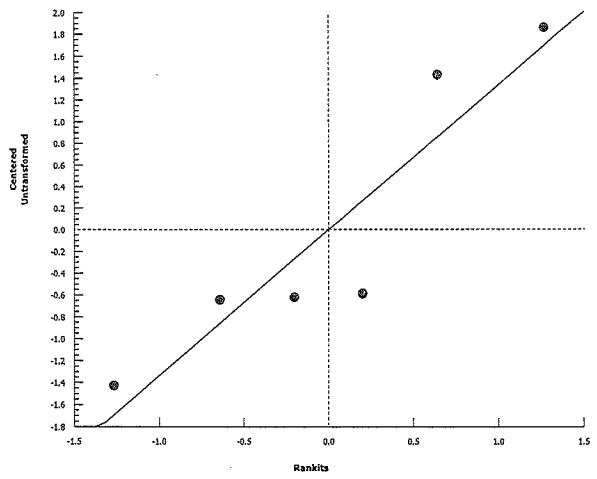
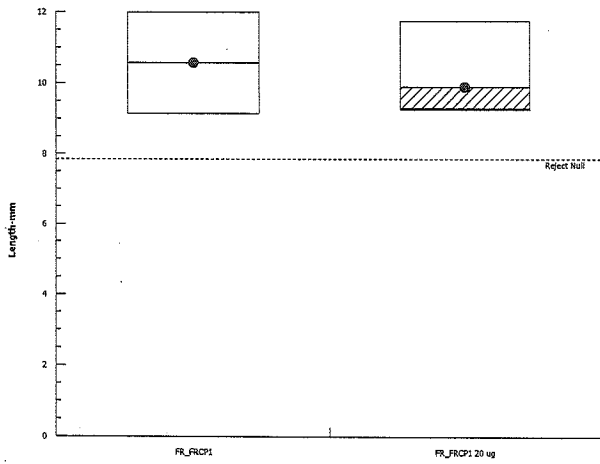
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-0232-3768      Endpoint: Length-mm  
Analyzed: 17 Oct-17 16:30      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



# CETIS Analytical Report

Report Date: 10 Nov-17 10:55 (p 1 of 1)  
 Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-0523-4610	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:40	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

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 20 ug	0.05936	0.0594	Exact	Non-Significant Effect

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	56	4	60	0.9333	0.06667	0.0%
FR_FRCP1 20 ug	60	0	60	1	0	-7.14%

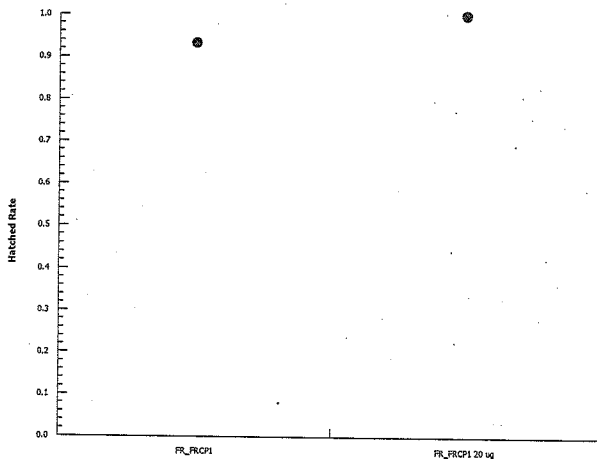
### Hatched Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	1	1	0.8667	0.8667
FR_FRCP1 20 ug	1	1	1	1

### Hatched Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	15/15	15/15	13/15	13/15
FR_FRCP1 20 ug	15/15	15/15	15/15	15/15

### Graphics



# CETIS Analytical Report

Report Date: 10 Nov-17 10:41 (p 2 of 2)  
 Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-2152-4755	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:40	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

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 20 ug	0	<0.0001	Exact	Significant Effect

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	9	51	60	0.15	0.85	0.0%
FR_FRCP1 20 ug	40	20	60	0.6667	0.3333	-344.4%

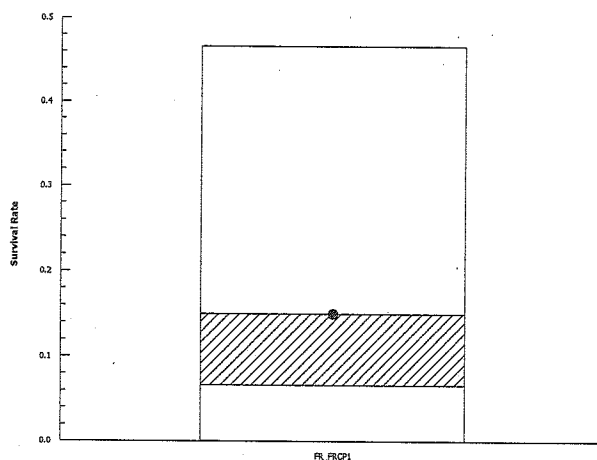
### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0	0	0.4667	0.1333
FR_FRCP1 20 ug	0.8667	0.7333	0.8	0.2667

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0/15	0/15	7/15	2/15
FR_FRCP1 20 ug	13/15	11/15	12/15	4/15

### Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:41 (p 3 of 4)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 07-1250-2718	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:40	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	180.0%	

**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 20 ug	2.034	1.943	0.286	6	0.0441	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1790028	0.1790028	1	4.136	0.0882	Non-Significant Effect
Error	0.2596681	0.04327802	6			
Total	0.4386709		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.577	47.47	0.7172	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9487	0.6451	0.6984	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	0.1592	-0.2071	0.5254	0.07433	0	0.488	0.1151	144.6%	0.0%
FR_FRCP1 20 ug	4	0.4583	0.1667	0.7499	0.4873	0.2087	0.65	0.09163	39.98%	-188.0%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0	0	0.488	0.1487
FR_FRCP1 20 ug	0.4887	0.486	0.65	0.2087

# CETIS Analytical Report

Report Date: 10 Nov-17 10:41 (p 4 of 4)

Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 07-1250-2718

Endpoint: Mean Dry Biomass-mg

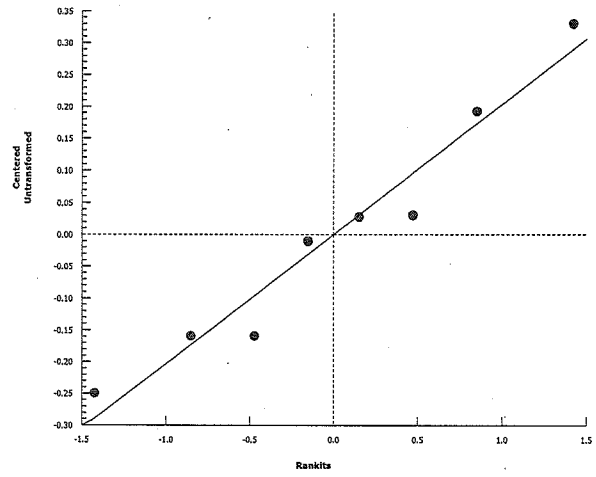
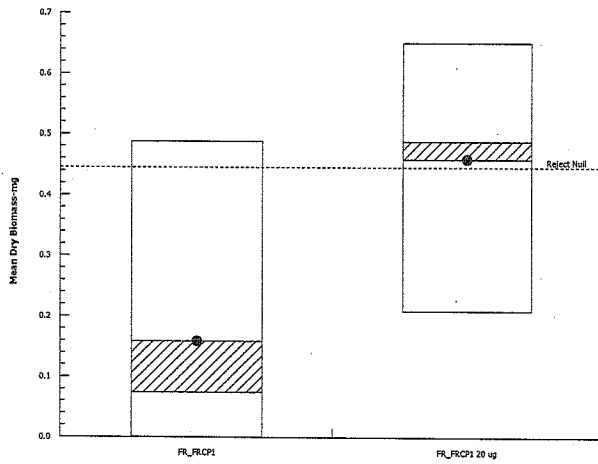
CETIS Version: CETISv1.8.7

Analyzed: 10 Nov-17 10:40

Analysis: Parametric-Two Sample

Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:42 (p 3 of 4)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 00-1607-0977	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:40	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 10-2689-5567	Test Type: Survival-Development-Growth	Analyst: Krysta Pearcy
Start Date: 28 Jul-17	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 29 Aug-17	Species: Pimephales promelas	Brine:
Duration: 32d 0h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	14-0070-1386	25 Jul-17 09:08	26 Jul-17 08:15	63h (16 °C)	Teck Coal	
FR_FRCP1 20 ug	06-8186-7156	25 Jul-17 09:08	26 Jul-17 08:15	63h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N		
FR_FRCP1 20 ug	Water Sample	Teck Coal	FR_FRCP1_Q_03072017_N (20 u		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	116.0%	

**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 20 ug	1.455	1.943	6.156	6	0.0979	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	42.49296	42.49296	1	2.117	0.1959	Non-Significant Effect
Error	120.4259	20.07099	6			
Total	162.9189		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	25.24	47.47	0.0250	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9317	0.6451	0.5315	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	5.286	-4.602	15.17	4.571	0	12	3.107	117.6%	0.0%
FR_FRCP1 20 ug	4	9.895	7.927	11.86	9.29	9.25	11.75	0.6184	12.5%	-87.2%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0	0	9.143	12
FR_FRCP1 20 ug	9.308	9.273	9.25	11.75

# CETIS Analytical Report

Report Date: 10 Nov-17 10:42 (p 4 of 4)

Test Code: 170737a | 07-5325-2191

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-1607-0977

Endpoint: Length-mm

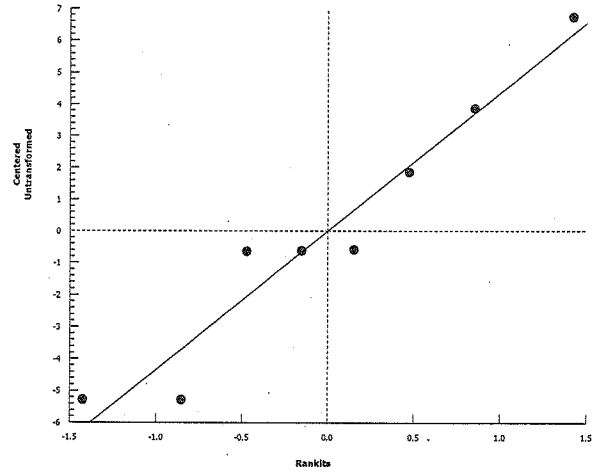
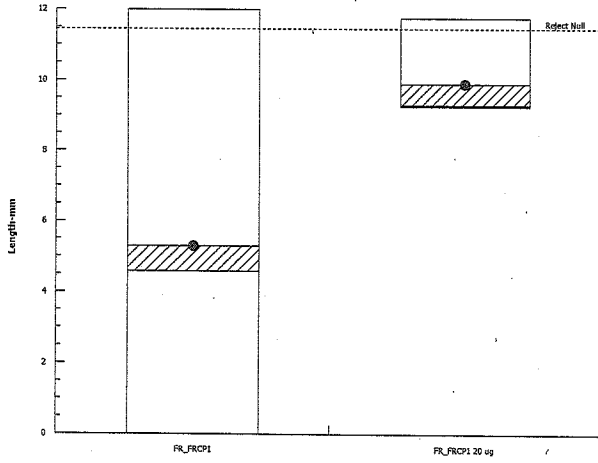
CETIS Version: CETISv1.8.7

Analyzed: 10 Nov-17 10:40

Analysis: Parametric-Two Sample

Official Results: Yes

### Graphics





**CETIS Analytical Report**

Report Date: 17 Oct-17 17:23 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 19-0982-3152	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 17:22	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	12h	Teck Coal	Teck Coal Q3
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA		
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		

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 10 ug/L	1	1.0000	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20 ug/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	60	0	60	1	0	0.0%
Cu Ctrl 10 ug/L Control Sed	60	0	60	1	0	0.0%
Cu Ctrl 20 ug/L Negative Contr	59	1	60	0.983	0.0167	1.67%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	1	1	1
Cu Ctrl 10 ug/L	1	1	1	1
Cu Ctrl 20 ug/L	1	1	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	15/15	15/15	15/15	15/15
Cu Ctrl 10 ug/L	15/15	15/15	15/15	15/15
Cu Ctrl 20 ug/L	15/15	15/15	14/15	15/15

# CETIS Analytical Report

Report Date: 17 Oct-17 17:23 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

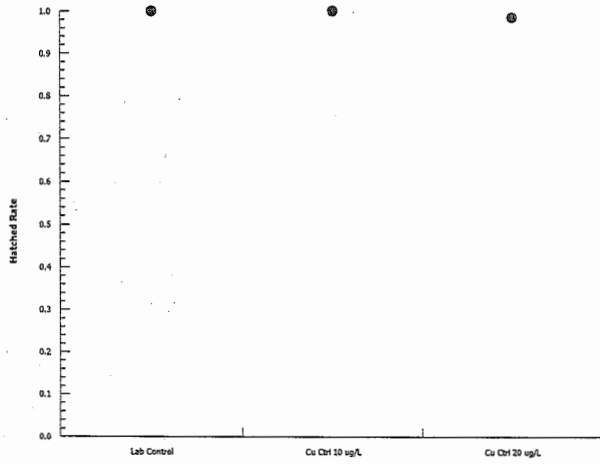
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-0982-3152      Endpoint: Hatched Rate  
Analyzed: 17 Oct-17 17:22      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 17:24 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 02-4850-8116	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 17:24	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	12h	Teck Coal	Teck Coal Q3
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA		
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		

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 10 ug/L	1	1.0000	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20 ug/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	47	13	60	0.783	0.217	0.0%
Cu Ctrl 10 ug/L Control Sed	48	12	60	0.8	0.2	-2.13%
Cu Ctrl 20 ug/L Negative Contr	48	12	60	0.8	0.2	-2.13%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8	0.8	0.6667	0.8667
Cu Ctrl 10 ug/L	0.8667	0.7333	0.8	0.8
Cu Ctrl 20 ug/L	0.8667	0.5333	0.8667	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	12/15	10/15	13/15
Cu Ctrl 10 ug/L	13/15	11/15	12/15	12/15
Cu Ctrl 20 ug/L	13/15	8/15	13/15	14/15

# CETIS Analytical Report

Report Date: 17 Oct-17 17:24 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

Fathead Minnow 32-d Survival and Growth Test

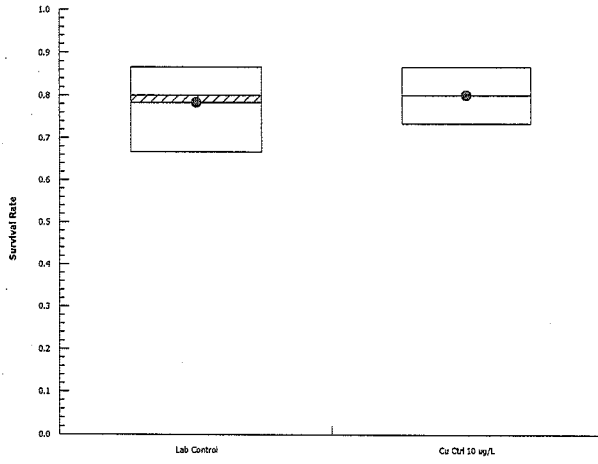
Nautilus Environmental

Analysis ID: 02-4850-8116  
Analyzed: 17 Oct-17 17:24

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 17:24 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 19-0281-7177      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 17 Oct-17 17:24      Analysis: Parametric-Control vs Treatments      Official Results: Yes

Batch ID: 10-2689-5567      Test Type: Survival-Development-Growth      Analyst: Krysta Percy  
 Start Date: 28 Jul-17      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 29 Aug-17      Species: Pimephales promelas      Brine:  
 Duration: 32d 0h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	12h	Teck Coal	Teck Coal Q3
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA		
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.3%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		Cu Ctrl 10 ug/L	3.534	2.18	0.111	6	0.0058	CDF	Significant Effect
		Cu Ctrl 20 ug/L	3.371	2.18	0.111	6	0.0075	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.08290017	0.04145009	2	7.959	0.0102	Significant Effect
Error	0.0468687	0.005207634	9			
Total	0.1297689		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.069	9.21	0.1308	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.941	0.802	0.5112	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	0.642	0.5674	0.7166	0.6243	0.608	0.7113	0.02343	7.3%	0.0%
Cu Ctrl 10 ug/L	4	0.4617	0.4089	0.5144	0.4493	0.4373	0.5107	0.01658	7.18%	28.1%
Cu Ctrl 20 ug/L	4	0.47	0.2933	0.6467	0.4777	0.3427	0.582	0.05551	23.6%	26.8%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.608	0.6233	0.6253	0.7113
Cu Ctrl 10 ug/L	0.5107	0.4487	0.45	0.4373
Cu Ctrl 20 ug/L	0.582	0.3427	0.414	0.5413

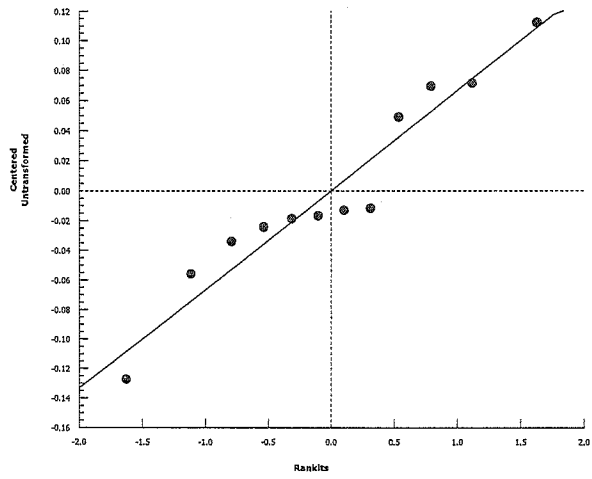
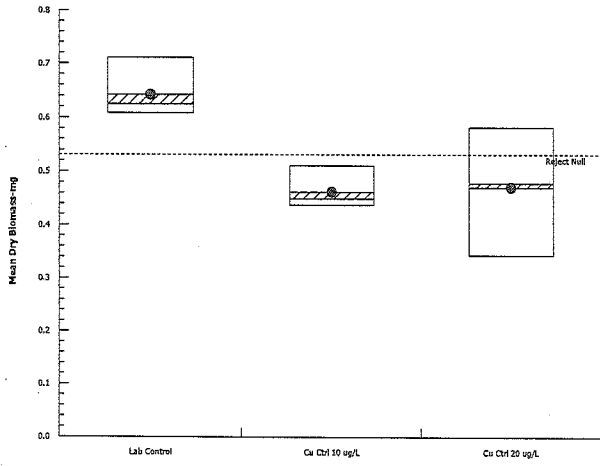
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 19-0281-7177      Endpoint: Mean Dry Biomass-mg  
Analyzed: 17 Oct-17 17:24      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 17 Oct-17 17:24 (p 1 of 2)  
 Test Code: 170737a | 07-5325-2191

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 20-5108-1139	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 17 Oct-17 17:23	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 10-2689-5567	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Krysta Pearcy
<b>Start Date:</b> 28 Jul-17	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 29 Aug-17	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 32d 0h	<b>Source:</b> Aquafox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-9377-7547	27 Jul-17 11:45	27 Jul-17 11:45	12h	Teck Coal	Teck Coal Q3
Cu Ctrl 10 ug/L	17-8459-8912	28 Jul-17	28 Jul-17	NA		
Cu Ctrl 20 ug/L	16-3436-0172	28 Jul-17	28 Jul-17	NA		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	Lab Control		
Cu Ctrl 10 ug/L	Lab Control (10 ug/L	Lab Control (10 ug/L Cu)	Lab Control (10 ug/L Cu)		
Cu Ctrl 20 ug/L	Lab Control (20 ug/L	Lab Control (20 ug/L Cu)	Lab Control (20 ug/L Cu)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	3.03%	

**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 10 ug/L	2.426	2.18	0.309	6	0.0338	CDF	Significant Effect
		Cu Ctrl 20 ug/L	4.074	2.18	0.309	6	0.0026	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.6763324	0.3381662	2	8.401	0.0087	Significant Effect
Error	0.3622566	0.04025073	9			
Total	1.038589		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.805	9.21	0.2460	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9283	0.802	0.3628	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	10.2	9.801	10.59	10.23	9.9	10.42	0.124	2.43%	0.0%
Cu Ctrl 10 ug/L	4	9.852	9.72	9.984	9.867	9.75	9.923	0.04162	0.85%	3.38%
Cu Ctrl 20 ug/L	4	9.618	9.254	9.982	9.635	9.357	9.846	0.1143	2.38%	5.67%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	10.42	10.08	9.9	10.38
Cu Ctrl 10 ug/L	9.923	9.818	9.917	9.75
Cu Ctrl 20 ug/L	9.846	9.5	9.769	9.357

# CETIS Analytical Report

Report Date: 17 Oct-17 17:24 (p 2 of 2)  
Test Code: 170737a | 07-5325-2191

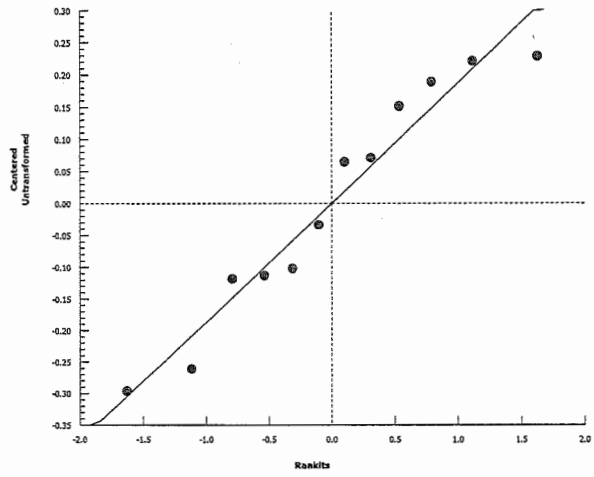
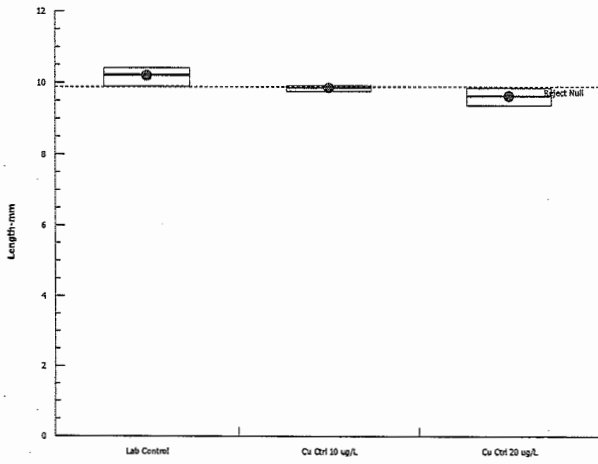
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-5108-1139      Endpoint: Length-mm  
Analyzed: 17 Oct-17 17:23      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics





**APPENDIX E – Chain-of-Custody Forms**

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COC ID: 20170725-1314

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Jacklyn Pool			Email 1:	Dylan.Begir@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email				Email 2:	Neil.MacDonald@teck.com	x	x	x
Address	PO Box 100			Address	#4 6125-12th Street S.E.			Email 3:	teckcoal@equisonline.com			x
City	Elkford	Province	BC	City	Calgary	Province	AB	PO number				
Postal Code	V0B 1H0	Country	Canada	Postal Code	T2H 2K1	Country	CAN					
Phone Number	1-250-865-5204			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.	30 Day Early Life Stage Fathead Minnow P/F (10 ug/l CU Treated)	30 Day Early Life Stage Fathead Minnow P/F (20 ug/l CU Treated)				
1617-1328 FR_FRCPL_Q_03072017_N	FR_FRCPL1	WS		2017/07/25	09:08	G	4	1	1				
1617-1329 FR_UFR1_Q_03072017_N	FR_UFR1	WS		2017/07/25	11:41	G	2	1	1				

BEARS P/W  
DROPOFF @ 1115  
2017/07/26  
6 x 20L CARBOYS  
NO 3/I  
GOOD CONDITION  
160

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Dylan Ogden	July 25/17		

NB OF BOTTLES RETURNED/DESCRIPTION	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 Ogden	250 425 3629
	Sampler's Signature	Date/Time
		July 25/17

<b>COC ID:</b>		<b>Q3 Chronic TOX July 25</b>		<b>TURNAROUND TIME:</b>		regular		<b>RUSH:</b>																																																																																																																																																																																																																																																																
<b>PROJECT/CLIENT INFO</b>				<b>LABORATORY</b>				<b>OTHER INFO</b>																																																																																																																																																																																																																																																																
Facility Name		Greenhills Operations		Lab Name		Nautilus Environmental		EDD delivery:																																																																																																																																																																																																																																																																
Project Manager		Leigh Stickney		Lab Contact		Krysta Percy		Site:		leigh.stickney@teck.com		EQUS: GHO																																																																																																																																																																																																																																																												
Email		leigh.stickney@teck.com		Email				Report Format / Distribution																																																																																																																																																																																																																																																																
Address		PO Box 5000		Address		8664 Commence Court		Yes		PDF		Yes																																																																																																																																																																																																																																																												
						Imperial Square Lake City						Email 1: leigh.stickney@teck.com																																																																																																																																																																																																																																																												
City		Elkford		Province		BC		City		Burnaby		Province		BC																																																																																																																																																																																																																																																										
Postal Code		V0B 1H0		Country		Canada		Postal Code		V5A 4N7		Country		Can																																																																																																																																																																																																																																																										
Phone Number		250 865 3274		Phone Number										PO number																																																																																																																																																																																																																																																										
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				<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>96 hr Rainbow trout (pass/fail)</td> <td>48 hr daphnia (pass/fail)</td> <td>48 hr daphnia @ 10 deg C (pass/fail)</td> <td>7d C.dubia P/F</td> <td>35 d rainbow trout early life stage N03/S04</td> <td>72 hr P. Subcapitata P/F</td> <td></td> <td></td> <td>28 day H. azteca</td> <td>28 Day Hyallella P/F</td> <td>32d FHM P/F Conducted in Calgary</td> <td></td> <td>Temp °C</td> </tr> <tr> <td>GH_FR1_WS_2017-07-25_N ①</td> <td>GH_FR1</td> <td>WS</td> <td>N</td> <td>25-Jul-17</td> <td>9:26</td> <td>G</td> <td>1 X 20L</td> <td></td> <td></td> <td></td> <td></td> <td>15.0</td> </tr> <tr> <td>GH_ERC_WS_2017-07-25_N ①</td> <td>GH_ERC</td> <td>WS</td> <td>N</td> <td>25-Jul-17</td> <td>12:10</td> <td>G</td> <td>1 X 20L</td> <td></td> <td></td> <td></td> <td></td> <td>15.0</td> </tr> <tr> <td>GH_ER2_WS_2017-07-25_N ①</td> <td>GH_ER2</td> <td>WS</td> <td>N</td> <td>25-Jul-17</td> <td>11:15</td> <td>G</td> <td>1 X 20L</td> <td></td> <td></td> <td></td> <td></td> <td>15.0</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4"><b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b></td> <td colspan="4"><b>RELINQUISHED BY/AFFILIATION</b></td> <td colspan="4"><b>Accepted By/Affiliation</b></td> </tr> <tr> <td colspan="4">① sample description: clear, colourless, odourless, some particulates present</td> <td colspan="4">J. Enns</td> <td colspan="4">Date: 13:00 @ 25-July, Time: Nautilus-Burnaby, Accepted By: NY - New Yamamoto, Date: Jul 26/17 - 08:15</td> </tr> <tr> <td colspan="4"><b>SERVICE REQUEST (rush - subject to availability)</b></td> <td colspan="4"></td> <td colspan="4"></td> </tr> <tr> <td colspan="4">Regular (default) <input checked="" type="checkbox"/></td> <td colspan="4"><b>Sampler's Name</b></td> <td colspan="4"><b>Mobile #</b></td> </tr> <tr> <td colspan="4">Priority (2-3 business days) - 50% surcharge</td> <td colspan="4">J. Enns</td> <td colspan="4"></td> </tr> <tr> <td colspan="4">Emergency (1 Business Day) - 100% surcharge</td> <td colspan="4"><b>Sampler's Signature</b></td> <td colspan="4"><b>Date/Time</b></td> </tr> <tr> <td colspan="4">For Emergency &lt;1 Day, ASAP or Weekend - Contact ALS</td> <td colspan="4"></td> <td colspan="4"></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	96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	35 d rainbow trout early life stage N03/S04	72 hr P. Subcapitata P/F			28 day H. azteca	28 Day Hyallella P/F	32d FHM P/F Conducted in Calgary		Temp °C	GH_FR1_WS_2017-07-25_N ①	GH_FR1	WS	N	25-Jul-17	9:26	G	1 X 20L					15.0	GH_ERC_WS_2017-07-25_N ①	GH_ERC	WS	N	25-Jul-17	12:10	G	1 X 20L					15.0	GH_ER2_WS_2017-07-25_N ①	GH_ER2	WS	N	25-Jul-17	11:15	G	1 X 20L					15.0																																																																																																									<b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b>				<b>RELINQUISHED BY/AFFILIATION</b>				<b>Accepted By/Affiliation</b>				① sample description: clear, colourless, odourless, some particulates present				J. Enns				Date: 13:00 @ 25-July, Time: Nautilus-Burnaby, Accepted By: NY - New Yamamoto, Date: Jul 26/17 - 08:15				<b>SERVICE REQUEST (rush - subject to availability)</b>												Regular (default) <input checked="" type="checkbox"/>				<b>Sampler's Name</b>				<b>Mobile #</b>				Priority (2-3 business days) - 50% surcharge				J. Enns								Emergency (1 Business Day) - 100% surcharge				<b>Sampler's Signature</b>				<b>Date/Time</b>				For Emergency <1 Day, ASAP or Weekend - Contact ALS											
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# Chain Of Custody Record

COC ID: 20170725-0725

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Bob Werner  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7321  
 Email EDD To: Karen.Hannan@Teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com  
 Errin.DeBoer@teck.com

Lab Name: Nautilus Environmental  
 Contact Name: Krysta Pearcy  
 Emma Marus  
 Address: 8664 commerce Court  
 City: Burnaby State BC  
 Postal Code: V5A 4N7 Country: Canada  
 Phone Number: 604-420-8773  
 Email Address: krysta@nautilusenvironmental.ca  
 emma@nautilusenvironmental.ca  
 PO Number: CMO00478260

Send Invoice To  
 Address  
 City  
 Postal Code  
 Country  
 Task Code  
 Shipping Company  
 Tracking Number  
 CC Hardcopy To  
 CC Hardcopy To

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.	ANALYSIS				Temp °C	ADDITIONAL INFORMATION
							72h P. subcapitata (P/F)	7-d C. dubia (P/F)	28 d Hyalabella P/F	32d FHM P/F		
CM_MC1_WS_20170725_N	WS	Jul 25, 2017	8:30	G	1 x 20L		X	X	X	X	14.2	Week 1
CM_MC2_WS_20170725_N	WS	Jul 25, 2017	13:05	G	1 x 20L		X	X	X	X	18.0	Week 1
						wo #	170739	170738	170736	170737		

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions			
							Y/N	Y/N	Y/N	
☐ sample description: clear, colourless, odorless, no particulates present				Nautilus - Burnaby JB - Jaymee Bucanog	July 26/17	08:15	Y/N	Y/N	Y/N	
							Y/N	Y/N	Y/N	
	Sampler's Name	Don Sacino/Kim San		Mobile #			Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
	Sampler's Signature	<i>DS</i>		Date/Time	7/25/2017 2:00PM					



Teck

COC ID: 20170725N		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	Krysta Peracy		Email 1:	Jeff.Williams@teck.com	X	X	X
Project Manager	Jeff Williams			Email	krysta@nautilusenvironmental.ca		Email 2:	teckcoal@equisonline.com			
Email	Jeff.Williams@teck.com			Address	8664 Commerce Court		Email 3:	James.Boldt@teck.com	X	X	X
Address	RR#1 HWY# 3				Imperial Square, Lako City		Email 4:	Cameron.Griffin@teck.com	X	X	X
							Email 5:	Teck.Lab.Results@sharepoint.teck.com	X	X	X
City	Sparwood	Province	BC	City	Burnaby	Province	BC	PO number	475474		
Postal Code	V1C 4C3	Country	Canada	Postal Code	V5A 4N7	Country	Canada				
Phone Number	1-250-865-5289			Phone Number							

SAMPLE DETAILS								ANALYSIS REQUESTED							Filtered - F, Field L, Lab, FL, Field & Lab, N, Not				
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G-Crab 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_2017-07-25_N <sup>①</sup>	EV_HC1	WS	N	2017/07/25	10:45	G	1x20L		x	x									16.9
EV_MC2_WS_2017-07-25_N <sup>①</sup>	EV_MC2	WS	N	2017/07/25	13:05	G	1x20L		x	x									16.9
Total							2		60 # 170739 170738										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS 72h P.subcapitata P/F 7d C.dupia P/F 30d rainbow trout early life stage P/F 96 hr Rainbow Trout P/F 48 hr Daphnia P/F	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			Nautilus - Burnaby	July 24/17 @ 08:15
			JB - Jaymee Buchanan	July 24/17 @ 08:15
				26.
Regular (default) <input checked="" type="checkbox"/> 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	Sampler's Signature	Mobile #	Date/Time
		<i>Cameron Griffin</i>		25 July - 17

① sample description: clear, colourless, odourless, some particulates present

Temp °C  
16.9  
16.9



COC ID: **20170726-1035**      TURNAROUND TIME:      RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	Nautilus Environmental			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Jay Jones			Lab Contact	Krysta Percy			Email 1:	jay.jones@teck.com	x	x
Email	jay.jones@teck.com			Email	Krysta@NautilusEnvironmental.ca			Email 2:	chris.blurton@teck.com	x	x
Address	Box 2003			Address	8664 commerce Court			Email 3:	teckcoal@equisonline.com		x
	15km North Hwy 43							Email 4:	lee.wilm@teck.com	x	x
City	Sparwood	Province	BC	City	Burnaby	Province	BC				
Postal Code	V0B 2G0	Country	Canada	Postal Code	V5A 4N7	Country	Canada	PO number	432106		
Phone Number	250-425-6111			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.	7 d C.dubia dilution-series	72hr Psubcapitata P/F dilution-series	7d L. minor plant grown dilution series	7 d O mykis development dilution series	72h P. subcapitata P/F	7d C.dubia P/F	30 d rainbow trout early life stage P/F	NAUT_96Hr_RT_Single Concentration Toxicity Test	NAUT_48Hr_DM_Single Concentration Toxicity Test 20°C	Temp °C
LC_LCDSSLCC_WS_2017-05-22 N ①	LC_LCDSSLCC	WS	N	25-Jul-17	10:31	G 1/8 1 x 20L	x	x								13.4
							w0# 170738	170739								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
① sample description: clear, colourless, odourless, some particulates present	T Phillips/ NUPQU	July 26, 2017	Nautilus - Burnaby JTB - Jaymee Buchanan	July 26/17 @ 08:15

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Tyler Phillips	Mobile #	(250) 919-0965
Regular (default)	X	Sampler's Signature <td></td> <td>Date/Time <td>July 26, 2017</td> </td>		Date/Time <td>July 26, 2017</td>	July 26, 2017
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					



# Teck

COC ID: 20170801-1302

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual			Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Neil MacDonald			Lab Contact	Elisabeth Henson			Email 1:	dylan.begin@teck.com	x	x	x
Email	Neil.MacDonald@teck.com			Email	elisabeth_henson@golder.com			Email 2:	Neil.MacDonald@teck.com	x	x	x
Address	PO Box 100			Address				Email 3:	teckcoal@quisonline.com			x
City	Elkford	Province	BC	City		Province		PO number				
Postal Code	V0B 1H0	County	Carinda	Postal Code		Country						
Phone Number	1-250-865-5204			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.	30 Day Early Life Stage Fathead Minnow P/F (10 ug/l CU Treated)	30 Day Early Life Stage Fathead Minnow P/F (20 ug/l CU Treated)					
FR_FRCP1_QR_10072017_N	FR_FRCP1	WS		2017/08/01	11:20	G	4	2	2					
FR_UFRI_QR_10072017_N	FR_UFRI	WS		2017/08/01	08:42	G	2	2						
<p>1617-1388</p> <p>1617-1389</p>								<p>MANATOLIN</p> <p>2017/08/02</p> <p>@ 12:30</p> <p>6x 20L CARBURY</p> <p>NO S/I</p> <p>GOOD CONDITION</p> <p>100</p>						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Jason Gravelle	08/01/17		

NE OF BOTTLES RETURNED/DESCRIPTION	Sampler's Name	Mobile #
Regular (default) X	Jason Gravelle	(250) 865-5191
Priority (2-3 business days) - 50% surcharge	Jason Gravelle	
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

Sampler's Signature	Date/Time
<i>Jason Gravelle</i>	Aug 01/2017

COC ID: **Q3 Chronic TOX August 1**

TURNAROUND TIME:

regular

RUSH: *h*

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	Greenhills Operations			Lab Name	Nautilus Environmental			EDD delivery:				
Project Manager	Leigh Stickney			Lab Contact	Krysta Percy			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	Yes	Excel	
					Imperial Square Lake City			Email 1: leigh.stickney@teck.com				
City	Elkford	Province	BC	City	Burnaby	Province	BC	Email 2: sean.beswick@teck.com				
Postal Code	VOB 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Can	Email 3: jeremy.enns@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)

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
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P. Subcapitata P/F		28 day H. azteca	28 Day Hyalella P/F	32d FHM P/F conducted in Calgary	Temp °C	
GH_FR1_WS_2017-07-25_N	GH_FR1	WS	N	1-Aug-17	10:35	G	1 x 20L				x		x			x	x	16.5	
GH_ER2_WS_2017-07-25_N	GH_ER2	WS	N	1-Aug-17	12:00	G	1 x 20L				x		x			wo# 170736	wo# 170737	16.5	

= refresh sample =

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	1-Aug-17	14:00	Nautilus - Burnaby	Aug 02/17	08:30
				NV - Nan Ya-ma-mo		

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	<input checked="" type="checkbox"/>	Sampler's Name	J. Enns
Priority (2-3 business days) - 50% surcharge	<input type="checkbox"/>	Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge	<input type="checkbox"/>	Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	<input type="checkbox"/>	Date/Time	





# Chain Of Custody Record

COC ID: 20170801-0801

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To					
Contact Name	Bob Werner			Contact Name	Claudio Quinteros			Address					
Address	2261 Corbin Rd.			Address	Jessica Wang			City			State		
City	Sparwood	Prov.	BC	City	#4, 6125-12th Street S.E.		City			Postal Code		Country	
Postal Code	V0B 2G0	Country	Canada	City	Calgary	State	AB	Postal Code			Country		
Phone Number	250 425 7321			Postal Code	T2H 2K1	Country	Canada	Task Code					
Email EDD To	Karen.Hannan@teck.com			Phone Number	403-253-7121			Shipping Company					
	Don.Sacino@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number					
	Bob.Werner@teck.com				jessica@nautilusenvironmental.ca			CC Hardcopy To					
	Erin.DeBoer@teck.com			PO Number	CM008476075			CC Hardcopy To					

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION			
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PREP	ANALYSIS								
1617-1384 CM_MC1_WS_20170801_N	WS	1-Aug-17	8:00	G	2										Week 2
CM_MC2_WS_20170801_N	WS	1-Aug-17	9:00	G	4										Week 2
1617-1385															

Additional Comments/Special Instructions		Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions		
					2017/08/02 1230 HS			Y/N	Y/N	Y/N
					3x caddis / 14x 20L scudbugs			Y/N	Y/N	Y/N
					no S/T good condition			Y/N	Y/N	Y/N
					drop off 10°C			Y/N	Y/N	Y/N
Sampler's Name	Don Sacino/Kim San		Mobile #				Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
Sampler's Signature			Date/Time	7/25/2017 2:00PM						

COC ID: 20170808-1357		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			Excel PDF EDD
Email	Neil.MacDonald@teck.com			Email	Lee.Wilm@teck.com		x x x
Address	PO Box 100			Address	8664 Commerce Court		x x x
City	Elkford	Province	BC	City	Burnaby	Province	BC
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-865-5204			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.	48 hr Daphnia Single Conc. Pass/Fail	96 Hr Rainbow Trout Single Conc. Pass/Fail	28 Day H. azteca Pass/Fail	72 Hr. P-Subacute P/F	70 d Daph P/F	48 hr Daphnia Single Conc. Pass/Fail @ 10.9 degrees	48 hr Daphnia Single Conc. Pass/Fail @ 11.4 degrees	48 hr Daphnia Single Conc. Pass/Fail @ 10 degrees	32d FHM P/F conducted in Calgary	Temp (C)
5) FR_CCL_Q_03072017_N	FR_CC1	WS		2017/08/08	10:30	G	1	1	2								19.4
6) FR_LMP1_Q_03072017_N	FR_LMP1	WS		2017/08/08	11:10	G	1	1	2								19.6
3) FR_SP1_Q_03072017_N	FR_SP1	WS		2017/08/08	11:40	G	2	1	2				1				18.1
4) GH_CC1_Q_03072017_N	GH_CC1	WS		2017/08/08	09:50	G	2	1	2						1		17.1
7) GH_SC1_Q_03072017_N	GH_SC1	WS		2017/08/08	10:34	G	2	1	2					1			18.8
FR_FRCP1_QR_17072017_N	FR_FRCP1	WS		2017/08/08	11:46	G	1			2	2					x	19.9
FR_UFR1_QR_17072017_N	FR_UFR1	WS		2017/08/08	09:14	G	1			2	2					x	13.7

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Bryan Caden	Aug 8/17	Nautilus - Burnaby Jaymee Bucaneg	Aug 09/17 C 07:45

NB OF BOTTLES RETURNED/DESCRIPTION	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	Bryan Caden	250 425 3629
	Sampler's Signature	Date/Time
	<i>[Signature]</i>	Aug 8/17

① Confirmed w/ client, testing not needed.  
 ② Received 2x20L of FR UFR1 → Forwarded 1x20L to Calgary overnight.  
 Received 4x20L of FR FRCP1 → Forwarded 3x20L to Calgary overnight.



COC ID: <b>20170808-1401</b>		TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY	
Facility Name / Job#	Fording River Operation		Lab Name	Hydroqual	
Project Manager	Neil MacDonald		Lab Contact	Elisabeth Henson	
Email	Neil.MacDonald@teck.com		Email	elisabeth_henson@golder.com	
Address	PO Box 100		Address		
City	Elkford	Province	BC	City	
Postal Code	V0B 1H0	Country	Canada	Postal Code	
Phone Number	1-250-865-5204		Phone Number	403-253-7121	
Report Format / Distribution				Excel	PDF
Email 1:				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Email 2:				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Email 3:				<input type="checkbox"/>	<input type="checkbox"/>
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.	30 Day Early Life Stage Fathead Minnow P/F (10 ug/l CU Treated)	30 Day Early Life Stage Fathead Minnow P/F (20 ug/l CU Treated)
FR_FRCP1_QR_17072017_N	FR_FRCP1	WS		2017/08/08	11:46	G	1	2	2
FR_UFR1_QR_17072017_N	FR_UFR1	WS		2017/08/08	09:14	G	1	2	2

J.C.  
2017/08/10  
11:40  
15°C  
  
2x 20L Carboys  
No S/No I  
good condition

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
				Aug 8/17					
NR OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name		Sampler's Signature		Mobile #		Date/Time	
Regular (default) <input checked="" type="checkbox"/>						250 425 3629		Aug 8/17	
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

<b>COC ID:</b> Q3 Chronic TOX August 8th		<b>TURNAROUND TIME:</b> regular		<b>RUSH:</b>
--	--	---------------------------------	--	--------------

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Greenhills Operations			Lab Name	Nautilus Environmental			EDD delivery:			
Project Manager	Leigh Stickney			Lab Contact	Krysta Pearcy			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	Yes	Excel
City	Elkford	Province	BC	City	Imperial Square Lake City	Province	BC	Email 1: leigh.stickney@teck.com			
Postal Code	VOB 1H0	Country	Canada	Postal Code	Burnaby	Country	Can	Email 2: sean.beswick@teck.com			
Phone Number	250 865 3274			Phone Number	V5A 4N7	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
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	70 Columbia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P-Subcapitana P/F	28 day H azteca	28 Day Hyalella P/F	32d PHM P/F conducted in Calgary	Temp (C)		
GH_FRI_WS_2017-07-25_N	GH_FRI	WS	N	8-Aug-17	10:55	G	1				x				x	x	16.8		
GH_ER2_WS_2017-07-25_N	GH_ER2	WS	N	8-Aug-17	12:40	G	1				x				x	x	16.8		
															NO# 17 0736	NO# 170737			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
				Nautilus - Burnaby Jaymee Bucancy JB	Aug 09/17	07:45

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	J. Kelly / S. Hartley
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	[Signature]
Emergency (1 Business Day) - 100% surcharge		Mobile #	
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	

① Confirmed w/ client, testing not needed.

COC ID: Q3 Chronic TOX August 8th

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  
 City: Elkford  
 Province: BC  
 Postal Code: V0B 1H0  
 Phone Number: 250 865 3274

Lab Name: Hydroqual Laboratories Ltd.  
 Lab Contact: Jacklyn Pool  
 Email:  
 Address: #4, 6125 - 12th Street S.E.  
 City: Calgary  
 Province: AB  
 Postal Code: T2H 2K1  
 Phone Number: 403.253.7121

EDD delivery:  
 Site: leigh.stickney@teck.com  
 Report Format / Distribution:  
 Yes PDF Yes Excel  
 Email 1: leigh.stickney@teck.com  
 Email 2: sean.beswick@teck.com  
 Email 3: jeremy.enns@teck.com  
 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_2017-07-25_N	GH_FR1	WS	N	8-Aug-17	10:55	G	2	X															
GH_ER2_WS_2017-07-25_N	GH_ER2	WS	N	8-Aug-17	12:40	G	2	X															

J.C.  
 2017/08/04  
 11:40  
 4 x 20L canbox  
 No S / No I  
 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	Mobile #	Sampler's Signature	Date/Time
					J. Kropp / S. Hardy		[Signature]	

# Chain Of Custody Record

COC ID: 20170808-0808

Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	Coal Mountain Operation			Lab Name	Nautilus Environmental			Send Invoice To				
Contact Name	Bob Werner			Contact Name	Krysta Pearcy			Address				
Address	2261 Corbin Rd.			Address	Emma Marus			City			State	
City	Sparwood	Prov.	BC	City	8664 commerce Court			City			State	
Postal Code	V0B 2G0	Country	Canada	City	Burnaby	State	BC	Postal Code			Country	
Phone Number	250 425 7321			Postal Code	V5A 4N7	Country	Canada	Task Code				
Email EDD To	Karen.Hannan@Teck.com			Phone Number	604-420-8773			Shipping Company				
	Don.Sacino@teck.com			Email Address	krysta@nautilusenvironmental.ca			Tracking Number				
	Bob.Werner@teck.com				emma@nautilusenvironmental.ca			CC Hardcopy To				
	Errin.DeBoer@teck.com			PO Number	CMO00478260			CC Hardcopy To				

SAMPLE DETAILS						ANALYSIS REQUESTED										ADDITIONAL INFORMATION						
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.																
CM_MC1_WS_20170808_N	WS	8-Aug-17	8:55	G	1 ①																	Week 3
CM_MC2_WS_20170808_N	WS	8-Aug-17	9:55	G	1																	Week 3

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions				
							Y / N	Y / N	Y / N	Y / N	
				Nautilus - Burnaby Jaymee Bucarney	Aug 09/17 07:45 JB	07:45	15.8	Y / N	Y / N	Y / N	Y / N
								Y / N	Y / N	Y / N	Y / N
								Y / N	Y / N	Y / N	Y / N
								Y / N	Y / N	Y / N	Y / N

Sampler's Name	Don Sacino/Kim San	Mobile #	
Sampler's Signature		Date/Time	Aug 8/17 12:00

① Received 3x20L of CM-MC1, forwarded 2x20L to Calgary lab overnight.



COC ID: <b>20170815-1210</b>		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			Excel PDF EDD
Email	Neil.MacDonald@teck.com			Email	Dylan.Begin@teck.com	x	x x
Address	PO Box 100			Email	Neil.Macdonald@teck.com	x	x x
				Address	8664 Commerce Court	Email 3:	teckcoal@equisonline.com
City	Elkford	Province	BC	City	Burnaby	Province	BC
Postal Code	V0B 1H0	Country	Canada	Postal Code	V5A 4N7	Country	Canada
Phone Number	1-250-865-5204			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.	28 Day H. azteca Pass/Fail	32d FHM PIF conducted in Calgary													
FR_FRCP1_QR_24072017_N	FR_FRCP1	WS		2017/08/15	09:25	G	1	1	x													Temp °C
FR_UFR1_QR_24072017_N	FR_UFR1	WS		2017/08/15	10:48	G	1	1	x													15.6

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Bryan Ogden	August 15, 2017	Jaimie Buchanan Nautilus - Burnaby	Aug 16/17 @ 07:45

NB OF BOTTLES RETURNED/DESCRIPTION		Sampler's Name	Mobile #
Regular (default)	X	Bryan Ogden	250 425 3629
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
			August 15, 2017

# Teck

COC ID: 20170815-1207		TURNAROUND TIME:		RUSH:													
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO											
Facility Name / Job# Fording River Operation		Lab Name Hydroqual		Report Format / Distribution		Excel	PDF	EDD									
Project Manager Neil MacDonald		Lab Contact Elisabeth Henson		Email 1: Dylan.Beggs@teck.com		x	x	x									
Email Neil.MacDonald@teck.com		Email elisabeth_henson@golder.com		Email 2: Neil.MacDonald@teck.com		x	x	x									
Address PO Box 100		Address		Email 3: teckcoal@cauisonline.com				x									
City Elkford	Province BC	City	Province	PO number													
Postal Code V0B 1H0	Country Canada	Postal Code	Country														
Phone Number 1-250-865-5204		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.	30 Day Early Life Stage Fathead Minnow P/F (10 ug/l CU Treated)	30 Day Early Life Stage Fathead Minnow P/F (20 ug/l CU Treated)								
1617-1328	FR_FRCP1	WS		2017/08/15	09:25	G	4	2	2								
	FR_UFR1	WS		2017/08/15	10:48	G	2	2									
1617-1329																	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME							
				Bryan Ogden		Aug 15/17											
NB OF BOTTLES RETURNED/DESCRIPTION				Sampler's Name		Sampler's Signature		Mobile #		Date/Time							
Regular (default) X				Bryan Ogden				250 425 3629		Aug 15/17							
Priority (2-3 business days) - 50% surcharge																	
Emergency (1 Business Day) - 100% surcharge																	
For Emergency <1 Day, ASAP or Weekend - Contact ALS																	

S.C.  
 2017/08/15  
 11:00  
 1300  
 Drop off  
 No 5/1/05  
 Good condition

**COC ID:** Q3 Chronic TOX August 15th      **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	Krysta Pearcy			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	Yes	Excel			
City	Elkford		Province	BC		City	Burnaby		Province	BC		Email 1:	leigh.stickney@teck.com	
Postal Code	VOB 1H0		Country	Canada		Postal Code	V5A 4N7		Country	Can		Email 2:	sean.beswick@teck.com	
Phone Number	250 865 3274			Phone Number				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
								96 hr Rainbow trout (pass/fail)	48 hr daphnia (pass/fail)	48 hr daphnia @ 10 deg C (pass/fail)	7d C.dubia P/F	39 d rainbow trout early life stage NO3/SO4	72 hr P-Subcapitata P/F testing not needed confirmed w/ client	28 day H azteca	28 Day Hyaltilia P/F	32 d FHM P/F conducted in category	Temp °C		
GH_FR1_WS_2017-08-15_N	GH_FR1	WS	N	15/8/2017	10:00	G	1								x	x	13.8		
GH_ER2_WS_2017-08-15_N	GH_ER2	WS	N	15/8/2017	11:30	G	1								x	x	13.8		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	8/15/2017		Nautilus - Burnaby Kymee Buarney JB	Aug 16/17	07:45

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	<input checked="" type="checkbox"/>	Sampler's Name	Jeremy Enns
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge		Mobile #	250-425-1170
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	



# Teck

COC ID: **Q3 Chronic TOX August 15th**

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	VOB 1H0	Country	Canada	Postal Code	T2H 2K1	Country	Can	Email 2: sean.beswick@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 30 d early life stage fathead minnow P/F	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1617-1326 GH_FRI_WS_2017-08-15_N	GH_FRI	WS	N	15-Aug-17	10:00	G	2	X												
GH_ER2_WS_2017-08-15_N	GH_ER2	WS	N	15-Aug-17	11:30	G	2	X												
1617-1327																				

J.C.  
2017/08/16  
11:00  
12°C  
Drop off  
No 5/No 2  
Good condition

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	8/15/2017				

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	X	Sampler's Name	Jeremy Enns
Priority (2-3 business days) - 50% surcharge		Mobile #	250-425-1170
Emergency (1 Business Day) - 100% surcharge		Sampler's Signature	
For Emergency <1 Day, ASAP or Weekend - Contact ALS		Date/Time	



# Chain Of Custody Record

COC ID: 20170815-0815

Page: 1 of 1

Turnaround Time:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name: Coal Mountain Operation  
 Contact Name: Bob Werner  
 Address: 2261 Corbin Rd.  
 City: Sparwood Prov. BC  
 Postal Code: V0B 2G0 Country: Canada  
 Phone Number: 250 425 7321  
 Email EDD To: Karen.Hannan@teck.com  
 Don.Sacino@teck.com  
 Bob.Werner@teck.com  
 Errin.DeBoer@teck.com

Lab Name: Hydroqual Laboratories  
 Contact Name: Claudio Quinteros  
 Address: Jessica Wang  
 Address: #4, 6125-12th Street S.E.  
 City: Calgary State: AB  
 Postal Code: T2H 2K1 Country: Canada  
 Phone Number: 403-253-7121  
 Email Address: claudio@nautilusenvironmental.ca  
 jessica@nautilusenvironmental.ca  
 PO Number: CM006478075

Send Invoice To  
 Address  
 City  
 State  
 Postal Code  
 Country  
 Task Code  
 Shipping Company  
 Tracking Number  
 CC Hardcopy To  
 CC Hardcopy To

**SAMPLE DETAILS**

**ANALYSIS REQUESTED**

**ADDITIONAL INFORMATION**

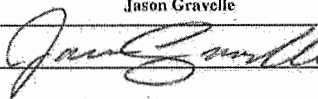
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV	ANALYSIS	30 day early life stage fathead minnow P/F (10ug/l CU Treated)	30 day early life stage fathead minnow P/F (20 ug/l CU Treated)	ADDITIONAL INFORMATION
1617-1330	WS	15-Aug-17	11:00	G	2			X		Week 4
CM_MC1_WS_20170815_N	WS	15-Aug-17	12:40	G	4			X	X	Week 4
1617-1331										

J.C. JE  
 2017/08/15  
 11:00  
 12°C  
 Drop off  
 No S/No I  
 Good condition

Additional Comments/Special Instructions	Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time	Sample Receipt Conditions		
							Y / N	Y / N	Y / N

Sampler's Name	Don Sacino/Kim San	Mobile #	250-425-7541	Temp in °C	Samples on ice?	Sample intact?	Trip Blank?
Sampler's Signature		Date/Time	8/15/2017 14:00:00 PM				

# Teck

COC ID: 20170822-1322		TURNAROUND TIME:			RUSH:												
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO											
Facility Name / Job#	Fording River Operation			Lab Name	Hydroqual		Report Format / Distribution										
Project Manager	Neil MacDonald			Lab Contact	Elisabeth Henson		Email 1:	Dylan.Beggs@teck.com									
Email	Neil.MacDonald@teck.com			Email	elisabeth_henson@golder.com		Email 2:	Neil.MacDonald@teck.com									
Address	PO Box 100			Address			Email 3:	teckcoal@equisonline.com									
City	Elkford	Province	BC	City		Province		PO number									
Postal Code	V0B 1H0	Country	Canada	Postal Code		Country											
Phone Number	1-250-865-5204			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.	30 Day Early Life Stage Fathead Minnow P/F (10 eg/l CU Treated)	30 Day Early Life Stage Fathead Minnow P/F (20 eg/l CU Treated)								
FR_FRCP1_QR_31072017_N	FR_FRCP1	WS		2017/08/22	10:33	G	4	2	2								
FR_UFRI_QR_31072017_N	FR_UFRI	WS		2017/08/22	09:24	G	2	2									
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS				RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME							
				Jason Gravelle		8/22/2017											
NB OF BOTTLES RETURNED/DESCRIPTION				Sampler's Name		Jason Gravelle		Mobile #		(250) 865-5191							
Regular (default) X				Sampler's Signature				Date/Time		August 22, 2017							
Priority (2-3 business days) - 50% surcharge																	
Emergency (1 Business Day) - 100% surcharge																	
For Emergency <1 Day, ASAP or Weekend - Contact ALS																	

J.C.  
2017/08/23  
11:00  
18°C  
Bears Paw  
6 x 20L carboys  
No S/No L  
Good condition

COC ID: Q3 Chronic TOX August 22

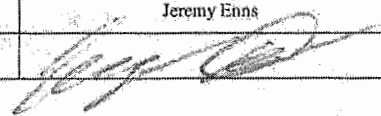
TURNAROUND TIME: regular

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: senn.beswick@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	#/N/A	#/N/A	
GH_FR1_WS_2017-08-22_N	GH_FR1	WS	N	22-Aug-17	10:30	G	2	X														
GH_ER2_WS_2017-08-22_N	GH_ER2	WS	N	22-Aug-17	9:30	G	2	X														

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	Date	Time	Accepted By/Affiliation	Date	Time
	J. Enns	8/22/2017	11:00			

SERVICE REQUEST (rush - subject to availability)			
Regular (default)	<input checked="" type="checkbox"/>	Sampler's Name	Jeremy Enns
Priority (2-3 business days) - 50% surcharge	<input type="checkbox"/>	Sampler's Signature	
Emergency (1 Business Day) - 100% surcharge	<input type="checkbox"/>	Mobile #	250-425-1170
For Emergency <1 Day, ASAP or Weekend - Contact ALS	<input type="checkbox"/>	Date/Time	

# Chain Of Custody Record

COC ID: 20170822-0822


Page: 1 of 1

Turnaround Time:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Coal Mountain Operation			Lab Name	Hydroqual Laboratories			Send Invoice To			
Contact Name	Bob Werner			Contact Name	Claudio Quinteros			Address			
Address	2261 Corbin Rd.			Address	Jessica Wang						
City	Sparwood	Prov.	BC	Address	#4, 6125-12th Street S.E.			City		State	
Postal Code	V0B 2G0	Country	Canada	City	Calgary	State	AB	Postal Code		Country	
Phone Number	250 425 7321			Postal Code	T2H 2K1	Country	Canada	Task Code			
Email EDD To				Phone Number	403-253-7121			Shipping Company			
	Don.Sacino@teck.com			Email Address	claudio@nautilusenvironmental.ca			Tracking Number			
	Bob.Werner@teck.com			Email Address	jessica@nautilusenvironmental.ca			CC Hardcopy To			
				PO Number	CM000478075			CC Hardcopy To			

SAMPLE DETAILS						ANALYSIS REQUESTED						ADDITIONAL INFORMATION			
Sample ID	Matrix	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PRESERV.									
CM_MC1_WS_20170822_N	WS	22-Aug-17	8:40	G	2										Week 5
CM_MC2_WS_20170822_N	WS	22-Aug-17	10:02	G	4										Week 5

J.L.  
 2017/06/23  
 11:00  
 15°C  
 Bear's Paw  
 6 x 20L carboys  
 No S / No T  
 Good condition

Additional Comments/Special Instructions	Relinquished By/Affiliation		Date	Time	Accepted By/Affiliation		Date	Time	Sample Receipt Conditions			
									Y / N	Y / N	Y / N	Y / N
									Y / N	Y / N	Y / N	Y / N
									Y / N	Y / N	Y / N	Y / N
									Y / N	Y / N	Y / N	Y / N
	Sampler's Name	Don Sacino/Kim San		Mobile #	250-425-7541		Temp in °C		Samples on Ice?	Sample intact?	Trip Blank?	
	Sampler's Signature			Date/Time	8/22/2017 14:00:00 PM							

**END OF REPORT**

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Appendix B-4  
Fourth Quarter 2017 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*, *Pimephales promelas*  
and *Oncorhynchus mykiss***

Fourth Quarter 2017 Results

Final Report

February 15, 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>Hyalella azteca</i> .....	10
3.4 <i>Pimephales promelas</i> .....	11
3.5 <i>Oncorhynchus mykiss</i> .....	11
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.	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>Hyalella 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

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### List of Figures

Figure 1.	Chronic toxicity monitoring locations.....	3
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### 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	

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## SIGNATURE PAGE

### Original Signed By

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

### Original Signed By

---

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 fourth quarter of 2017 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 and LC_LCDSSLCC*
Sample collection dates	October 2, 10, 17, 24 and 31, 2017
Sample receipt dates	October 3, 11, 18 and 26 and November 1, 2017
Sample receipt temperatures	Ranged from 2.6 to 9.0°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

### Summary of Results

Endpoint	Mean ± SD					
	Laboratory Control	FR_UFR1 (Site Control)	GH_ER2 (Site Control)	CM_MC1 (Site Control)	FR_FRCP1	GH_FR1
<b><i>C. dubia</i></b>						
Survival (%)	100	100	100	100	100	100
Reproduction	18.4 ± 2.4	18.7 ± 4.7	17.9 ± 2.9	18.6 ± 2.7	9.9 ± 1.1 * <sup>αβ†</sup>	21.3 ± 1.8
<b><i>P. subcapitata</i></b>						
Cell Yield (x 10 <sup>4</sup> cells/mL)	29.2 ± 1.8	108.1 ± 7.4	109.6 ± 8.2	111.4 ± 6.7	97.8 ± 4.6 <sup>β†</sup>	116.3 ± 9.3
<b><i>H. azteca</i></b>						
Survival (%)	98.0 ± 4.5	100 ± 0.0	96.0 ± 5.5	96.0 ± 8.9	94.0 ± 5.5	100 ± 0.0
Dry weight (mg)	0.63 ± 0.03	0.56 ± 0.07	0.47 ± 0.17	0.45 ± 0.20 *	0.48 ± 0.07 *	0.48 ± 0.09 *

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Summary of Results (continued)**

Endpoint	Mean ± SD				
	GH_ERC	EV_MC2	EV_HC1	CM_MC2	LC_LCDSSLCC
<b><i>C. dubia</i></b>					
Survival (%)	100	100	100	80	100
Reproduction	18.6 ± 4.9	23.1 ± 2.6	18.4 ± 2.0	7.6 ± 4.9* <sup>αβ†</sup>	23.4 ± 2.8
<b><i>P. subcapitata</i></b>					
Cell Yield (x 10 <sup>4</sup> cells/mL)	128.8 ± 2.5	107.8 ± 7.0	109.8 ± 8.2	105.0 ± 3.4	103.5 ± 4.4
<b><i>H. azteca</i></b>					
Survival (%)	NT	NT	NT	88.0 ± 16.4	NT
Dry weight (mg)	NT	NT	NT	0.27 ± 0.06* <sup>α</sup>	NT

SD = Standard Deviation, NT = Not Tested

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the 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)	FR_FRCP1	GH_FR1	CM_MC2
<b><i>P. promelas</i></b>							
<b>10 µg/L Cu</b>							
Hatch (%)	95.0 ± 6.4	100 ± 0.0	98.3 ± 3.3	95.0 ± 6.4	96.7 ± 3.8	98.3 ± 3.3	95.0 ± 6.4
Survival (%)	83.3 ± 11.6	81.7 ± 12.6	80.0 ± 9.4	65.0 ± 22.0	16.7 ± 8.6* <sup>αβ†§</sup>	70.0 ± 3.8	18.3 ± 24.0* <sup>αβ†§</sup>
Biomass (mg)	0.80 ± 0.07	0.78 ± 0.04	0.68 ± 0.03*	0.73 ± 0.13	0.51 ± 0.15* <sup>α§</sup>	0.84 ± 0.01	0.34 ± 0.23* <sup>αβ†§</sup>
Length (mm)	10.9 ± 0.4	10.1 ± 0.2	10.0 ± 0.3	10.6 ± 0.8	13.3 ± 2.0	10.2 ± 0.3*	12.7 ± 2.5
Normal development (%)	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0	100 ± 0.0
<b>20 µg/L Cu</b>							
Hatch (%)	95.0 ± 6.4	NT	NT	NT	95.0 ± 3.3	91.7 ± 6.4	93.3 ± 7.7
Survival (%)	81.7 ± 10.0	NT	NT	NT	78.3 ± 10.0	76.7 ± 12.8	66.7 ± 9.4
Biomass (mg)	0.82 ± 0.13	NT	NT	NT	0.89 ± 0.07	0.83 ± 0.10	0.78 ± 0.08
Length (mm)	10.6 ± 0.3	NT	NT	NT	10.7 ± 0.2	10.4 ± 0.4	10.3 ± 0.4
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

<sup>α</sup> Result was significantly lower than the 10 µg/L copper-treated site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the 10 µg/L copper-treated site control GH\_ER2

<sup>†</sup> 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)	FR_FRCP1	GH_FR1	CM_MC2
<b><i>O. mykiss</i></b>							
Survival (%)	89.7 ± 8.3	62.7 ± 41.8*	51.1 ± 36.2* <sup>α</sup>	31.7 ± 41.8* <sup>α</sup> <sub>β</sub>	24.2 ± 46.1* <sup>α</sup> <sub>β</sub>	20.7 ± 41.4* <sup>α</sup> <sub>β</sub>	20.7 ± 41.4* <sup>αβ</sup>
Viability (%)	83.8 ± 6.3	61.9 ± 41.1*	49.4 ± 35.6* <sup>α</sup>	30.0 ± 41.9* <sup>α</sup> <sub>β</sub>	24.2 ± 46.1* <sup>α</sup> <sub>β</sub>	19.0 ± 37.9* <sup>α</sup> <sub>β</sub>	19.0 ± 37.9* <sup>α</sup> <sub>β</sub>
Length (mm)	18.0 ± 0.3	18.0 ± 0.3	17.8 ± 0.7	17.7 ± 0.2	17.2 ± 1.1	16.5 ± 0.0	20.3 ± 0.0
Wet weight (mg)	71.9 ± 4.2	71.0 ± 7.4	70.6 ± 1.3	74.4 ± 5.1	75.7 ± 8.1	77.9 ± 0.0	91.7 ± 0.0

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sub>β</sub> Result was significantly lower than the site control GH\_ER2

**Summary of Results (continued)**

Endpoint	Mean ± SD			
	GH_ERC	EV_MC2	EV_HC1	LC_LCDSSLCC
<b><i>O. mykiss</i></b>				
Survival (%)	20.5 ± 34.0* αβ	21.8 ± 41.4* αβ	30.8 ± 33.5* αβ	36.4 ± 39.8* αβ
Viability (%)	18.8 ± 32.8* αβ	19.4 ± 38.7* αβ	28.3 ± 31.1* αβ	34.6 ± 36.8* αβ
Length (mm)	16.4 ± 0.5	16.4 ± 1.2	16.2 ± 0.4	19.5 ± 0.6
Wet weight (mg)	69.0 ± 3.3	73.1 ± 4.4	66.4 ± 7.8	85.6 ± 3.4

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

## 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*). 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 2.6 to 9.0°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*, *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.

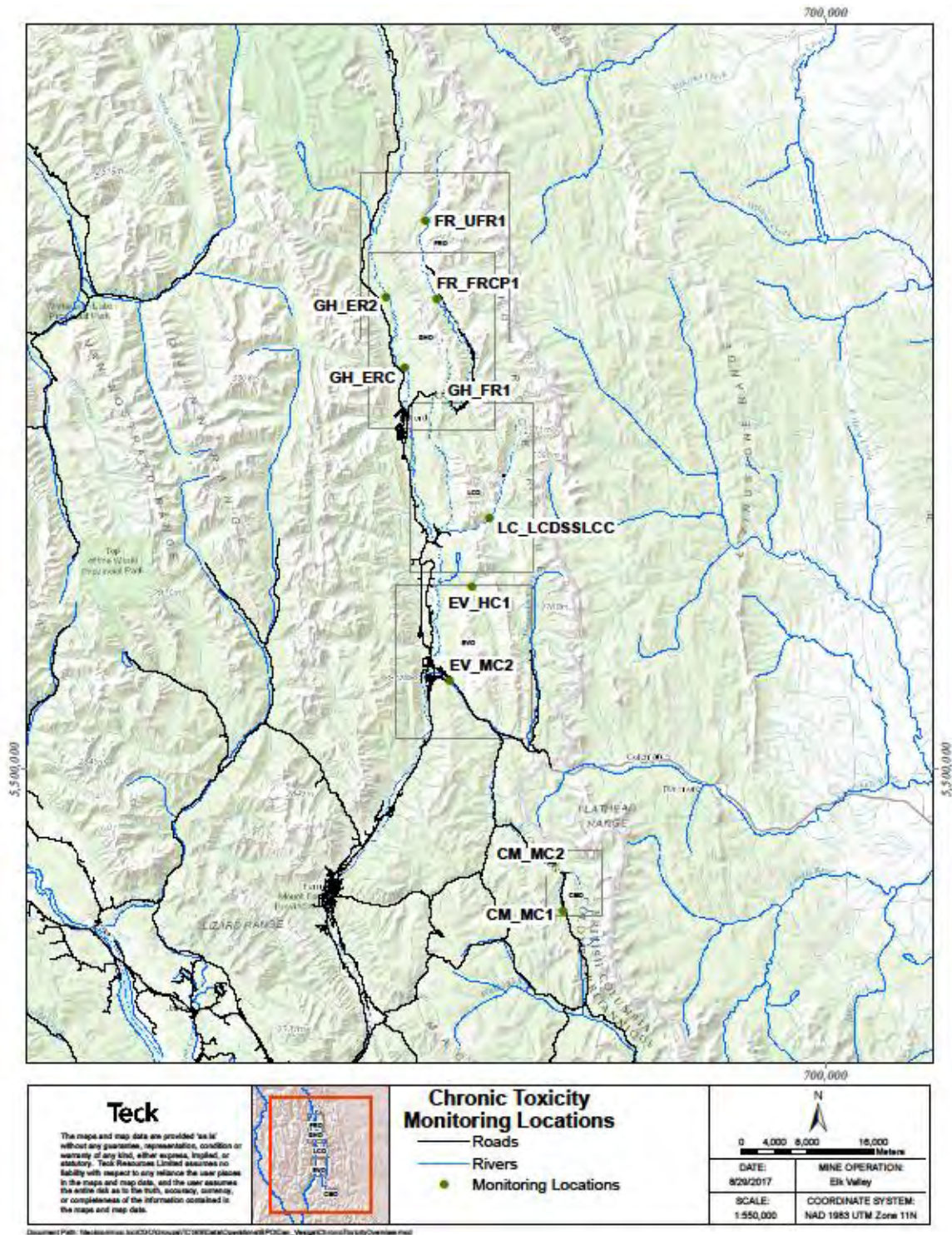
This report presents the results of the toxicity tests. Copies of laboratory data sheets and printouts of statistical analyses are provided in Appendices A through E. Results of analytical chemistry that was performed on the samples tested in this program are uploaded by Teck to the Environmental Management 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.**

<b>Sample ID</b>	<b>EMS Location ID</b>	<b>Species Tested</b>	<b>Sample Collection Dates</b>
FR_UFR1 *	E216777	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
GH_ER2 *	0200389	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
CM_MC1 *	E258175	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
FR_FRCP1	E300071	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
GH_FR1	0200378	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
GH_ERC	E300090	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
EV_MC2	E300091	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
EV_HC1	E102682	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
CM_MC2	E258937	<i>C. dubia</i> , <i>P. subcapitata</i> , <i>H. azteca</i> , <i>P. promelas</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017
LC_LCDSSLCC	E297110	<i>C. dubia</i> , <i>P. subcapitata</i> and <i>O. mykiss</i>	October 2, 10, 17, 24 and 31, 2017

\* Site water controls

**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 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 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
Test acceptability criteria for controls	broods; ≥60% of controls producing three or more broods; no ephippia present
Reference toxicant	Sodium chloride (NaCl)

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

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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 <sub>4</sub> )

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**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)

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**Table 6. Test conditions: *Oncorhynchus mykiss* embryo-alevin test.**

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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)

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## 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), Elk River (GH\_ER2) 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, Elk River and Michel Creek stations.

There were no adverse effects on *C. dubia* survival; survival ranged from 80 to 100% in all samples and control treatments. However, reproduction was significantly reduced in two samples (FR\_FRCP1 and CM\_MC2) compared to all four control and site control waters. Sample CM\_MC2 produced the greatest reduction in reproduction; there was a 59% reduction of reproduction in CM\_MC2 compared to site control CM\_MC1.

### 3.2 *Pseudokirchneriella subcapitata*

Results of the toxicity tests using *P. subcapitata* are provided in Table 8. In these tests, the three site water controls produced 3.7 to 3.8-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 234.2 and 340.2%. There was a statistically significant reduction of cell growth in sample FR\_FRCP1 relative to site water controls GH\_ER2 and CM\_MC1; however, this reduction was only approximately 10%.

### 3.3 *Hyalella azteca*

Results of the toxicity tests using *H. azteca* are provided in Table 9. Survival 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 this endpoint. Dry weight in site water controls FR\_UFR1 and GH\_ER2 was not statistically different compared to the laboratory control. Dry weight of *H. azteca* in site water control CM\_MC1 was statistically lower compared to the laboratory control for this endpoint;

however, the lower growth in this site primarily resulted from poor growth in one of the five replicates. Excluding that replicate, dry weight in CM\_MC1 was  $0.54 \pm 0.06$  mg, similar to FR\_UFR1.

There were no adverse effects on survival in any of the samples compared to the control and site water control treatments. However, there was a statistically significant reduction in dry weight observed in all samples compared to the laboratory control. A significant reduction in dry weight was also observed in sample CM\_MC2 compared to site water control FR\_UFR1.

### 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), since results for hatch, survival, biomass, length and normal development (i.e., incidence of deformities) were similar between site water controls and the laboratory control.

There were no adverse effects on hatch, 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 no adverse effects on any of the endpoints for sample GH\_FR1. Adverse effects were only observed on survival and biomass in samples FR\_FRCP1 and CM\_CM2. Survival was 16.7 and 18.3% in samples FR\_FRCP1 and CM\_CM2, respectively. Biomass was 0.51 and 0.34 mg in samples FR\_FRCP1 and CM\_CM2, respectively, whereas biomass in the laboratory control was 0.80 mg. The reduction in biomass was related to reduced survival, rather than an effect on growth of the surviving fish. These results are consistent with effects caused by microbial growth, and suggest that 10 µg/L copper was not sufficient to control microbial growth in these two samples.

Amending the samples with 20 µg/L copper successfully reduced the toxicity observed in samples FR\_FRCP1 and CM\_CM2 amended with 10 µg/L copper. There were no statistically significant adverse effects observed on any of the endpoints in any of the samples that were amended with 20 µg/L copper.

### 3.5 *Oncorhynchus mykiss*

Results of the toxicity tests using *O. mykiss* are provided in Table 11. Survival and viability were reduced in all three of the site water controls relative to the laboratory control. Based on the presence of adverse responses in each of these upstream site waters, it is likely that the adverse responses observed in the laboratory were related to naturally-occurring microbes, as has been

observed previously with the fathead minnow test, rather than indicating a toxicological effect caused by contaminants.

Similar to the responses observed in the upstream site waters, all of the samples also exhibited reduced survival and viability when compared to the laboratory control. A significant reduction in survival and viability was also apparent between the samples and the Fording River site water (FR\_UFR1) and the Elk River site control (GH\_ER2), but not in relation to the Michel Creek site control (CM\_MC2).

The laboratory control and site water controls produced similar results for the length and wet weight endpoints, indicating that there were no adverse effects associated with the site waters for these two endpoints.

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.**

<b>Sample ID</b>	<b>Survival (%)</b>	<b>Reproduction (Mean ± SD)</b>
Laboratory Control	100	18.4 ± 2.4
FR_UFR1 (Site Control)	100	18.7 ± 4.7
GH_ER2 (Site Control)	100	17.9 ± 2.9
CM_MC1 (Site Control)	100	18.6 ± 2.7
FR_FRCP1	100	9.9 ± 1.1 * <sup>α</sup> β <sup>†</sup>
GH_FR1	100	21.3 ± 1.8
GH_ERC	100	18.6 ± 4.9
EV_MC2	100	23.1 ± 2.6
EV_HC1	100	18.4 ± 2.0
CM_MC2	80	7.6 ± 4.9 * <sup>α</sup> β <sup>†</sup>
LC_LCDSSLCC	100	23.4 ± 2.8

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 8. Results: *Pseudokirchneriella subcapitata* growth inhibition test.**

Sample ID	Cell Yield (x 10 <sup>4</sup> cells/mL)	Stimulation relative to laboratory control (%)
	(Mean ± SD)	
Laboratory Control	29.2 ± 1.8	-
FR_UFR1 (Site Control)	108.1 ± 7.4	269.7
GH_ER2 (Site Control)	109.6 ± 8.2	274.8
CM_MC1 (Site Control)	111.4 ± 6.7	280.8
FR_FRCP1	97.8 ± 4.6 <sup>β†</sup>	234.2
GH_FR1	116.3 ± 9.3	297.4
GH_ERC	128.8 ± 2.5	340.2
EV_MC2	107.8 ± 7.0	268.4
EV_HC1	109.8 ± 8.2	275.2
CM_MC2	105.0 ± 3.4	259.0
LC_LCDSSLCC	103.5 ± 4.4	253.8

SD = Standard Deviation

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

<sup>†</sup> Result was significantly lower than the site control CM\_MC1

**Table 9. Results: *Hyaella azteca* survival and growth test.**

Sample ID	(Mean ± SD)	
	Survival (%)	Dry weight (mg)
Laboratory Control	98.0 ± 4.5	0.63 ± 0.03
FR_UFR1 (Site Control)	100 ± 0.0	0.56 ± 0.07
GH_ER2 (Site Control)	96.0 ± 5.5	0.47 ± 0.17
CM_MC1 (Site Control)	96.0 ± 8.9	0.45 ± 0.20 *
FR_FRCP1	94.0 ± 5.5	0.48 ± 0.07 *
GH_FR1	100 ± 0.0	0.48 ± 0.09 *
CM_MC2	88.0 ± 16.4	0.27 ± 0.06 * <sup>α</sup>

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1



**Table 10. 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	81.7 ± 8.4	0.82 ± 0.05	11.6 ± 0.7	100 ± 0.0
<b>10 µg/L Cu treatment</b>					
Laboratory Control [+Cu]	95.0 ± 6.4	83.3 ± 11.6	0.80 ± 0.07	10.9 ± 0.4	100 ± 0.0
FR_UFR1 (Site Control) [+Cu]	100 ± 0.0	81.7 ± 12.6	0.78 ± 0.04	10.1 ± 0.2	100 ± 0.0
GH_ER2 (Site Control) [+Cu]	98.3 ± 3.3	80.0 ± 9.4	0.68 ± 0.03 *	10.0 ± 0.3	100 ± 0.0
CM_MC1 (Site Control) [+Cu]	95.0 ± 6.4	65.0 ± 22.0	0.73 ± 0.13	10.6 ± 0.8	100 ± 0.0
FR_FRCP1 [+Cu]	96.7 ± 3.8	16.7 ± 8.6 * <sup>αβ†§</sup>	0.51 ± 0.15 * <sup>α§</sup>	13.3 ± 2.0	100 ± 0.0
GH_FR1 [+Cu]	98.3 ± 3.3	70.0 ± 3.8	0.84 ± 0.01	10.2 ± 0.3	100 ± 0.0
CM_MC2 [+Cu]	95.0 ± 6.4	18.3 ± 24.0 * <sup>αβ†§</sup>	0.34 ± 0.23 * <sup>αβ†§</sup>	12.7 ± 2.5	100 ± 0.0
<b>20 µg/L Cu treatment</b>					
Laboratory Control [+Cu]	95.0 ± 6.4	81.7 ± 10.0	0.82 ± 0.13	10.6 ± 0.3	100 ± 0.0
FR_FRCP1 [+Cu]	95.0 ± 3.3	78.3 ± 10.0	0.89 ± 0.07	10.7 ± 0.2	100 ± 0.0
GH_FR1 [+Cu]	91.7 ± 6.4	76.7 ± 12.8	0.83 ± 0.10	10.4 ± 0.4	100 ± 0.0
CM_MC2 [+Cu]	93.3 ± 7.7	66.7 ± 9.4	0.78 ± 0.08	10.3 ± 0.4	100 ± 0.0

SD = Standard Deviation

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

<sup>α</sup> Result was significantly lower than the 10 µg/L copper-treated site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the 10 µg/L copper-treated site control GH\_ER2

<sup>†</sup> Result was significantly lower than the 10 µg/L copper-treated site control CM\_MC1

<sup>§</sup> Result was significantly lower than the corresponding 20 µg/L copper-treated sample

**Table 11. Results: *Oncorhynchus mykiss* embryo-alevin test.**

Sample ID	(Mean ± SD)			
	Survival (%)	Viability (%)	Length (mm)	Wet weight (mg)
Laboratory Control	89.7 ± 8.3	83.8 ± 6.3	18.0 ± 0.3	71.9 ± 4.2
FR_UFR1 (Site Control)	62.7 ± 41.8 * <sup>α</sup>	61.9 ± 41.1 *	18.0 ± 0.3	71.0 ± 7.4
GH_ER2 (Site Control)	51.1 ± 36.2 * <sup>α</sup>	49.4 ± 35.6 * <sup>α</sup>	17.8 ± 0.7	70.6 ± 1.3
CM_MC1 (Site Control)	31.7 ± 41.8 * <sup>αβ</sup>	30.0 ± 41.9 * <sup>αβ</sup>	17.7 ± 0.2	74.4 ± 5.1
FR_FRCP1	24.2 ± 46.1 * <sup>αβ</sup>	24.2 ± 46.1 * <sup>αβ</sup>	17.2 ± 1.1	75.7 ± 8.1
GH_FR1	20.7 ± 41.4 * <sup>αβ</sup>	19.0 ± 37.9 * <sup>αβ</sup>	16.5 ± 0.0	77.9 ± 0.0
GH_ERC	20.5 ± 34.0 * <sup>αβ</sup>	18.8 ± 32.8 * <sup>αβ</sup>	16.4 ± 0.5	69.0 ± 3.3
EV_MC2	21.8 ± 41.4 * <sup>αβ</sup>	19.4 ± 38.7 * <sup>αβ</sup>	16.4 ± 1.2	73.1 ± 4.4
EV_HC1	30.8 ± 33.5 * <sup>αβ</sup>	28.3 ± 31.1 * <sup>αβ</sup>	16.2 ± 0.4	66.4 ± 7.8
CM_MC2	20.7 ± 41.4 * <sup>αβ</sup>	19.0 ± 37.9 * <sup>αβ</sup>	20.3 ± 0.0	91.7 ± 0.0
LC_LCDSSLCC	36.4 ± 39.8 * <sup>αβ</sup>	34.6 ± 36.8 * <sup>αβ</sup>	19.5 ± 0.6	85.6 ± 3.4

SD = Standard Deviation

\* Result was significantly lower than the laboratory control

<sup>α</sup> Result was significantly lower than the site control FR\_UFR1

<sup>β</sup> Result was significantly lower than the site control GH\_ER2

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#### 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)	6	October 4, 2017
	Reproduction (IC50): 1.9 g/L NaCl	1.5 (1.0 – 2.1)	20	
<i>P. subcapitata</i>	Growth (IC50): 34.9 µg/L Zn	32.8 (26.5 – 40.5)	11	September 22, 2017
<i>H. azteca</i>	Survival (LC50): 5.6 g/L NaCl	5.8 (5.2 – 6.6)	6	October 5, 2017
<i>P. promelas</i>	Survival (LC50): 5.1 g/L NaCl	6.0 (4.1 – 9.1)	14	October 5, 2017
	Biomass (IC25): 2.3 g/L NaCl	3.5 (2.0 – 6.3)	20	
<i>O. mykiss</i>	Viability (EC50): 4.6 mg/L SDS	4.2 (2.0 – 8.8)	45	October 5, 2017

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, EC = Effect Concentration

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**APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data**

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# Ceriodaphnia dubia Summary Sheet

Client: Teck Coal  
 Work Order No.: 171091

Start Date/Time: Oct 5/17 @ 700h  
 Set up by: EMM/TS

**Sample Information:**

Sample ID: Various: See results table for IDs  
 Sample Date: Oct 02, 2017  
 Date Received: Oct 03, 2017  
 Sample Volume: Various

**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  $\geq 15$  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) =  $25 \pm 1$ ; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

**Test Organism Information:**

Broodstock No.: 092717B  
 Age of young (Day 0): <24-h (within 12-h)  
 Avg No. young in first 3 broods of previous 7 d: 25  
 Mortality (%) in previous 7 d: 0  
 Individual female # used  $\geq 8$  young on test day: 23, 26, 32, 35, 37, 39, 40

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: CD167  
 Stock Solution ID: 17N205  
 Date Initiated: Oct 4/17

7-d LC50 (95% CL): 2.1(1.5-3.0) g/L NaCl  
 7-d IC50 (95% CL): 1.9(1.6-2.1) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0(1.8-2.2) g/L NaCl CV (%) 6  
 7-d IC50 Reference Toxicant Mean and Historical Range: 1.5(1.0-2.1) g/L NaCl CV (%) 20

**Test Results:**

	Survival (%)	Reproduction (Mean $\pm$ SD)	
05 Negative Control 05	100	18.4 $\pm$ 2.4	
*reproduction (site control) significantly less than lab control	FR-FRCP1_WS_2017-10-02_N19	18.7 $\pm$ 4.7	C= reproduction significantly less than site control CM MCI
(site control)	GH-ER2_WS_2017-10-02_N	17.9 $\pm$ 2.9	
(site control)	CM_MCI_WS_20171003_N	18.6 $\pm$ 2.7	
a= reproduction significantly less than site control FR_UFRI	FR-FRCP1_WS_2017-10-02_N19	9.9 $\pm$ 1.1	*abc
	GH-FRI_WS_2017-10-02_N	21.3 $\pm$ 1.8	
b= reproduction less or not significantly less than site control GH-ER2	GH-ERC_WS_2017-10-02_N	18.6 $\pm$ 4.9	
	GH-MCI_WS_2017-10-02_N	18.4 $\pm$ 2.0	
	EV_MCI2_WS_2017-10-02_N	23.1 $\pm$ 2.6	
	CM_MCI2_WS_20171003_N	7.6 $\pm$ 4.9	*abc
	EM-IC-LCDSSLCC_WS_2017-10-02_N	23.4 $\pm$ 2.8	

Reviewed by: [Signature]

Date reviewed: NOV. 22, 2017

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: Pass / fails various  
 Work Order #: 171091

Start Date & Time: Oct 5/17 @ 700h  
 Stop Date & Time: Oct 12/17 @ 1000h  
 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	25.0	24.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	
DO (mg/L)	8.0	7.8	8.0	7.6	8.0	7.8	8.0	7.3	8.1	7.9	8.2	7.6	8.1	7.5	
pH	8.0	8.0	7.8	8.0	7.9	7.9	8.0	7.9	8.2	8.0	8.1	8.0	8.1	7.9	
Cond. (µS/cm)	216		213		206		210		219		215		218	220	
Initials	EMM		EMM		EMM		EMM		JS		JS		EMM	EMM	

Concentration FR_UFR1	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	
DO (mg/L)	8.2	7.6	8.2	7.5	8.2	7.8	8.1	7.2	8.1	7.9	8.1	7.8	8.2	7.5	
pH	8.3	8.2	8.3	8.2	8.3	8.2	8.1	8.2	8.3	8.0	8.3	8.1	8.3	8.1	
Cond. (µS/cm)	410		365		369		360		367		356		358	356	
Initials	EMM		EMM		EMM		EMM		JS		EMM		EMM	EMM	

Concentration GH_ER2	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	
DO (mg/L)	8.2	7.6	8.2	7.5	8.2	7.8	8.1	7.2	8.1	7.9	8.1	7.8	8.2	7.6	
pH	8.3	8.1	8.3	8.0	8.2	8.1	8.1	8.1	8.2	8.1	8.2	8.2	8.2	8.1	
Cond. (µS/cm)	350		310		312		312		312		316		316	310	
Initials	EMM		EMM		EMM		EMM		JS		EMM		EMM	EMM	

Concentration CU_MCI	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	
DO (mg/L)	8.2	7.6	8.2	7.5	8.2	7.8	8.1	7.2	8.1	7.9	8.0	7.8	8.2	7.6	
pH	8.1	7.9	8.2	7.9	8.2	7.9	8.1	8.1	8.2	8.1	8.2	8.2	8.2	8.3	
Cond. (µS/cm)	339		297		300		300		298		299		298	300	
Initials	EMM		EMM		EMM		EMM		JS		EMM		EMM	EMM	

Thermometer: 4 DO meter/probe: 3 / 1, 2 pH meter/probe: 1 / 2 Conductivity meter/probe: 3 / 1, 2

	Control	FR_UFR1	GH_ER2	CU_MCI
Hardness*	100	192	160	156
Alkalinity*	98	146	148	144

Analysts: EMM, JS

Reviewed by: [Signature]

Date reviewed: Nov 22, 2017

Sample Description: various; see coc for all sample descriptions 1/3

Comments: Broodboard Used: 092617<sup>em</sup> 092717 B (23, 26, 32-35, 37, 39, 40)



## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck Coal  
 Sample ID: pass/fails various  
 Work Order #: 171091

Start Date & Time: Oct 5/17 @ 7:00h  
 Stop Date & Time: Oct 12/17 @ 10:00h  
 CER #: 4  
 Test Species: Ceriodaphnia dubia

Concentration FR-FRCPI	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.2	7.9	8.2	7.8	8.2	7.7	8.0	7.2	8.1	7.9	8.1	7.8	8.2	7.5
pH	8.4	8.3	8.4	8.2	8.4	8.1	8.0	7.9	8.2	8.0	8.2	8.1	8.2	8.1
Cond. (µS/cm)	820	1245		1290		1298		1297		1296		1296		1298
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM

Concentration GH-FRI	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.2	7.8	8.2	7.5	8.2	7.8	8.2	7.3	8.1	7.9	8.1	7.8	8.2	7.3
pH	8.3	8.2	8.3	8.2	8.3	8.2	8.3	7.9	8.3	8.0	8.3	8.2	8.3	8.1
Cond. (µS/cm)	890	836		838		838		853		850		852		850
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM

Concentration GH-FRC	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	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.2	7.6	8.2	7.6	8.2	7.3	8.2	7.3	8.2	7.9	8.1	7.8	8.2	7.3
pH	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.3	8.1	8.3	8.1	8.3	8.2
Cond. (µS/cm)	376	340		348		343		350		352		356		352
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM

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	final
Temperature (°C)	24.0	24.0	24.0	25.0	24.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.2	7.9	8.2	7.6	8.2	7.3	8.1	7.3	8.2	7.9	8.1	7.8	8.2	7.6
pH	8.3	8.1	8.3	8.2	8.3	8.2	8.3	8.2	8.3	8.1	8.3	8.1	8.3	8.1
Cond. (µS/cm)	743	715		716		716		725		729		726		730
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM

Thermometer: 4 DO meter/probe: 1/2 pH meter/probe: 1/2 Conductivity meter/probe: 1/2

	Control	FR-FRCPI	GH-FRI	GH-FRC
Hardness*	100	816	550	184
Alkalinity*	98	232	202	152

Analysts: EMM, JS  
 Reviewed by: [Signature]  
 Date reviewed: Nov-22, 2017

Sample Description: See page 1/3 2/3

Comments: Broodboard Used: 097717B(23,26,32-35,37,39,40)

## Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: FEOK CO2  
 Sample ID: pass/fails various  
 Work Order #: 171091

Start Date & Time: Oct 5/17 @ 700h  
 Stop Date & Time: Oct 12/17 @ 1000h  
 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	final
Temperature (°C)	24.0	24.0	24.0	25.0	24.0	24.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.7	7.8	8.1	7.5	8.2	7.3	8.2	7.3	8.2	7.9	8.1	7.6	8.1	7.3	8.1	7.3
pH	8.2	8.2	8.2	8.2	8.2	7.9	8.2	8.0	8.3	8.1	8.3	8.2	8.3	8.1	8.1	8.1
Cond. (µS/cm)	665	634		630		639		632		640		630		628		628
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM		EMM

Concentration EMM-C2	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	24.0	24.0	25.0	24.0	24.0	24.0	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.7	8.1	8.2	7.6	8.2	7.3	8.2	7.3	8.2	7.9	8.1	7.8	8.2	7.3	8.2	7.3
pH	8.3	8.2	8.3	8.2	8.3	8.1	8.3	8.1	8.3	8.1	8.3	8.1	8.3	8.2	8.2	8.2
Cond. (µS/cm)	1058	1036		1039		1030		1028		1029		1028		1028		1028
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM		EMM

Concentration LC-LCDSLCC	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	24.0	24.0	25.0	24.0	24.0	24.8	25.0	24.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	8.2	8.0	8.2	7.6	8.0	7.3	8.1	7.3	8.2	7.8	8.2	7.8	8.2	7.3	8.2	7.3
pH	8.2	8.1	8.2	8.2	8.1	8.1	8.2	8.1	8.3	8.0	8.3	8.1	8.3	8.1	8.3	8.1
Cond. (µS/cm)	926	899		890		890		903		900		907		901		901
Initials	EMM	EMM		EMM		EMM		JS		EMM		EMM		EMM		EMM

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: L12 pH meter/probe: L12 Conductivity meter/probe: L12  
100% (UN)  
 Control EV-HCl EV-MC2 CM-MC2 LCLCDSLCC  
 Analysts: EMM, JS  
 Hardness\* 100 546 326 690 660  
 Alkalinity\* 98 190 194 208 208 Reviewed by: [Signature]  
 \* mg/L as CaCO3 Date reviewed: Nov 22, 2017

Sample Description: See page 1/3 3/3

Comments: Broodboard Used: 0927178(23,26,32-35,37,39,40)

Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data

Client: beck coal  
Sample ID: POST Fall 5 various  
Work Order: 12109/1

100% (V/V)

Start Date & Time: Oct 5/17 @ 700h  
Stop Date & Time: Oct 12/17 @ 1000h  
Set up by: EMM/JS

Days	Concentration: Control										Concentration: FD UPR										Concentration: GT FPD												
	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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
4	4	4	3	3	4	4	4	4	3	3	EMM	3	3	3	2	3	2	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
5	4	6	3	3	4	3	4	4	3	3	EMM	3	3	3	2	3	2	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
6	5	6	3	3	4	3	4	4	3	3	EMM	3	3	3	2	3	2	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
7	8	10	7	9	10	9	8	8	8	8	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
8	8	10	13	12	12	11	9	11	6	6	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
Total	17	21	23	23	24	18	27	19	17	17	15	18	6	19	21	10	12	16	9	8	9	10	18	15	23	20	19	13	18	18	18	15	15

Days	Concentration: DM MC1										Concentration: FD FD-CP1										Concentration: GH FD-2												
	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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
4	3	3	2	2	3	2	3	3	2	2	EMM	3	3	3	2	3	2	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
5	3	3	2	2	3	2	3	3	2	2	EMM	3	3	3	2	3	2	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
6	8	9	6	6	9	7	9	7	7	7	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
7	9	10	11	11	9	8	9	10	9	8	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
8	9	10	13	12	12	11	9	11	6	6	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
Total	20	12	18	19	24	17	21	20	18	20	15	10	10	11	10	12	16	9	8	9	10	10	18	15	22	22	23	21	22	18	21	15	15

Days	Concentration: GHERC										Concentration: EVTRC1										Concentration: FVMC2												
	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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
4	2	2	2	2	2	2	2	2	2	2	EMM	2	2	2	2	2	2	2	2	2	2	EMM	2	2	2	2	2	2	2	2	2	2	EMM
5	3	3	3	3	3	3	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM	3	3	3	3	3	3	3	3	3	3	EMM
6	6	8	8	8	8	8	8	8	8	8	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
7	8	10	13	12	12	11	9	11	6	6	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
8	8	10	13	12	12	11	9	11	6	6	EMM	4	4	4	4	4	4	4	4	4	4	EMM	4	4	4	4	4	4	4	4	4	4	EMM
Total	17	21	23	23	24	18	27	19	17	17	15	18	6	19	21	10	12	16	9	8	9	10	18	15	23	20	19	13	18	18	18	15	15

Notes: X = mortality.

Sample Description: various, 800 cc for all sample descriptions  
Comments: Trial # Young only based on the first 3 broods. Fourth and subsequent broods not included in total count.

Reviewed by: [Signature] Date reviewed: Nov 22 2017

Chronic Freshwater Toxicity Test  
C. dubia Reproduction Data

Client: Test Coal  
Sample ID: PAS/TOX/VS VARIOUS  
Work Order: 17109/

100% (V/N) 100% (V/N)

Start Date & Time: Oct 5/17 09:00  
Stop Date & Time: Oct 12/17 10:00  
Set up by: EMM/IS

Days	Concentration: 100%										Concentration: 156										Concentration: 3.12																
	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	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM				
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM				
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM				
4	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM				
5	4	3	4	4	2	3	1	2	2	2	EMM	3	10	11	9	4	3	3	3	4	3	2	3	EMM	3	10	11	9	4	3	3	3	4	3	2	3	EMM
6	4	6	4	4	18	3	6	4	4	4	EMM	4	14	14	10	13	12	13	13	14	14	10	14	EMM	4	14	14	10	13	12	13	13	14	14	10	14	EMM
7	4	4	4	4	4	4	4	4	4	4	EMM	4	14	14	10	13	12	13	13	14	14	10	14	EMM	4	14	14	10	13	12	13	13	14	14	10	14	EMM
8	8	9	13	10	10	6	15	6	6	9	EMM	8	16	14	12	12	13	13	13	14	14	10	14	EMM	8	16	14	12	12	13	13	13	14	14	10	14	EMM
Total	6.25										12.5										25																

Days	Concentration: 50										Concentration: 100											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
4	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
5	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
6	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
7	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
8	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
Total	50										100											

Days	Concentration: 50										Concentration: 100											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
2	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
3	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
4	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
5	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
6	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
7	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
8	/	/	/	/	/	/	/	/	/	/	EMM	/	/	/	/	/	/	/	/	/	/	EMM
Total	50										100											

Notes: X = mortality.

Sample Description: various of 500 coc for all sample descriptions

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: EMM

Date reviewed: Nov 22, 2017

2/2

Client: Tock

W.O.#: 171091

### Hardness and Alkalinity Datasheet

Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	Alkalinity		Total Alkalinity (mg/L CaCO <sub>3</sub> )	Hardness		Technician
				(mL) 0.02N HCl/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCl/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2		Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
① FR-VER1	Oct 5/17	Oct 5/17	50	7.5	7.7	146	9.0	192	AW2
② GH-ER2				7.5	7.6	149	8.0	160	AW2
③ CM-MC1				7.4	7.6	144	7.8	156	AW2
④ FR-FRCP1				11.8	12.0	232	8.1	210	AW2
⑤ GH-FR1				10.3	10.5	202	8.5	250	AW2
⑥ GH-ERC				7.0	8.0	152	9.2	184	AW2
⑦ EV-HC1				9.8	10.1	190	5.4	540	AW2
⑧ EV-MC2				9.9	10.1	194	16.3	326	AW2
⑨ CM-MC2				10.6	10.8	208	6.9	690	AW2
⑩ LC-LCNSLIC				10.6	10.8	208	6.6	660	AW2
20% Ferrar			50	5.0	5.1	98	5.0	100	AW2

Notes: ① Diluted up to 100ml w/ DI

Reviewed by: [Signature]

Date Reviewed: Nov 22, 2017

**CETIS Summary Report**

Report Date: 10 Nov-17 10:39 (p 1 of 2)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Batch ID: 14-4097-1323      Test Type: Reproduction-Survival (7d)      Analyst: Jill Sones  
 Start Date: 05 Oct-17 07:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 12 Oct-17 10:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 7d 3h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

**7d 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%
GH_ER2	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%
FR_FRCP1	10	1	1	1	1	1	0	0	0.0%	0.0%
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_HC1	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%
CM_MC2	10	0.8	0.4984	1	0	1	0.1333	0.4216	52.7%	20.0%
LC_LCDSSLCC	10	1	1	1	1	1	0	0	0.0%	0.0%

**CETIS Summary Report**

Report Date: 10 Nov-17 10:39 (p 2 of 2)  
 Test Code: 171091 | 15-5722-2938

**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	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	1	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	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	0	1	1	1	1	0	1
LC_LCDSSLCC	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	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	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	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	0/1	1/1
LC_LCDSSLCC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Analyst: JS QA: Nov-22/17

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 10 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 14-0965-0009      Endpoint: 7d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 07 Nov-17 17:47      Analysis: STP 2x2 Contingency Tables      Official Results: Yes  
 Batch ID: 14-4097-1323      Test Type: Reproduction-Survival (7d)      Analyst: Jill Sones  
 Start Date: 05 Oct-17 07:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 12 Oct-17 10:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 7d 3h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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		GH_ER2	1	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	1	1.0000	Exact	Non-Significant Effect
Lab Control		CM_MC2	0.2368	1.0000	Exact	Non-Significant Effect
Lab Control		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

<sup>35</sup> ~~lab contr~~  
 ① lab control = 20% Perrier



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 11 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 14-0965-0009      Endpoint: 7d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 07 Nov-17 17:47      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	10	0	10	1	0	0.0%
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	10	0	10	1	0	0.0%
CM_MC2	8	2	10	0.8	0.2	20.0%
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
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	1	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	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	0	1	1	1	1	0	1
LC_LCDSSLCC	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	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	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	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	0/1	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 Nov-17 10:38 (p 12 of 12)

Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 14-0965-0009

Endpoint: 7d Survival Rate

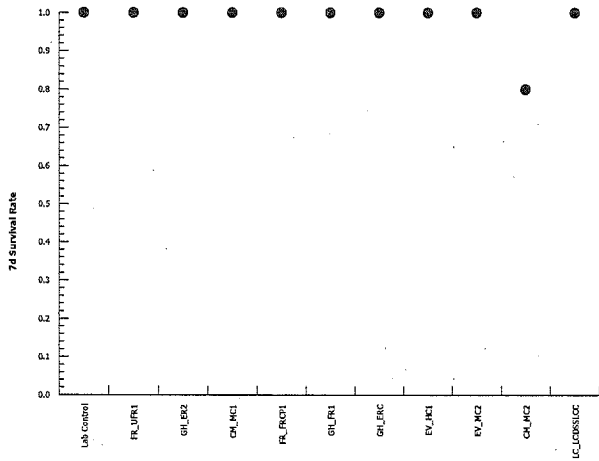
CETIS Version: CETISv1.8.7

Analyzed: 07 Nov-17 17:47

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

### Graphics



*Handwritten signature*  
Nov 22/17

# CETIS Analytical Report

Report Date: 10 Nov-17 10:38 (p 7 of 12)  
 Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

<b>Analysis ID:</b> 16-4009-7279	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 10:33	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-4097-1323	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Jill Sones
<b>Start Date:</b> 05 Oct-17 07:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 12 Oct-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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		GH_ER2	1	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	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.2368	1.0000	Exact	Non-Significant Effect
FR_UFR1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① FR\_UFR1 = site control

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 8 of 12)

Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 16-4009-7279  
Analyzed: 10 Nov-17 10:33

Endpoint: 7d Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
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%
GH_ER2	10	0	10	1	0	0.0%
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	10	0	10	1	0	0.0%
CM_MC2	8	2	10	0.8	0.2	20.0%
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
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	1	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	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	0	1	1	1	1	0	1
LC_LCDSSLCC	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	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	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	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	0/1	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 Nov-17 10:38 (p 9 of 12)  
Test Code: 171091 | 15-5722-2938

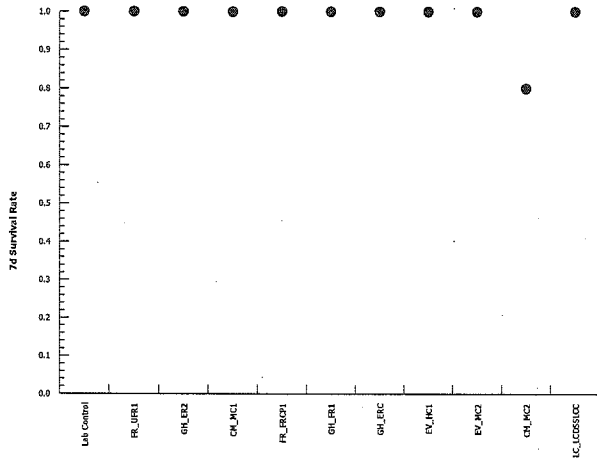
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 16-4009-7279      Endpoint: 7d Survival Rate  
Analyzed: 10 Nov-17 10:33      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 1 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

Nautilus Environmental

<b>Analysis ID:</b> 02-6692-0665	<b>Endpoint:</b> 7d Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 10:30	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-4097-1323	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Jill Sones
<b>Start Date:</b> 05 Oct-17 07:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 12 Oct-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1	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_HC1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		EV_MC2	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.2368	1.0000	Exact	Non-Significant Effect
GH_ER2		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① GH\_ER2 = site control

# CETIS Analytical Report

Report Date: 10 Nov-17 10:38 (p 2 of 12)  
 Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-6692-0665      Endpoint: 7d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 10 Nov-17 10:30      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%
GH_ER2      Site Control	10	0	10	1	0	0.0%
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	10	0	10	1	0	0.0%
CM_MC2	8	2	10	0.8	0.2	20.0%
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
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	1	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	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	0	1	1	1	1	0	1
LC_LCDSSLCC	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	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	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	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	0/1	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 Nov-17 10:38 (p 3 of 12)  
Test Code: 171091 | 15-5722-2938

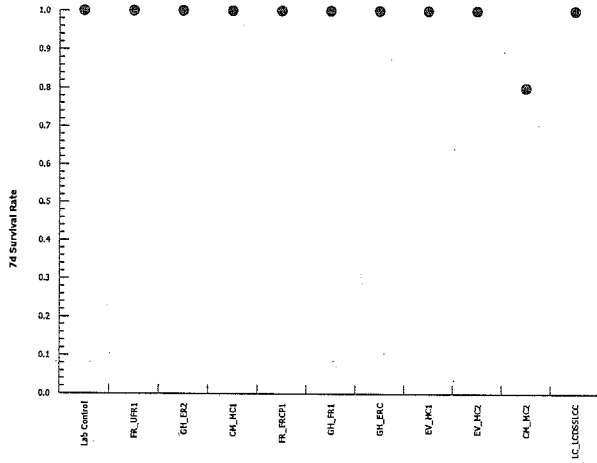
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 02-6692-0665      Endpoint: 7d Survival Rate  
Analyzed: 10 Nov-17 10:30      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics





**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 4 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 12-1187-8901	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 10:32	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 14-4097-1323	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones
Start Date: 05 Oct-17 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water
Ending Date: 12 Oct-17 10:00	Species: Ceriodaphnia dubia	Brine:
Duration: 7d 3h	Source: In-House Culture	Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1	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	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.2368	1.0000	Exact	Non-Significant Effect
CM_MC1		LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

① CM\_MC1 = site control

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:38 (p 5 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 12-1187-8901      Endpoint: 7d Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 10 Nov-17 10:32      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%
GH_ER2	10	0	10	1	0	0.0%
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	10	0	10	1	0	0.0%
CM_MC2	8	2	10	0.8	0.2	20.0%
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
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	1	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	1	1	1	1	1	1	1	1	1
CM_MC2	1	1	1	0	1	1	1	1	0	1
LC_LCDSSLCC	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	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	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	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	0/1	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 Nov-17 10:38 (p 6 of 12)  
Test Code: 171091 | 15-5722-2938

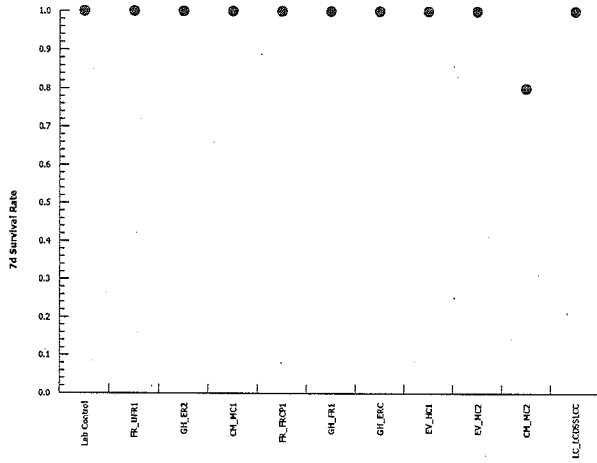
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-1187-8901      Endpoint: 7d Survival Rate  
Analyzed: 10 Nov-17 10:32      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



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Nov-22/17

# CETIS Summary Report

Report Date: 10 Nov-17 10:39 (p 1 of 2)  
 Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Batch ID: 14-4097-1323      Test Type: Reproduction-Survival (7d)      Analyst: Jill Sones  
 Start Date: 05 Oct-17 07:00      Protocol: EC/EPS 1/RM/21      Diluent: 20% Perrier Water  
 Ending Date: 12 Oct-17 10:00      Species: Ceriodaphnia dubia      Brine:  
 Duration: 7d 3h      Source: In-House Culture      Age: <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

### Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	10	18.4	16.67	20.13	14	22	0.763	2.413	13.11%	0.0%
FR_UFR1	10	18.7	15.33	22.07	6	22	1.491	4.715	25.22%	-1.63%
GH_ER2	10	17.9	15.81	19.99	13	23	0.9244	2.923	16.33%	2.72%
CM_MC1	10	18.6	16.69	20.51	12	21	0.8459	2.675	14.38%	-1.09%
FR_FRCP1	10	9.9	9.113	10.69	8	12	0.348	1.101	11.12%	46.2%
GH_FR1	10	21.3	20.04	22.56	18	25	0.5588	1.767	8.3%	-15.76%
GH_ERC	10	18.6	15.09	22.11	7	24	1.551	4.904	26.36%	-1.09%
EV_HC1	10	18.4	17	19.8	14	21	0.6182	1.955	10.63%	0.0%
EV_MC2	10	23.1	21.27	24.93	18	26	0.809	2.558	11.07%	-25.54%
CM_MC2	10	7.6	4.108	11.09	0	15	1.543	4.881	64.22%	58.7%
LC_LCDSSLCC	10	23.4	21.4	25.4	19	27	0.8844	2.797	11.95%	-27.17%

# CETIS Summary Report

Report Date: 10 Nov-17 10:39 (p 2 of 2)  
Test Code: 171091 | 15-5722-2938

## 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	17	22	19	18	14	21	18	21	17	17
FR_UFR1	18	6	19	21	21	18	22	21	22	19
GH_ER2	18	15	23	20	19	13	18	18	20	15
CM_MC1	20	12	18	19	21	17	21	20	18	20
FR_FRCP1	10	10	11	10	12	10	9	8	9	10
GH_FR1	20	21	22	22	25	21	21	22	18	21
GH_ERC	17	21	23	23	24	18	17	19	7	17
EV_HC1	19	18	18	21	19	18	14	17	20	20
EV_MC2	20	26	24	24	25	23	23	22	18	26
CM_MC2	8	9	13	0	10	6	15	6	0	9
LC_LCDSSLCC	26	27	22	26	23	23	25	24	19	19

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Nov 22/17

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:39 (p 10 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-8679-6309	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 9:59	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-4097-1323	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Jill Sones
<b>Start Date:</b> 05 Oct-17 07:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 12 Oct-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.5%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① Lab Control		FR_UFR1	121	72	4	18	0.9979	Asymp	Non-Significant Effect
		GH_ER2	102.5	72	2	18	0.8643	Asymp	Non-Significant Effect
		CM_MC1	111	72	4	18	0.9714	Asymp	Non-Significant Effect
		FR_FRCP1	55	72	0	18	0.0007	Asymp	Significant Effect
		GH_FR1	137.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	112	72	4	18	0.9771	Asymp	Non-Significant Effect
		EV_HC1	108	72	5	18	0.9472	Asymp	Non-Significant Effect
		EV_MC2	146.5	72	2	18	1.0000	Asymp	Non-Significant Effect
		CM_MC2	56	72	0	18	0.0010	Asymp	Significant Effect
		LC_LCDSSLCC	147.5	72	2	18	1.0000	Asymp	Non-Significant Effect

① Lab control = 20% Perrier

# CETIS Analytical Report

Report Date: 10 Nov-17 10:39 (p 11 of 12)

Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 07-8679-6309

Endpoint: Reproduction

CETIS Version: CETISv1.8.7

Analyzed: 10 Nov-17 9:59

Analysis: Nonparametric-Control vs Treatments

Official Results: Yes

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.691	240.9691	10	23.22	<0.0001	Significant Effect
Error	1027.3	10.37677	99			
Total	3436.991		109			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	32.89	23.21	0.0003	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.9683	<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	18.4	16.67	20.13	18	14	22	0.763	13.11%	0.0%
FR_UFR1	10	18.7	15.33	22.07	20	6	22	1.491	25.22%	-1.63%
GH_ER2	10	17.9	15.81	19.99	18	13	23	0.9244	16.33%	2.72%
CM_MC1	10	18.6	16.69	20.51	19.5	12	21	0.8459	14.38%	-1.09%
FR_FRCP1	10	9.9	9.113	10.69	10	8	12	0.348	11.12%	46.2%
GH_FR1	10	21.3	20.04	22.56	21	18	25	0.5588	8.3%	-15.76%
GH_ERC	10	18.6	15.09	22.11	18.5	7	24	1.551	26.36%	-1.09%
EV_HC1	10	18.4	17	19.8	18.5	14	21	0.6182	10.63%	0.0%
EV_MC2	10	23.1	21.27	24.93	23.5	18	26	0.809	11.07%	-25.54%
CM_MC2	10	7.6	4.108	11.09	8.5	0	15	1.543	64.22%	58.7%
LC_LCDSSLCC	10	23.4	21.4	25.4	23.5	19	27	0.8844	11.95%	-27.17%

### 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	17	22	19	18	14	21	18	21	17	17
FR_UFR1	18	6	19	21	21	18	22	21	22	19
GH_ER2	18	15	23	20	19	13	18	18	20	15
CM_MC1	20	12	18	19	21	17	21	20	18	20
FR_FRCP1	10	10	11	10	12	10	9	8	9	10
GH_FR1	20	21	22	22	25	21	21	22	18	21
GH_ERC	17	21	23	23	24	18	17	19	7	17
EV_HC1	19	18	18	21	19	18	14	17	20	20
EV_MC2	20	26	24	24	25	23	23	22	18	26
CM_MC2	8	9	13	0	10	6	15	6	0	9
LC_LCDSSLCC	26	27	22	26	23	23	25	24	19	19

Ceriodaphnia 7-d Survival and Reproduction Test

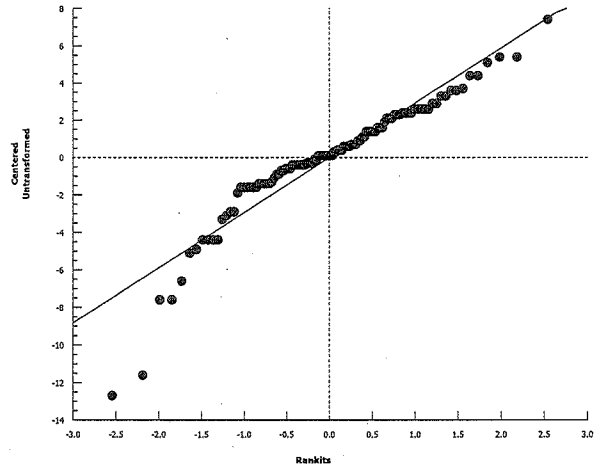
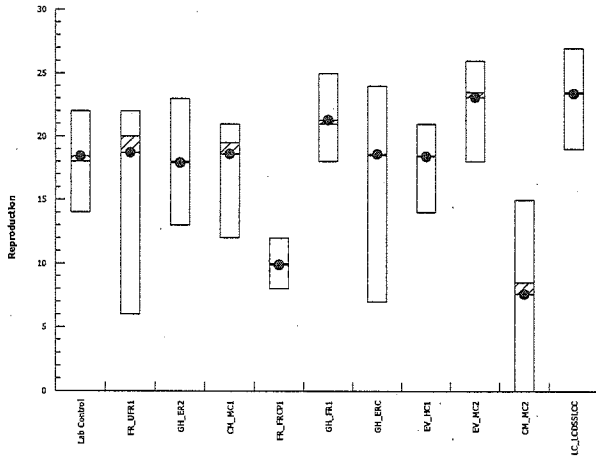
Nautilus Environmental

Analysis ID: 07-8679-6309  
Analyzed: 10 Nov-17 9:59

Endpoint: Reproduction  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 10 Nov-17 10:39 (p 1 of 12)  
 Test Code: 171091 | 15-5722-2938

<b>Ceriodaphnia 7-d Survival and Reproduction Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 01-5315-6641	Endpoint: Reproduction	CETIS Version: CETISv1.8.7			
Analyzed: 10 Nov-17 10:08	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes			
Batch ID: 14-4097-1323	Test Type: Reproduction-Survival (7d)	Analyst: Jill Sones			
Start Date: 05 Oct-17 07:00	Protocol: EC/EPS 1/RM/21	Diluent: 20% Perrier Water			
Ending Date: 12 Oct-17 10:00	Species: Ceriodaphnia dubia	Brine:			
Duration: 7d 3h	Source: In-House Culture	Age: <24h			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.1%	

**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	89	72	5	18	0.4376	Asymp	Non-Significant Effect
		GH_ER2	88	72	2	18	0.4016	Asymp	Non-Significant Effect
		CM_MC1	93	72	3	18	0.5843	Asymp	Non-Significant Effect
		FR_FRCP1	65	72	0	18	0.0102	Asymp	Significant Effect
		GH_FR1	125	72	4	18	0.9994	Asymp	Non-Significant Effect
		GH_ERC	101.5	72	3	18	0.8428	Asymp	Non-Significant Effect
		EV_HC1	87.5	72	3	18	0.3840	Asymp	Non-Significant Effect
		EV_MC2	141	72	3	18	1.0000	Asymp	Non-Significant Effect
		CM_MC2	62	72	1	18	0.0049	Asymp	Significant Effect
		LC_LCDSSLCC	142	72	3	18	1.0000	Asymp	Non-Significant Effect

① FR\_UFR1 = site control

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:39 (p 2 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

Analysis ID: 01-5315-6641      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 10 Nov-17 10:08      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.691	240.9691	10	23.22	<0.0001	Significant Effect
Error	1027.3	10.37677	99			
Total	3436.991		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	32.89	23.21	0.0003	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.9683	<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	18.4	16.67	20.13	18	14	22	0.763	13.11%	0.0%
FR_UFR1	10	18.7	15.33	22.07	20	6	22	1.491	25.22%	-1.63%
GH_ER2	10	17.9	15.81	19.99	18	13	23	0.9244	16.33%	2.72%
CM_MC1	10	18.6	16.69	20.51	19.5	12	21	0.8459	14.38%	-1.09%
FR_FRCP1	10	9.9	9.113	10.69	10	8	12	0.348	11.12%	46.2%
GH_FR1	10	21.3	20.04	22.56	21	18	25	0.5588	8.3%	-15.76%
GH_ERC	10	18.6	15.09	22.11	18.5	7	24	1.551	26.36%	-1.09%
EV_HC1	10	18.4	17	19.8	18.5	14	21	0.6182	10.63%	0.0%
EV_MC2	10	23.1	21.27	24.93	23.5	18	26	0.809	11.07%	-25.54%
CM_MC2	10	7.6	4.108	11.09	8.5	0	15	1.543	64.22%	58.7%
LC_LCDSSLCC	10	23.4	21.4	25.4	23.5	19	27	0.8844	11.95%	-27.17%

**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	17	22	19	18	14	21	18	21	17	17
FR_UFR1	18	6	19	21	21	18	22	21	22	19
GH_ER2	18	15	23	20	19	13	18	18	20	15
CM_MC1	20	12	18	19	21	17	21	20	18	20
FR_FRCP1	10	10	11	10	12	10	9	8	9	10
GH_FR1	20	21	22	22	25	21	21	22	18	21
GH_ERC	17	21	23	23	24	18	17	19	7	17
EV_HC1	19	18	18	21	19	18	14	17	20	20
EV_MC2	20	26	24	24	25	23	23	22	18	26
CM_MC2	8	9	13	0	10	6	15	6	0	9
LC_LCDSSLCC	26	27	22	26	23	23	25	24	19	19

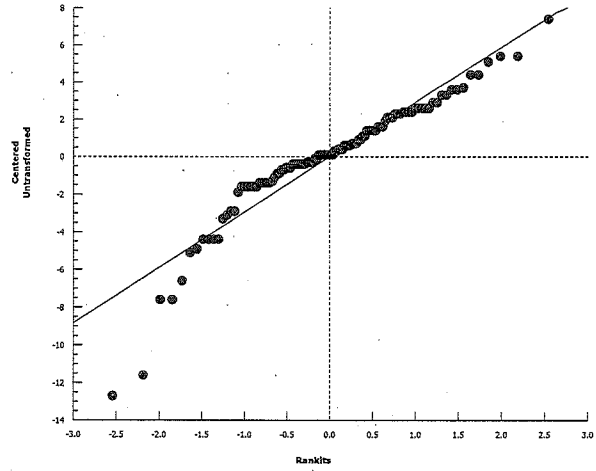
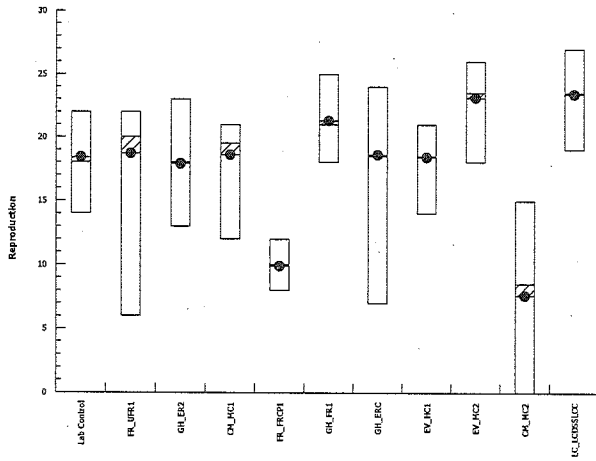
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 01-5315-6641      Endpoint: Reproduction  
Analyzed: 10 Nov-17 10:08      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



# CETIS Analytical Report

Report Date: 10 Nov-17 10:39 (p 7 of 12)

Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

<b>Analysis ID:</b> 21-3181-4651	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 10:28	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-4097-1323	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Jill Sones
<b>Start Date:</b> 05 Oct-17 07:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 12 Oct-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	20.0%	

### Steel Many-One Rank Sum Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
① GH_ER2		Lab Control	107.5	72	2	18	0.9419	Asymp	Non-Significant Effect
		FR_UFR1	122	72	2	18	0.9984	Asymp	Non-Significant Effect
		CM_MC1	115.5	72	3	18	0.9901	Asymp	Non-Significant Effect
		FR_FRCP1	55	72	0	18	0.0007	Asymp	Significant Effect
		GH_FR1	140.5	72	2	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	113	72	3	18	0.9818	Asymp	Non-Significant Effect
		EV_HC1	110.5	72	3	18	0.9682	Asymp	Non-Significant Effect
		EV_MC2	145.5	72	3	18	1.0000	Asymp	Non-Significant Effect
		CM_MC2	57.5	72	2	18	0.0015	Asymp	Significant Effect
	LC_LCDSSLCC	146	72	2	18	1.0000	Asymp	Non-Significant Effect	

① GH\_ER2 = site control

# CETIS Analytical Report

Report Date: 10 Nov-17 10:39 (p 8 of 12)  
 Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 21-3181-4651      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 10 Nov-17 10:28      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.691	240.9691	10	23.22	<0.0001	Significant Effect
Error	1027.3	10.37677	99			
Total	3436.991		109			

### Distributional Tests


Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	32.89	23.21	0.0003	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.9683	<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	18.4	16.67	20.13	18	14	22	0.763	13.11%	0.0%
FR_UFR1	10	18.7	15.33	22.07	20	6	22	1.491	25.22%	-1.63%
GH_ER2	10	17.9	15.81	19.99	18	13	23	0.9244	16.33%	2.72%
CM_MC1	10	18.6	16.69	20.51	19.5	12	21	0.8459	14.38%	-1.09%
FR_FRCP1	10	9.9	9.113	10.69	10	8	12	0.348	11.12%	46.2%
GH_FR1	10	21.3	20.04	22.56	21	18	25	0.5588	8.3%	-15.76%
GH_ERC	10	18.6	15.09	22.11	18.5	7	24	1.551	26.36%	-1.09%
EV_HC1	10	18.4	17	19.8	18.5	14	21	0.6182	10.63%	0.0%
EV_MC2	10	23.1	21.27	24.93	23.5	18	26	0.809	11.07%	-25.54%
CM_MC2	10	7.6	4.108	11.09	8.5	0	15	1.543	64.22%	58.7%
LC_LCDSSLCC	10	23.4	21.4	25.4	23.5	19	27	0.8844	11.95%	-27.17%

### 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	17	22	19	18	14	21	18	21	17	17
FR_UFR1	18	6	19	21	21	18	22	21	22	19
GH_ER2	18	15	23	20	19	13	18	18	20	15
CM_MC1	20	12	18	19	21	17	21	20	18	20
FR_FRCP1	10	10	11	10	12	10	9	8	9	10
GH_FR1	20	21	22	22	25	21	21	22	18	21
GH_ERC	17	21	23	23	24	18	17	19	7	17
EV_HC1	19	18	18	21	19	18	14	17	20	20
EV_MC2	20	26	24	24	25	23	23	22	18	26
CM_MC2	8	9	13	0	10	6	15	6	0	9
LC_LCDSSLCC	26	27	22	26	23	23	25	24	19	19

*Handwritten:*   
 Nov 22/17

# CETIS Analytical Report

Report Date: 10 Nov-17 10:39 (p 9 of 12)  
Test Code: 171091 | 15-5722-2938

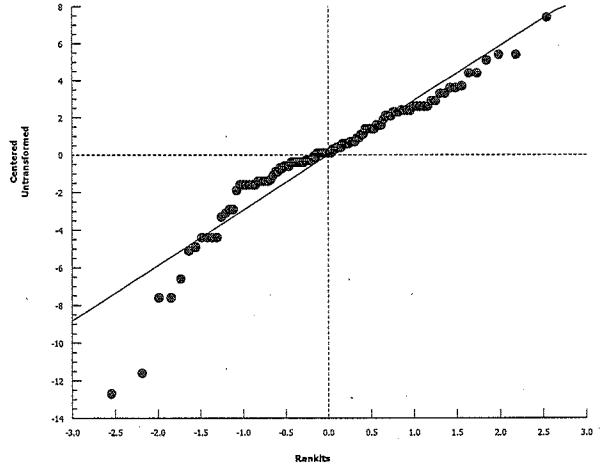
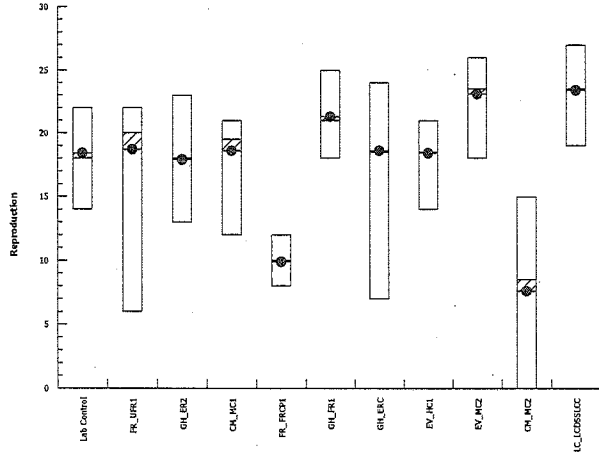
## Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 21-3181-4651      Endpoint: Reproduction  
Analyzed: 10 Nov-17 10:28      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 10:39 (p 4 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-5782-2912	<b>Endpoint:</b> Reproduction	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 10:22	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 14-4097-1323	<b>Test Type:</b> Reproduction-Survival (7d)	<b>Analyst:</b> Jill Sones
<b>Start Date:</b> 05 Oct-17 07:00	<b>Protocol:</b> EC/EPS 1/RM/21	<b>Diluent:</b> 20% Perrier Water
<b>Ending Date:</b> 12 Oct-17 10:00	<b>Species:</b> Ceriodaphnia dubia	<b>Brine:</b>
<b>Duration:</b> 7d 3h	<b>Source:</b> In-House Culture	<b>Age:</b> <24h

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	00-5024-4324	05 Oct-17	05 Oct-17	7h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	67h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	68h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	62h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	66h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	66h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	67h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	69h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	68h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	61h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	70h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Water Sample	Teck Coal	20% Perrier Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.2%	

**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		Lab Control	99	72	5	18	0.7799	Asymp	Non-Significant Effect
		FR_UFR1	117	72	4	18	0.9933	Asymp	Non-Significant Effect
		GH_ER2	94.5	72	3	18	0.6376	Asymp	Non-Significant Effect
		FR_FRCP1	55.5	72	1	18	0.0008	Asymp	Significant Effect
		GH_FR1	140.5	72	4	18	1.0000	Asymp	Non-Significant Effect
		GH_ERC	106	72	5	18	0.9236	Asymp	Non-Significant Effect
		EV_HC1	97.5	72	6	18	0.7362	Asymp	Non-Significant Effect
		EV_MC2	144.5	72	2	18	1.0000	Asymp	Non-Significant Effect
		CM_MC2	57	72	0	18	0.0013	Asymp	Significant Effect
	LC_LCDSSLCC	144	72	1	18	1.0000	Asymp	Non-Significant Effect	

① CM\_MC1 = site control

**CETIS Analytical Report**

Report Date: 10 Nov-17 10:39 (p 5 of 12)  
 Test Code: 171091 | 15-5722-2938

**Ceriodaphnia 7-d Survival and Reproduction Test** **Nautilus Environmental**

Analysis ID: 17-5782-2912      Endpoint: Reproduction      CETIS Version: CETISv1.8.7  
 Analyzed: 10 Nov-17 10:22      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2409.691	240.9691	10	23.22	<0.0001	Significant Effect
Error	1027.3	10.37677	99			
Total	3436.991		109			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	32.89	23.21	0.0003	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9105	0.9683	<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	18.4	16.67	20.13	18	14	22	0.763	13.11%	0.0%
FR_UFR1	10	18.7	15.33	22.07	20	6	22	1.491	25.22%	-1.63%
GH_ER2	10	17.9	15.81	19.99	18	13	23	0.9244	16.33%	2.72%
CM_MC1	10	18.6	16.69	20.51	19.5	12	21	0.8459	14.38%	-1.09%
FR_FRCP1	10	9.9	9.113	10.69	10	8	12	0.348	11.12%	46.2%
GH_FR1	10	21.3	20.04	22.56	21	18	25	0.5588	8.3%	-15.76%
GH_ERC	10	18.6	15.09	22.11	18.5	7	24	1.551	26.36%	-1.09%
EV_HC1	10	18.4	17	19.8	18.5	14	21	0.6182	10.63%	0.0%
EV_MC2	10	23.1	21.27	24.93	23.5	18	26	0.809	11.07%	-25.54%
CM_MC2	10	7.6	4.108	11.09	8.5	0	15	1.543	64.22%	58.7%
LC_LCDSSLCC	10	23.4	21.4	25.4	23.5	19	27	0.8844	11.95%	-27.17%

**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	17	22	19	18	14	21	18	21	17	17
FR_UFR1	18	6	19	21	21	18	22	21	22	19
GH_ER2	18	15	23	20	19	13	18	18	20	15
CM_MC1	20	12	18	19	21	17	21	20	18	20
FR_FRCP1	10	10	11	10	12	10	9	8	9	10
GH_FR1	20	21	22	22	25	21	21	22	18	21
GH_ERC	17	21	23	23	24	18	17	19	7	17
EV_HC1	19	18	18	21	19	18	14	17	20	20
EV_MC2	20	26	24	24	25	23	23	22	18	26
CM_MC2	8	9	13	0	10	6	15	6	0	9
LC_LCDSSLCC	26	27	22	26	23	23	25	24	19	19



# CETIS Analytical Report

Report Date: 10 Nov-17 10:39 (p 6 of 12)  
Test Code: 171091 | 15-5722-2938

## Ceriodaphnia 7-d Survival and Reproduction Test

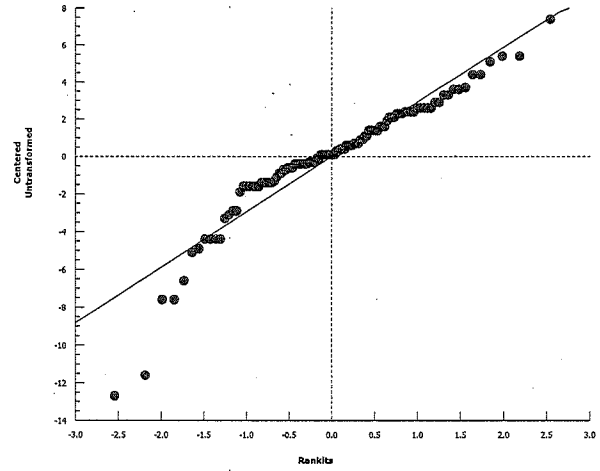
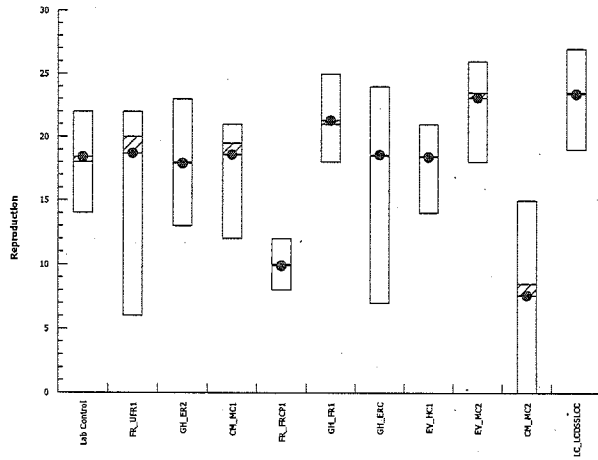
Nautilus Environmental

Analysis ID: 17-5782-2912  
Analyzed: 10 Nov-17 10:22

Endpoint: Reproduction  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



*JS*  
Nov-22/17

**APPENDIX B – *Pseudokirchneriella subcapitata* Toxicity Test Data**

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**Pseudokirchneriella subcapitata Summary Sheet**

Client: Teck Coal  
 Work Order No.: 171090

Start Date: Oct 4/17  
 Set up by: MLT

**Sample Information:**

Sample ID: Various: see results table for IDs  
 Sample Date: Oct 2/17  
 Date Received: Oct 3/17  
 Sample Volume: Various

**Test Organism Information:**

Culture Date: Sept 29/17  
 Age of culture (Day 0): 5d

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: SC161  
 Stock Solution ID: 172003  
 Date Initiated: Sept 22/17

72-h IC50 (95% CL): 34.9 (32.9-37.0) µg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 32.8 (26.5-40.5) µg/L Zn CV (%): 11

Test Results:	Cell Yield (Mean ± SD)
Negative Control	29.2 ± 1.8
FR-UFRI-WS-2017-10-02-N	108.1 ± 7.4 *
GH-ER2-WS-2017-10-02-N	109.6 ± 8.2 *
CM-MCI-WS-20171003-N	111.4 <sup>MLT</sup> 106.3 ± <sup>MLT</sup> 3.7 <sub>MLT</sub> 6.7 *
FR-FRCPI-WS-2017-10-02-N-3	97.8 <sup>MLT</sup> 46.5 ± <sup>MLT</sup> 4.7 <sub>MLT</sub> 4.6 * <sup>D</sup>
GH-FRI-WS-2017-10-02-N	116.3 ± 9.7 *
GH-ER2-WS-2017-10-02-N	128.8 ± 2.5 * <sup>a</sup>
EV-HCL-WS-2017-10-02-N	109.8 ± 8.2 *
EV-MC2-WS-2017-10-02-N	107.8 ± 7.0 *
CM-MC2-WS-20171003-N	105.0 ± 3.4 *
LC-LCPSSICC-WS-2017-10-02-N	103.5 ± 4.4 *

\* indicates cell yield that were significantly greater than the lab control  
 a. indicates cell yield that were significantly greater than site controls FR-UFRI, GH-ER2, and CM-MCI

b. indicates cell yield that were significantly lower than site controls GH-ER2 and CM-MCI

Reviewed by: [Signature] Date reviewed: Nov 20, 2017

### 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teck coal Setup by: MLT  
 Sample ID: various Test Date/Time: Oct 4/17 @ 1235h  
 Work Order No.: 171090 CER #: 4  
 Test Species: Pseudokirchneriella subcapitata  
 Culture Date: Sept 29/17 Age of Culture: 5d Culture Health: Good  
 Culture Count: 1 355 2 345 Average: 350 Culture Cell Density (c1): 350 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/ml} \times 100 \text{ ml}}{(c1) \quad 350 \times 10^4 \quad \text{cells/ml}} = 6.29 \text{ mL}$$

Time Zero Counts: 1 21 2 22 Average: 21.5

No. of Cells/mL: 21.5 x 10<sup>4</sup> / ML Initial Density: # cells/mL + 220 μL x 10 μL = 9773 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	6.8	23.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
FR-FRI	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
GH-ER2	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MC1	8.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
FR-FRCPI	8.4	23.0	↓	↓	↓	↓	✓	✓	✓	✓
GH-FRI	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
GH-ERC	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
EV-HCI	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
EV-MC2	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
CM-MC2	8.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT	MLT

Initial control pH: Well 1: 6.8 Well 2: 6.8

Final control pH: Well 1: 6.9 Well 2: 6.9

Light intensity (lux): 4060 Date measured: Oct 4/17

Thermometer: 4 Light meter: 1 pH meter/probe: 1/1

Sample Description: all samples: clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_

Reviewed: [Signature] Date reviewed: Nov. 2, 2017

### 72-h Algal Growth Inhibition Toxicity Test Water Quality Measurements

Client: Teek Coal Setup by: ML7  
 Sample ID: Various Test Date/Time: Oct 4/17 @ 1255h  
 Work Order No.: 171090 CER #: 4  
 Test Species: Pseudokirchneriella subcapitata  
 Culture Date: Sept 29/17 Age of Culture: 5d Culture Health: Good  
 Culture Count: 1 355 2 345 Average: 350 Culture Cell Density (c1): 350 x 10<sup>4</sup> cells/mL

$$v1 = \frac{220,000 \text{ cells/ml} \times 100 \text{ ml}}{(c1) \quad 350 \times 10^4 \text{ cells/ml}} = 629 \text{ mL}$$

Time Zero Counts: 1 21 2 22 Average: 21.5

No. of Cells/mL: 21.5 x 10<sup>4</sup> Initial Density: # cells/mL + 220 μL x 10 μL = 9773 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										
re-capslee	8.3	23.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
Initials	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7	ML7

Initial control pH: Well 1: 6.8 Well 2: 6.8  
 Final control pH: Well 1: 6.9 Well 2: 6.9

Light intensity (lux): 4060 Date measured: Oct 4/17

Thermometer: 4 Light meter: 1 pH meter/probe: 1/1

Sample Description: clear, colourless, odourless, some particulates


Comments: \_\_\_\_\_

Reviewed:  Date reviewed: Nov 2, 2017

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck Coal Start Date/Time: Oct 4/17 @ 1255h  
 Work Order #: 171090 Termination Date: Oct 7/17 @ 1255h  
 Sample ID: Various Test set up by: MLT  
 %(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	31					MLT
	B	28					
	C	33					
	D	30					
	E	29					
	F	31					
	G	28					
	H	32					
(95.2% v/v) site control FR_UFRI	A	113					
	B	101					
	C	111					
	D	105					
	E A <sup>MLT</sup>	118					
	FB	120					
	GC	103					
	HD	102					
(95.2% v/v) site control GH_ER2	A	102					
	B	121					
	C	123					
	D	115					
	E A <sup>MLT</sup>	105					
	FB	103					
	GC	106					
	HD	110					
(95.2% v/v) site control CMLMCI	A	112					
	B	109					
	C	103					
	D	107					
	E A <sup>MLT</sup>	122					
	FB	111					
	GC	119					
	HD	118					
(95.2% v/v) FR_FRCP1	A	101					
	B	102					
	C	92					
	D	100					

Comments: \_\_\_\_\_  
 Reviewed by:  Date Reviewed: Nov 2, 2017

**Pseudokirchneriella subcapitata Toxicity Test Data Sheet**  
**72-h Algal Cell Counts**

Client: Teck Com Start Date/Time: Oct 4/17 @ 1255h  
 Work Order #: 171090 Termination Date: Oct 7/17 @ 1255h  
 Sample ID: VARIOUS Test set up by: MLJ  
 %(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% v/v) GH-FR1	A	125					MLJ
	B	119					
	C	105					
	D	124					
(95.2% v/v) GH-FRC	A	127					
	B	130					
	C	129					
	D	133					
(95.2% v/v) EV-HC1	A	101					
	B	117					
	C	118					
	D	107					
(95.2% v/v) EV-MC2	A	110					
	B	108					
	C	117					
	D	100					
(95.2% v/v) CM-MC2	A	107					
	B	102					
	C	105					
	D	110					
(95.2% v/v) LC-LCDSLCC	A	110					
	B	106					
	C	100					
	D	102					
	A						
	B						
	C						
	D						

Comments: \_\_\_\_\_


Reviewed by:  Date Reviewed: Nov 2, 2017

**Pseudokirchneriella subcapitata Algal Counts**

Client: Teck Coal Start Date/Time: 4-Oct-17 @1255h  
 WO#: 171090 Termination Date/Time: 7-Oct-17 @1255h  
 Sample ID: Teck Coal various samples pass/fail Initial Cell Density: 9773 cell/mL

215000  
0.22  
0.01  
9772.727

Concentration %(v/v)	Rep	Count 1 (x 10 <sup>4</sup> )	Count 2 (x 10 <sup>4</sup> )	Count 3 (x 10 <sup>4</sup> )	Count 4 (x 10 <sup>4</sup> )	Mean (x 10 <sup>4</sup> )	Cell Yield (x 10 <sup>4</sup> ) cell/mL		
Control	A	31				31	30.0	mean	29.3
Lab Control	B	28				28	27.0	SD	1.832251
	C	33				33	32.0	CV	6.259242
	D	30				30	29.0		
	E	29				29	28.0		
	F	31				31	30.0		
	G	28				28	27.0		
	H	32				32	31.0		
Control	A	113				113	112.0	mean	108.1
Site Water	B	101				101	100.0	SD	7.434235
(FR_UFR1)	C	111				111	110.0	CV	6.874149
95.2% (v/v)	D	105				105	104.0		
	E	118				118	117.0		
	F	120				120	119.0		
	G	103				103	102.0		
	H	102				102	101.0		
Control	A	102				102	101.0	mean	109.6
Site Water	B	121				121	120.0	SD	8.158037
(GH_ER2)	C	123				123	122.0	CV	7.440225
95.2% (v/v)	D	115				115	114.0		
	E	105				105	104.0		
	F	103				103	102.0		
	G	106				106	105.0		
	H	110				110	109.0		
Control	A	112				112	111.0	mean	111.4
Site Water	B	107				107	106.0	SD	6.717514
(CM_MC1)	C	103				103	102.0	CV	6.030208
95.2% (v/v)	D	107				107	106.0		
	E	122				122	121.0		
	F	111				111	110.0		
	G	119				119	118.0		
	H	118				118	117.0		
FR_FRCP1	A	101				101	100.0		
95.2% (v/v)	B	102				102	101.0		
	C	92				92	91.0		
	D	100				100	99.0		

Reviewed by: 

Date reviewed: Nov-2, 2017





# CETIS Summary Report

Report Date: 18 Nov-17 12:05 (p 1 of 2)  
 Test Code: 171090 | 15-1593-5651

## EC Aiga Growth Inhibition Test

Nautilus Environmental

Batch ID: 05-4636-1035      Test Type: Cell Growth      Analyst: Mimi Tran  
 Start Date: 04 Oct-17 12:55      Protocol: EC/EPS 1/RM/25      Diluent: Deionized Water + nutrients  
 Ending Date: 07 Oct-17 12:55      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	09-8681-8157	04 Oct-17	04 Oct-17	13h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control ①	Water Sample	Teck Coal	Lab Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

① Lab control =  
 deionized water with  
 nutrients.  
 FR\_UFR1 = site control  
 GH\_ER2 = site control  
 CM\_MC1 = site control.

## Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	8	29.25	27.72	30.78	27	32	0.6478	1.832	6.26%	0.0%
FR_UFR1	8	108.1	101.9	114.3	100	119	2.628	7.434	6.88%	-269.7%
GH_ER2	8	109.6	102.8	116.4	101	122	2.884	8.158	7.44%	-274.8%
CM_MC1	8	111.4	105.8	117	102	121	2.375	6.718	6.03%	-280.8%
FR_FRCP1	4	97.75	90.47	105	91	101	2.287	4.573	4.68%	-234.2%
GH_FR1	4	116.3	101.4	131.1	104	124	4.661	9.323	8.02%	-297.4%
GH_ERC	4	128.8	124.8	132.7	126	132	1.25	2.5	1.94%	-340.2%
EV_HC1	4	109.8	96.73	122.8	100	117	4.09	8.18	7.45%	-275.2%
EV_MC2	4	107.8	96.62	118.9	99	116	3.497	6.994	6.49%	-268.4%
CM_MC2	4	105	99.64	110.4	101	109	1.683	3.367	3.21%	-259.0%
LC_LCDSSLCC	4	103.5	96.44	110.6	99	109	2.217	4.435	4.29%	-253.8%

# CETIS Summary Report

Report Date: 18 Nov-17 12:05 (p 2 of 2)  
Test Code: 171090 | 15-1593-5651

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	30	27	32	29	28	30	27	31
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 12-2385-6187	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Nov-17 12:04	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4636-1035	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 04 Oct-17 12:55	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 07 Oct-17 12:55	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	09-8681-8157	04 Oct-17	04 Oct-17	13h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °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_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	34.2%	

**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	24.85	2.577	8.179	14	<0.0001	CDF	Significant Effect
		GH_ER2	25.32	2.577	8.179	14	<0.0001	CDF	Significant Effect
		CM_MC1	25.87	2.577	8.179	14	<0.0001	CDF	Significant Effect
		FR_FRCP1	17.62	2.577	10.02	10	<0.0001	CDF	Significant Effect
		GH_FR1	22.38	2.577	10.02	10	<0.0001	CDF	Significant Effect
		GH_ERC	25.59	2.577	10.02	10	<0.0001	CDF	Significant Effect
		EV_HC1	20.71	2.577	10.02	10	<0.0001	CDF	Significant Effect
		EV_MC2	20.19	2.577	10.02	10	<0.0001	CDF	Significant Effect
		CM_MC2	19.48	2.577	10.02	10	<0.0001	CDF	Significant Effect
		LC_LCDSSLCC	19.1	2.577	10.02	10	<0.0001	CDF	Significant Effect

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 2 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 12-2385-6187      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:04      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			0.9061	Non-significant Trend in Controls

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	47445.06	4744.506	10	117.7	<0.0001	Significant Effect
Error	1974.875	40.30357	49			
Total	49419.93		59			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	18.24	23.21	0.0510	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9881	0.9459	0.8241	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	8	29.25	27.72	30.78	29.5	27	32	0.6478	6.26%	0.0%
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	-269.7%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-274.8%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-280.8%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	-234.2%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-297.4%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-340.2%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-275.2%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	-268.4%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	-259.0%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	-253.8%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
Lab Control	30	27	32	29	28	30	27	31
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

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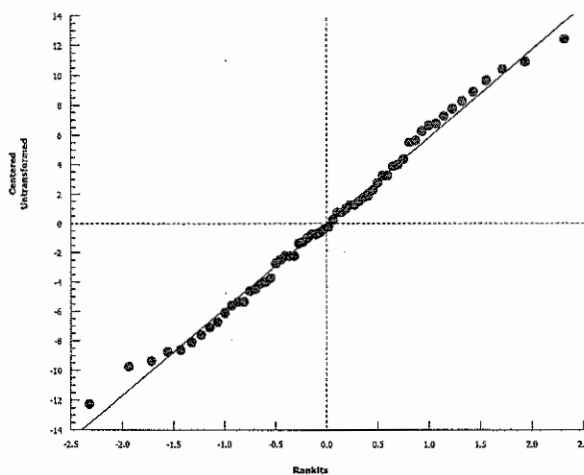
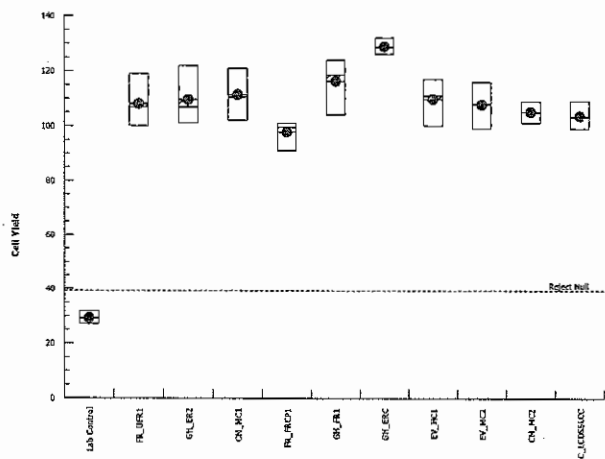
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 12-2385-6187      Endpoint: Cell Yield  
Analyzed: 18 Nov-17 12:04      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 15-1784-7680	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 18 Nov-17 12:03	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 05-4636-1035	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 04 Oct-17 12:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 07 Oct-17 12:55	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.88%	

**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	-0.4401	2.559	8.721	14	0.9845	CDF	Non-Significant Effect
		CM_MC1	-0.9536	2.559	8.721	14	0.9977	CDF	Non-Significant Effect
		FR_FRCP1	2.486	2.559	10.68	10	0.0589	CDF	Non-Significant Effect
		GH_FR1	-1.947	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		GH_ERC	-4.941	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	-0.3893	2.559	10.68	10	0.9816	CDF	Non-Significant Effect
		EV_MC2	0.08984	2.559	10.68	10	0.9252	CDF	Non-Significant Effect
		CM_MC2	0.7487	2.559	10.68	10	0.7116	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.108	2.559	10.68	10	0.5355	CDF	Non-Significant Effect

# CETIS Analytical Report

Report Date: 18 Nov-17 12:05 (p 2 of 3)  
 Test Code: 171090 | 15-1593-5651

## EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-1784-7680      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:03      Analysis: Parametric-Control vs Treatments      Official Results: Yes

### Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :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( $\alpha$ :5%)
Between	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

### Cell Yield Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

### Cell Yield Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				



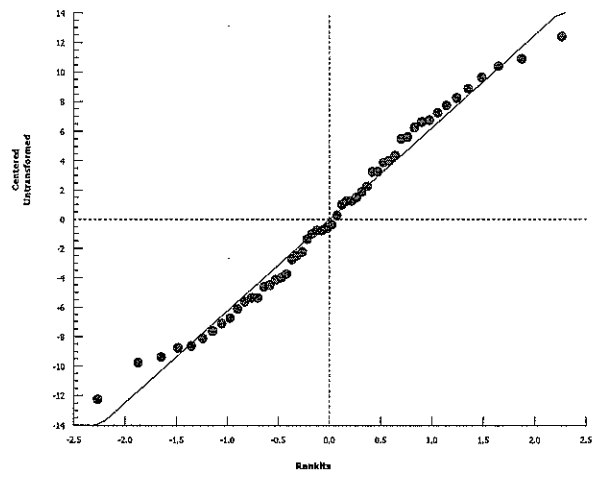
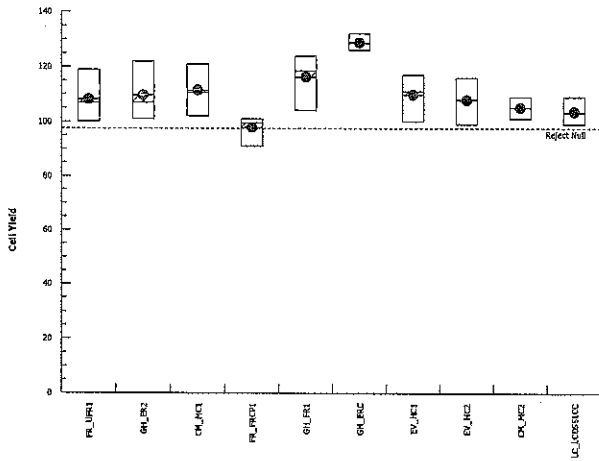
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 15-1784-7680      Endpoint: Cell Yield  
Analyzed: 18 Nov-17 12:03      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 08-7397-2437	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 18 Nov-17 12:03	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 05-4636-1035	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 04 Oct-17 12:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 07 Oct-17 12:55	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	9.88%	

**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	0.4401	2.559	8.721	14	0.8337	CDF	Non-Significant Effect
		CM_MC1	0.9536	2.559	8.721	14	0.6138	CDF	Non-Significant Effect
		FR_FRCP1	-2.486	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	1.947	2.559	10.68	10	0.1715	CDF	Non-Significant Effect
		GH_ERC	4.941	2.559	10.68	10	<0.0001	CDF	Significant Effect
		EV_HC1	0.3893	2.559	10.68	10	0.8502	CDF	Non-Significant Effect
		EV_MC2	-0.08984	2.559	10.68	10	0.9539	CDF	Non-Significant Effect
		CM_MC2	-0.7487	2.559	10.68	10	0.9949	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.108	2.559	10.68	10	0.9988	CDF	Non-Significant Effect

*ME7*  
 Nov-2017

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 2 of 3)

Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

Nautilus Environmental

Analysis ID: 08-7397-2437      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:03      Analysis: Parametric-Control vs Treatments      Official Results: Yes

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :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( $\alpha$ :5%)
Between	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

*MLJ*  
 NOV-20/17

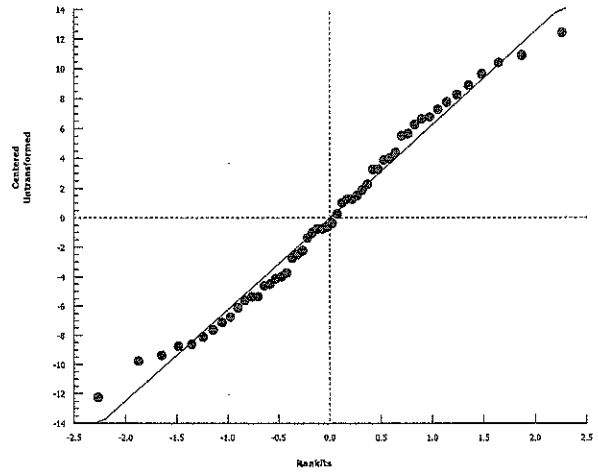
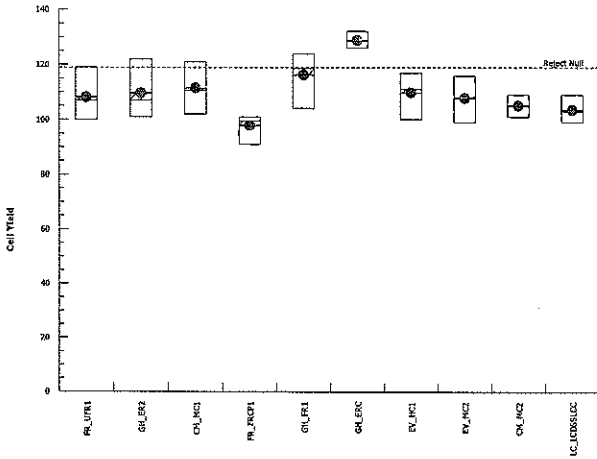
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 08-7397-2437      Endpoint: Cell Yield  
Analyzed: 18 Nov-17 12:03      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

**Report Date:** 18 Nov-17 12:06 (p 1 of 3)  
**Test Code:** 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 06-2374-4790	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Nov-17 12:04	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4636-1035	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 04 Oct-17 12:55	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 07 Oct-17 12:55	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.74%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	0.4401	2.559	8.721	14	0.8337	CDF	Non-Significant Effect
		CM_MC1	-0.5135	2.559	8.721	14	0.9879	CDF	Non-Significant Effect
		FR_FRCP1	2.845	2.559	10.68	10	0.0255	CDF	Significant Effect
		GH_FR1	-1.587	2.559	10.68	10	0.9999	CDF	Non-Significant Effect
		GH_ERC	-4.582	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	-0.02995	2.559	10.68	10	0.9455	CDF	Non-Significant Effect
		EV_MC2	0.4492	2.559	10.68	10	0.8307	CDF	Non-Significant Effect
		CM_MC2	1.108	2.559	10.68	10	0.5355	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.467	2.559	10.68	10	0.3570	CDF	Non-Significant Effect

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:06 (p 2 of 3)

Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 06-2374-4790      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:04      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	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

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Nov 20/17

EC Alga Growth Inhibition Test

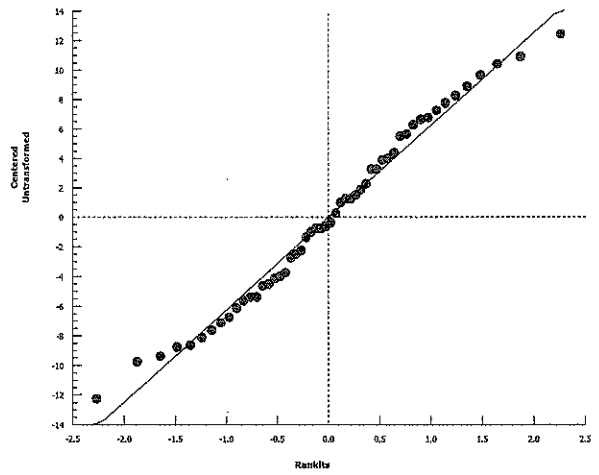
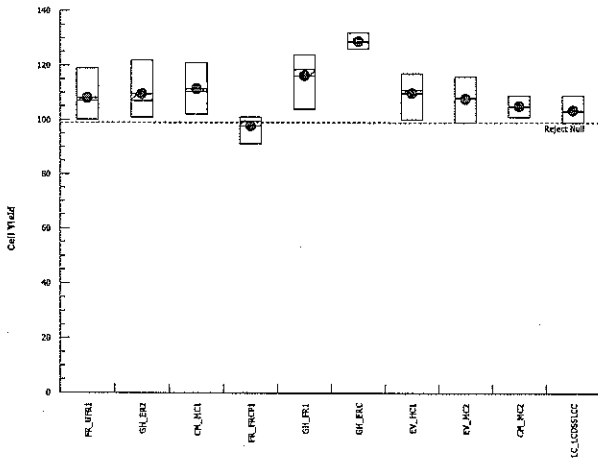
Nautilus Environmental

Analysis ID: 06-2374-4790  
Analyzed: 18 Nov-17 12:04

Endpoint: Cell Yield  
Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:06 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

EC Alga Growth Inhibition Test Nautilus Environmental

Analysis ID: 13-6616-9629	Endpoint: Cell Yield	CETIS Version: CETISv1.8.7
Analyzed: 18 Nov-17 12:04	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 05-4636-1035	Test Type: Cell Growth	Analyst: Mimi Tran
Start Date: 04 Oct-17 12:55	Protocol: EC/EPS 1/RM/25	Diluent: Deionized Water + nutrients
Ending Date: 07 Oct-17 12:55	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	9.74%	

**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	-0.4401	2.559	8.721	14	0.9845	CDF	Non-Significant Effect
		CM_MC1	0.5135	2.559	8.721	14	0.8081	CDF	Non-Significant Effect
		FR_FRCP1	-2.845	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	1.587	2.559	10.68	10	0.3033	CDF	Non-Significant Effect
		GH_ERC	4.582	2.559	10.68	10	0.0002	CDF	Significant Effect
		EV_HC1	0.02995	2.559	10.68	10	0.9360	CDF	Non-Significant Effect
		EV_MC2	-0.4492	2.559	10.68	10	0.9850	CDF	Non-Significant Effect
		CM_MC2	-1.108	2.559	10.68	10	0.9988	CDF	Non-Significant Effect
		LC_LCDSSLCC	-1.467	2.559	10.68	10	0.9998	CDF	Non-Significant Effect

*MLT*  
 18 Nov 2017



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:06 (p 2 of 3)

Test Code: 171090 | 15-1593-5651

EC Alga Growth inhibition Test Nautilus Environmental

Analysis ID: 13-6616-9629      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:04      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	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

*MLJ*  
 Nov-20/17

EC Alga Growth Inhibition Test

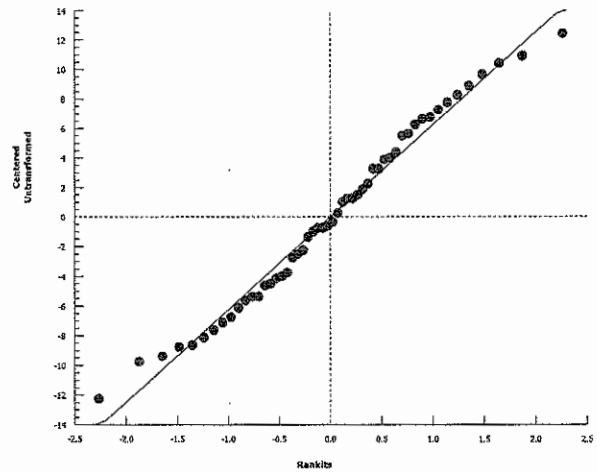
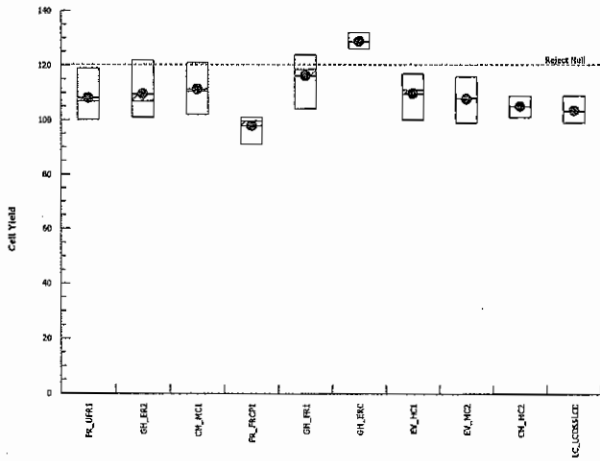
Nautilus Environmental

Analysis ID: 13-6616-9629  
Analyzed: 18 Nov-17 12:04

Endpoint: Cell Yield  
Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:13 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

EC Alga Growth Inhibition Test Nautilus Environmental

<b>Analysis ID:</b> 10-1580-4118	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Nov-17 12:13	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4636-1035	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 04 Oct-17 12:55	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 07 Oct-17 12:55	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.59%	

**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	0.9536	2.559	8.721	14	0.6138	CDF	Non-Significant Effect
		GH_ER2	0.5135	2.559	8.721	14	0.8081	CDF	Non-Significant Effect
		FR_FRCP1	3.264	2.559	10.68	10	0.0087	CDF	Significant Effect
		GH_FR1	-1.168	2.559	10.68	10	0.9991	CDF	Non-Significant Effect
		GH_ERC	-4.163	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		EV_HC1	0.3893	2.559	10.68	10	0.8502	CDF	Non-Significant Effect
		EV_MC2	0.8685	2.559	10.68	10	0.6556	CDF	Non-Significant Effect
		CM_MC2	1.527	2.559	10.68	10	0.3297	CDF	Non-Significant Effect
		LC_LCDSSLCC	1.887	2.559	10.68	10	0.1901	CDF	Non-Significant Effect

*ME*  
 11/20/17

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:13 (p 2 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 10-1580-4118      Endpoint: Cell Yield      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Nov-17 12:13      Analysis: Parametric-Control vs Treatments      Official Results: Yes

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :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( $\alpha$ :5%)
Between	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

*MLT*  
 Nov-20/17

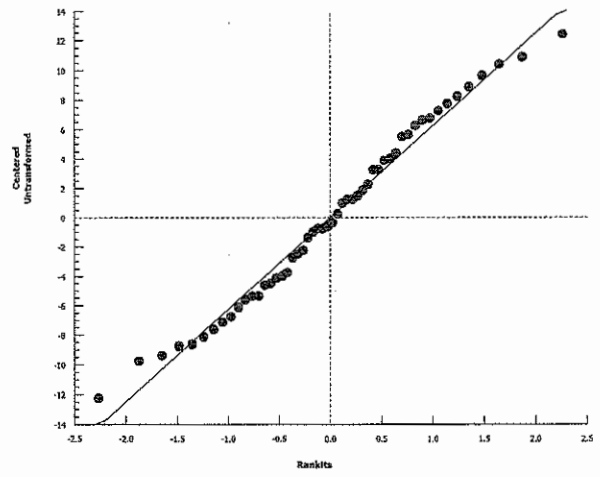
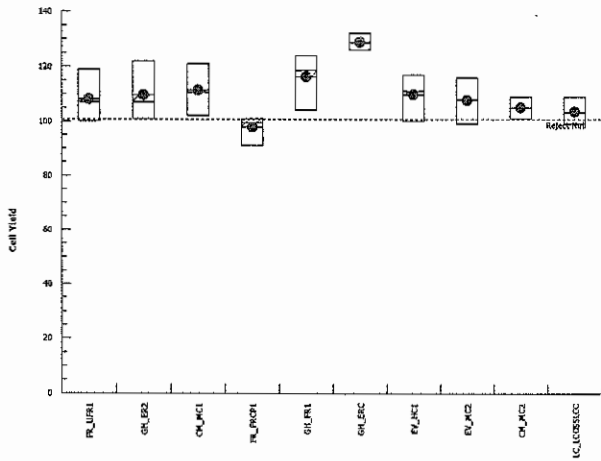
EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID: 10-1580-4118      Endpoint: Cell Yield  
Analyzed: 18 Nov-17 12:13      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 1 of 3)  
 Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-0837-1714	<b>Endpoint:</b> Cell Yield	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Nov-17 12:01	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4636-1035	<b>Test Type:</b> Cell Growth	<b>Analyst:</b> Mimi Tran
<b>Start Date:</b> 04 Oct-17 12:55	<b>Protocol:</b> EC/EPS 1/RM/25	<b>Diluent:</b> Deionized Water + nutrients
<b>Ending Date:</b> 07 Oct-17 12:55	<b>Species:</b> Pseudokirchneriella subcapitata	<b>Brine:</b>
<b>Duration:</b> 72h	<b>Source:</b> In-House Culture	<b>Age:</b> 5d

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	49h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	50h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	43h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	48h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	48h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	49h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	51h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	50h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	42h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	52h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	9.59%	

**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	-0.9536	2.559	8.721	14	0.9977	CDF	Non-Significant Effect
		GH_ER2	-0.5135	2.559	8.721	14	0.9879	CDF	Non-Significant Effect
		FR_FRCP1	-3.264	2.559	10.68	10	1.0000	CDF	Non-Significant Effect
		GH_FR1	1.168	2.559	10.68	10	0.5048	CDF	Non-Significant Effect
		GH_ERC	4.163	2.559	10.68	10	0.0007	CDF	Significant Effect
		EV_HC1	-0.3893	2.559	10.68	10	0.9816	CDF	Non-Significant Effect
		EV_MC2	-0.8685	2.559	10.68	10	0.9968	CDF	Non-Significant Effect
		CM_MC2	-1.527	2.559	10.68	10	0.9998	CDF	Non-Significant Effect
	LC_LCDSSLCC	-1.887	2.559	10.68	10	1.0000	CDF	Non-Significant Effect	

*MLT*  
 Nov-20/17

**CETIS Analytical Report**

Report Date: 18 Nov-17 12:05 (p 2 of 3)

Test Code: 171090 | 15-1593-5651

**EC Alga Growth Inhibition Test**

**Nautilus Environmental**

Analysis ID: 17-0837-1714  
 Analyzed: 18 Nov-17 12:01

Endpoint: Cell Yield  
 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :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( $\alpha$ :5%)
Between	2493.856	277.0951	9	5.964	<0.0001	Significant Effect
Error	1951.375	46.46131	42			
Total	4445.23		51			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variances	Bartlett Equality of Variance	7.781	21.67	0.5564	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9789	0.9388	0.4817	Normal Distribution

**Cell Yield Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	8	108.1	101.9	114.3	107	100	119	2.628	6.88%	0.0%
GH_ER2	8	109.6	102.8	116.4	107	101	122	2.884	7.44%	-1.39%
CM_MC1	8	111.4	105.8	117	110.5	102	121	2.375	6.03%	-3.01%
FR_FRCP1	4	97.75	90.47	105	99.5	91	101	2.287	4.68%	9.6%
GH_FR1	4	116.3	101.4	131.1	118.5	104	124	4.661	8.02%	-7.51%
GH_ERC	4	128.8	124.8	132.7	128.5	126	132	1.25	1.94%	-19.08%
EV_HC1	4	109.8	96.73	122.8	111	100	117	4.09	7.45%	-1.5%
EV_MC2	4	107.8	96.62	118.9	108	99	116	3.497	6.49%	0.35%
CM_MC2	4	105	99.64	110.4	105	101	109	1.683	3.21%	2.89%
LC_LCDSSLCC	4	103.5	96.44	110.6	103	99	109	2.217	4.29%	4.28%

**Cell Yield Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
FR_UFR1	112	100	110	104	117	119	102	101
GH_ER2	101	120	122	114	104	102	105	109
CM_MC1	111	106	102	106	121	110	118	117
FR_FRCP1	100	101	91	99				
GH_FR1	124	114	104	123				
GH_ERC	126	129	128	132				
EV_HC1	100	116	117	106				
EV_MC2	109	107	116	99				
CM_MC2	106	101	104	109				
LC_LCDSSLCC	109	105	99	101				

*MLT*  
 Nov 20/17

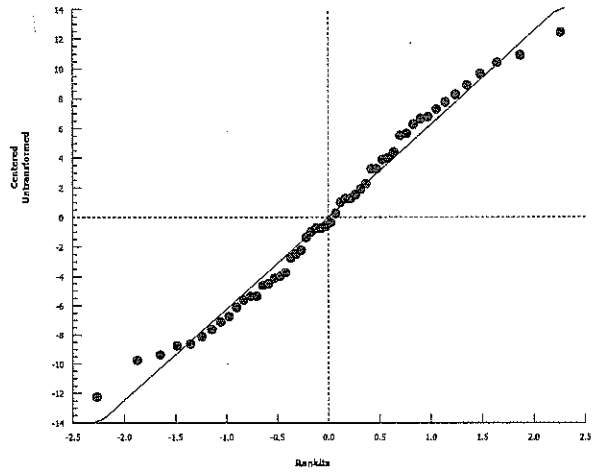
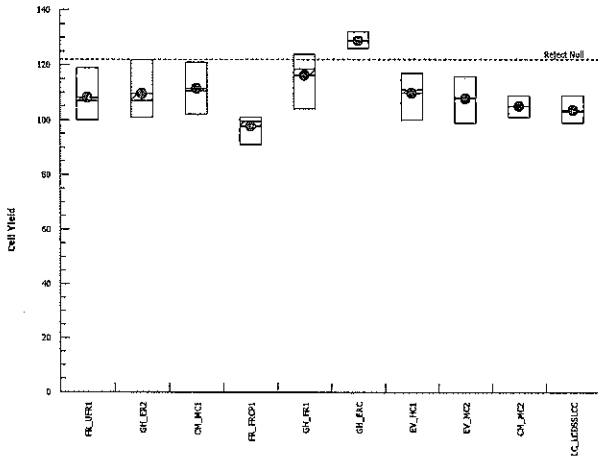
EC Alga Growth Inhibition Test

Nautius Environmental

Analysis ID: 17-0837-1714      Endpoint: Cell Yield  
Analyzed: 18 Nov-17 12:01      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**APPENDIX C – *Hyalella azteca* Toxicity Test Data**

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<sup>Water only</sup>  
***Hyalella azteca* Sediment Test Summary Sheet**

Client: Teck  
 Work Order No.: 171093

Start Date: Oct 5/17  
 Set up by: EL

**Sample Information:**

Sample ID: Various (See below)  
 Sample Date: Oct 2/17  
 Date Received: Oct 3/17  
 Sample Volume: 8, 10, 11  
~~8, 10, 11~~ x 20L (See C.O.C.)

**Test Organism Information:**

Species: *Hyalella azteca*  
 Supplier: Aquatic Biosystems Co  
 Date received: Oct 5/17  
 Age or size (Day 0): 7-8 days

① indicates there is a significant dry weight difference as compared to control  
 ② indicates there is a significant dry weight difference as compared to FR-UFR1

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: HA140  
 Stock Solution ID: n/a  
 Date Initiated: Oct 5/17

96-h LC50 (95% CL): 5.6 (4.5 - 6.9) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (5.2 - 6.6) g/L NaCl CV (%): 6

**Test Results:**

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control	98.0 ± 4.5	0.63 ± 0.03
FR-UFR1	100 ± 0.0	0.56 ± 0.07
GH-ERZ	96.0 ± 5.5	0.47 ± 0.17
CM-MC1	96.0 ± 8.9	0.45 ± 0.20 ①
FR-FRCPI	94.0 ± 5.5	0.48 ± 0.07 ①
GH-FR1	100 ± 0.0	0.48 ± 0.09 ①
CM-MC2	88.0 ± 16.4	0.27 ± 0.06 ① ② ③
	±	±

Reviewed by: JON

Date reviewed: Dec. 8/17

P.4/4

in water only

### Chronic *H. azteca* Sediment Toxicity Test Data Sheet

Freshwater Sediment Water Quality

Client: Teck  
 WO #: 171093  
 Sample ID: Various

Start Date: Oct 5/17  
 Termination Date: Nov 2/17  
 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	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-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
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
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
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
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	EL	EL	AWP	MM	EL	EL	EL	EL	EL	EL	MLT	EL	EL	EL	AWP

Temperature (°C)

Sample ID	Day														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
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	23.0	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	23.0	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	23.0	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	23.0	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	23.0	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	23.0	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	23.0	22.0	
Technician Initials	EL	EL	AWP	MLT	MLT	MLT	MLT	MLT	MLT	MLT	AWP	MLT	MLT	MLT	MLT

Thermometer: 6 Light meter: L171 Light intensity (Lux): 510-820

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: JGH Date Reviewed: Dec 6/17

P.1/4

*in water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment Water Quality

Client: Teck  
 WO #: 171093  
 Sample ID: Various

Start Date: Oct 5/17  
 Termination Date: Nov 2/17  
 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	443	458	447	448	439	464	462	467	456	425	426	473	477	453	430
FR-UFR1	437	465	449	450	456	453	460	472	446	448	453	473	462	461	456
GH-ER2	385	416	404	410	393	399	412	411	396	404	394	413	403	401	395
CM-MC1	378	397	387	389	380	385	378	380	377	381	383	388	395	401	381
FR-FRCPI	1350	1351	1370	1371	1396	1350	1358	1351	1342	1350	1333	1334	1389	1388	1336
GH-FR1	952	935	924	929	935	928	979	936	958	1014	1028	1078	1094	1095	1031
CM-MC2	1101	1204	1131	1190	1128	1133	1093	1132	1088	1091	1070	1083	1078	1090	1056
Technician Initials	EL	EL	ADP	AMM	EL	EL	EL	EL	EL	EL	ML	EL	EL	EL	AWK

**Conductivity (µS)**

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	440	442	441	437	432	430	428	431	423	427	436	430	433	439
FR-UFR1	461	460	454	455	452	451	436	441	447	439	455	445	445	442
GH-ER2	396	401	399	400	392	390	388	387	389	387	398	391	393	394
CM-MC1	386	386	379	386	380	379	368	362	363	360	369	365	364	370
FR-FRCPI	1372	1399	1407	1420	1417	1420	1369	1332	1314	1285	1291	1317	1319	1359
GH-FR1	1064	1015	995	1001	992	990	978	968	973	970	984	976	977	971
CM-MC2	1061	1061	1034	1057	1040	1058	1012	999	964	958	956	965	966	1026
Technician Initials	EL	EL	AWK	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML	ML

Conductivity meter/probe: 1

Comments: ① 131545

Reviewed by: Joh

Date Reviewed: Dec. 6/17

*in water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater ~~Sediment~~ Water Quality  
*EL*

Client: Teck  
 WO #: 171093  
 Sample ID: Various

Start Date: Oct 5/17  
 Termination Date: Nov 2/17  
 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	8.4	7.7	6.9	7.2	7.0	7.0	7.0	7.8	7.3	6.8	7.0	7.2	6.8	5.9	6.7
FR-UFR1	8.6	8.2	7.3	7.2	7.4	7.2	7.4	7.1	7.4	6.7	6.9	7.1	6.9	6.1	6.7
GH-ER2	8.6	8.2	7.3	7.2	7.3	7.0	7.3	7.1	7.6	6.9	6.9	7.2	6.9	6.6	6.9
CM-MC1	8.6	8.2	7.1	7.0	7.0	6.9	7.2	7.1	7.6	6.9	6.8	7.2	7.0	7.1	7.2
FR-FRCPI	8.6	8.1	7.1	7.0	6.9	6.6	7.3	7.1	7.7	7.0	6.9	7.2	7.3	7.3	7.6
GH-FR1	8.6	8.2	7.1	7.0	6.8	6.6	7.1	7.2	7.3	7.1	7.0	7.3	7.3	7.1	7.8
CM-MC2	8.6	8.1	7.3	7.2	6.8	6.7	7.1	7.2	7.4	7.2	7.0	7.2	7.3	7.0	7.8
Technician Initials	EL	EL	AJP	AMM	EL	EL	EL	EL	EL	EL	EL	ML	EL	EL	AWB

**Dissolved oxygen (mg/L)**

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	7.6	6.7	6.9	6.4	6.6	6.9	6.6	6.7	6.0	6.4	6.0	6.0	5.9	5.8
FR-UFR1	7.3	6.6	6.7	6.6	6.7	6.8	6.7	6.8	6.0	6.5	6.0	6.0	5.9	5.8
GH-ER2	7.3	6.5	6.4	7.0	6.8	6.8	6.9	6.8	6.1	6.4	6.1	6.0	5.9	5.9
CM-MC1	7.5	6.5	6.4	6.9	6.8	6.9	7.1	6.9	6.1	6.4	6.1	6.2	6.0	6.0
FR-FRCPI	7.7	7.0	6.5	6.8	7.0	6.8	6.6	6.7	6.0	6.5	6.2	6.4	6.3	6.2
GH-FR1	7.6	7.1	6.7	6.9	6.7	7.0	6.7	6.8	6.2	6.5	6.0	6.3	6.4	6.3
CM-MC2	7.6	7.1	6.6	6.8	6.9	7.1	6.8	6.8	6.2	6.7	6.5	6.4	6.3	6.3
Technician Initials	EL	K	MM	ML	ML	ML	ML	ML	ML	A	ML	ML	ML	ML

DO meter/probe: 111

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: JGH

Date Reviewed: Dec. 6/17

*in water only*  
**Chronic *H. azteca* Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment Water Quality

Client: Teck  
 WO #: 171093  
 Sample ID: Various

Start Date: Oct 5/17  
 Termination Date: Nov 2/17  
 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	7.6	7.2	7.2	7.3	7.4	7.2	7.2	7.4	7.5	7.1	7.1	7.4	7.2	7.3	7.3	
FR-VFR1	8.2	7.7	7.9	7.9	7.9	7.9	7.8	8.0	8.0	7.7	7.8	7.9	7.7	7.8	7.9	
GH-ER2	8.1	7.7	8.0	8.0	7.9	7.9	7.9	8.0	8.1	7.7	7.8	7.8	7.6	7.9	7.9	
CM-MC1	8.0	7.7	7.9	7.9	8.0	7.8	7.9	8.0	8.0	7.7	7.9	7.9	7.8	8.0	7.9	
FR-FRCPI	8.2	8.0	8.2	8.2	8.0	8.1	8.0	8.1	8.2	8.0	8.0	8.0	7.9	8.1	8.1	
GH-FR1	8.2	8.0	8.2	8.2	8.2	8.2	8.1	8.1	8.2	8.3	7.9	8.1	8.0	7.9	8.1	
CM-MC2	8.2	8.0	8.3	8.3	8.2	8.1	8.1	8.2	8.2	8.0	8.0	8.0	7.9	8.1	8.2	
Technician Initials	EW	EW	ADP	HMM	EW	EL	EL	EL	EL	EL	EL	MLT	EL	EL	EL	AWZ

pH

Sample ID	Day													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control	7.6	7.3	7.3	7.3	7.3	7.3	7.1	7.1	7.0	7.4	7.1	7.1	7.0	7.0
FR-VFR1	8.0	7.8	7.9	7.9	7.8	7.7	7.5	7.6	7.5	7.6	7.5	7.5	7.5	7.6
GH-ER2	8.1	7.8	7.9	7.9	7.9	7.8	7.6	7.7	7.5	7.7	7.5	7.6	7.5	7.6
CM-MC1	8.1	8.0	8.0	8.0	7.9	7.9	7.7	7.8	7.6	7.9	7.6	7.6	7.6	7.7
FR-FRCPI	8.2	8.2	8.0	8.0	8.1	7.9	7.7	7.8	7.8	8.0	7.9	7.8	7.8	7.8
GH-FR1	8.3	8.1	8.1	8.2	8.1	7.9	7.8	7.9	7.8	8.0	7.9	7.8	7.7	7.9
CM-MC2	8.3	8.1	8.0	8.1	8.0	8.0	7.8	8.0	7.8	8.1	7.8	7.7	7.7	7.8
Technician Initials	EL	W	MM	MLT	MLT	MLT	MLT	MLT	MLT	A	MLT	MLT	MLT	MLT

pH meter/probe: 111

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: JOU

Date Reviewed: Dec. 6/17

*water only*  
**H. azteca Sediment Toxicity Test Data Sheet**  
Freshwater Sediment ~~14-d~~ Survival and Weight

28-d

Client: Minnow/TecE  
Work Order No: 171093  
Sample ID: Various

Start Date: Oct 5/17  
Termination Date: Nov 2/17  
Test Organism: Hyalella azteca  
Balance: 1

Sample ID	<sup>M</sup> Pan No. <i>red</i>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
<del>Control Sediment</del>	1	A	9	0	1	MLJ	1014.31	1019.86	9	EL
	2	B	10	0	0		1024.29	1030.25	10	
	3	C	10	0	0		1023.48	1030.17	10	
	4	D	10	0	0		1024.82	1031.19	10	
	5	E	10	0	0		1014.31	1020.49	10	
FR-UFRI (Site Control)	6	A	10	0	0		1022.67	1028.62	10	
	7	B	10	0	0		1027.44	1033.88	10	
	8	C	10	0	0		1012.41	1018.19	10	
	9	D	10	0	0		1022.88	1027.45	10	
	10	E	10	0	0		1015.69	1021.12	10	
GH-ERZ (Site Control)	11	A	10	0	0		1032.24	1036.41	10	
	12	B	10	0	0		1029.62	1022.48	9 ②	
	13	C	10	0	0		1040.66	1046.53	10	
	14	D	9	0	1		1016.29	1021.98	9	
	15	E	9	0	1		1028.81	1033.34	9	
(M_MCI (Site Control))	16	A	10	0	0		1026.74	1031.67	10	
	17	B	10	0	0		1031.00	1035.897	10	
	18	C	10	0	0		1009.90	1015.99	10	
	19	D	8 <sup>0</sup>	0	2		1023.08	1023.86	8	
	20	E	10	0	0		1023.68	1029.30	10	

Comments:

① checked by CMP    ② Lost in transfer  
Reweigh: M2 - 1030.38, M3 - 1030.27, M32 - 1038.97, M26 - 1029.14  
by AWE

Reviewed by: Joh

Date Reviewed: Dec. 8/17

*water only*  
**H. azteca Sediment Toxicity Test Data Sheet**  
 Freshwater Sediment ~~14-d~~ Survival and Weight  
 28-1

Client: Minnon/teck  
 Work Order No: 171093  
 Sample ID: Various

Start Date: Oct 5/17  
 Termination Date: Nov 2/17  
 Test Organism: Hyalella azteca  
 Balance: 1

Sample ID	M Pan No. <i>red</i>	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment <i>un</i>	21	A	9	0	1	ML	1028.41	1033.04	9	EL
FR-FRCP1	22	B	10	0	0		1032.81	1036.59	10	
	23	C	9	0	1		998.30	1002.88	9	
	24	D	10	0	0		1031.92	1037.48	10	
	25	E	9	0	1		1031.20	1035.36	9	
GH-FR1	26	A	<del>ML</del> 10	0	0		1023.52	1028.97	10	
	27	B	10	0	0		1026.24	1029.88	10	
	28	C	10	0	0		1035.03	1040.13	10	
	29	D	10	0	0		1018.44	1022.57	10	
	30	E	10	0	0		1020.22	1025.99	10	
CM-MC2	31	A	9	0	1		1011.17	1013.91	9	
	32	B	10	0	0		1035.07	1038.74	10	
	33	C	6	0	4		1034.05	1035.44	6	
	34	D	9	0	1		1030.60	1032.56	9	
	35	E	10	0	0		1038.47	1040.99	10	
		A								
		B								
		C								
		D								
		E								

Comments: \_\_\_\_\_

Reviewed by: Jon

Date Reviewed: Dec. 8/17



**CETIS Summary Report**

Report Date: 08 Dec-17 13:59 (p 1 of 2)  
 Test Code: 171093 | 19-3128-5603

*water only*  
**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

*28*  
 Batch ID: 09-4382-7400      Test Type: Growth-Survival (10d)      Analyst: Eric Cheung  
 Start Date: 05 Oct-17      Protocol: EPA/600/R-99/064 (2000)      Diluent: Reconstituted Water  
 Ending Date: 02 Nov-17      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	01-7123-2313	05 Oct-17	05 Oct-17	NA		
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °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_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

*28*  
**10d Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.98	0.9245	1	0.9	1	0.02	0.04472	4.56%	0.0%
FR_UFR1	5	1	1	1	1	1	0	0	0.0%	-2.04%
GH_ER2	5	0.96	0.892	1	0.9	1	0.02449	0.05477	5.71%	2.04%
CM_MC1	5	0.96	0.8489	1	0.8	1	0.04	0.08944	9.32%	2.04%
FR_FRCP1	5	0.94	0.872	1	0.9	1	0.02449	0.05477	5.83%	4.08%
GH_FR1	5	1	1	1	1	1	0	0	0.0%	-2.04%
CM_MC2	5	0.88	0.676	1	0.6	1	0.07348	0.1643	18.67%	10.2%

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	5	0.6273	0.5933	0.6614	0.596	0.669	0.01227	0.02745	4.38%	0.0%
FR_UFR1	5	0.5634	0.4768	0.65	0.457	0.644	0.03118	0.06973	12.38%	10.19%
GH_ER2	5	0.4692	0.2603	0.6782	0.2067	0.6322	0.07526	0.1683	35.86%	25.2%
CM_MC1	5	0.4517	0.1987	0.7047	0.0975	0.609	0.09114	0.2038	45.12%	28.0%
FR_FRCP1	5	0.4839	0.3996	0.5682	0.378	0.556	0.03037	0.0679	14.03%	22.86%
GH_FR1	5	0.4818	0.3699	0.5937	0.364	0.577	0.04029	0.09009	18.7%	23.2%
CM_MC2	5	0.2746	0.1985	0.3506	0.2178	0.367	0.0274	0.06126	22.31%	56.23%

**CETIS Summary Report**

Report Date: 08 Dec-17 13:59 (p 2 of 2)  
 Test Code: 171093 | 19-3128-5603

*under oil*  
**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

28 **10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.9	1	1	1	1
FR_UFR1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
CM_MC1	1	1	1	0.8	1
FR_FRCP1	0.9	1	0.9	1	0.9
GH_FR1	1	1	1	1	1
CM_MC2	0.9	1	0.6	0.9	1

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.6167	0.596	0.669	0.637	0.618
FR_UFR1	0.595	0.644	0.578	0.457	0.543
GH_ER2	0.417	0.2067	0.587	0.6322	0.5033
CM_MC1	0.493	0.497	0.609	0.0975	0.562
FR_FRCP1	0.5144	0.378	0.5089	0.556	0.4622
GH_FR1	0.545	0.364	0.51	0.413	0.577
CM_MC2	0.3044	0.367	0.2316	0.2178	0.252

**10d Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	9/10	10/10	10/10	10/10	10/10
FR_UFR1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
CM_MC1	10/10	10/10	10/10	8/10	10/10
FR_FRCP1	9/10	10/10	9/10	10/10	9/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
CM_MC2	9/10	10/10	6/10	9/10	10/10

**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 1 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyaella 28-d Survival and Growth <sup>water only</sup> Sediment Test**

Nautilus Environmental

Analysis ID: 18-7079-2000	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 08 Dec-17 13:53	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 02 Nov-17	Species: Hyaella azteca	Brine:
Duration: 28d 0h	Source: Aquatic Biosystems, CO	Age: 7-8 <i>days</i>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	01-7123-2313	05 Oct-17	05 Oct-17	NA		
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °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_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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	1	1.0000	Exact	Non-Significant Effect
Control		GH_ER2	0.5	1.0000	Exact	Non-Significant Effect
Control		CM_MC1	0.5	1.0000	Exact	Non-Significant Effect
Control		FR_FRCP1	0.3087	1.0000	Exact	Non-Significant Effect
Control		GH_FR1	1	1.0000	Exact	Non-Significant Effect
Control		CM_MC2	0.05587	0.3352	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
Control	Negative Contr	49	1	50	0.98	0.02	0.0%
FR_UFR1		50	0	50	1	0	-2.04%
GH_ER2		48	2	50	0.96	0.04	2.04%
CM_MC1		48	2	50	0.96	0.04	2.04%
FR_FRCP1		47	3	50	0.94	0.06	4.08%
GH_FR1		50	0	50	1	0	-2.04%
CM_MC2		44	6	50	0.88	0.12	10.2%

**10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.9	1	1	1	1
FR_UFR1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
CM_MC1	1	1	1	0.8	1
FR_FRCP1	0.9	1	0.9	1	0.9
GH_FR1	1	1	1	1	1
CM_MC2	0.9	1	0.6	0.9	1

CETIS Analytical Report

Report Date: 08 Dec-17 13:59 (p 2 of 8)  
Test Code: 171093 | 19-3128-5603

*water only*  
Hyalella 28-d Survival and Growth ~~Sediment~~ Test

Nautilus Environmental

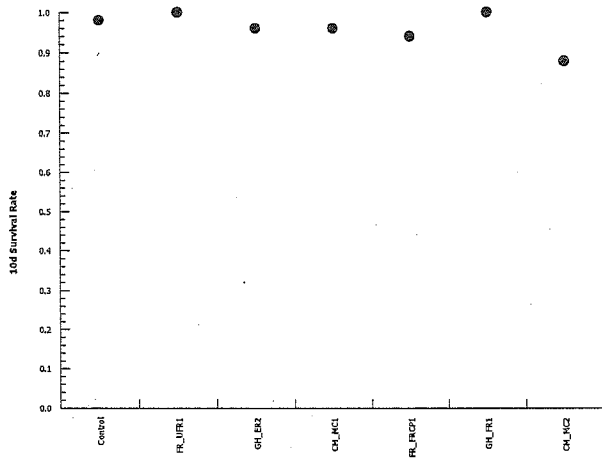
Analysis ID: 18-7079-2000      Endpoint: *28* 10d Survival Rate  
Analyzed: 08 Dec-17 13:53      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	9/10	10/10	10/10	10/10	10/10
FR_UFR1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
CM_MC1	10/10	10/10	10/10	8/10	10/10
FR_FRCP1	9/10	10/10	9/10	10/10	9/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
CM_MC2	9/10	10/10	6/10	9/10	10/10

Graphics



**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 3 of 8)  
 Test Code: 171093 | 19-3128-5603

<b>Hyalella 28-d Survival and Growth <sup>water only</sup> Sediment Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 03-3066-0045	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 08 Dec-17 13:54	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung			
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water			
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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	0.2475	0.7424	Exact	Non-Significant Effect
FR_UFR1		CM_MC1	0.2475	0.7424	Exact	Non-Significant Effect
FR_UFR1		FR_FRCP1	0.1212	0.4848	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.01333	0.0667	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Reference Sed	50	0	50	1	0	0.0%
GH_ER2	48	2	50	0.96	0.04	4.0%
CM_MC1	48	2	50	0.96	0.04	4.0%
FR_FRCP1	47	3	50	0.94	0.06	6.0%
GH_FR1	50	0	50	1	0	0.0%
CM_MC2	44	6	50	0.88	0.12	12.0%

**10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
CM_MC1	1	1	1	0.8	1
FR_FRCP1	0.9	1	0.9	1	0.9
GH_FR1	1	1	1	1	1
CM_MC2	0.9	1	0.6	0.9	1

CETIS Analytical Report

Report Date: 08 Dec-17 13:59 (p 4 of 8)  
Test Code: 171093 | 19-3128-5603

*in situ only*  
Hyalella 28-d Survival and Growth *in* Sediment Test

Nautilus Environmental

Analysis ID: 03-3066-0045  
Analyzed: 08 Dec-17 13:54

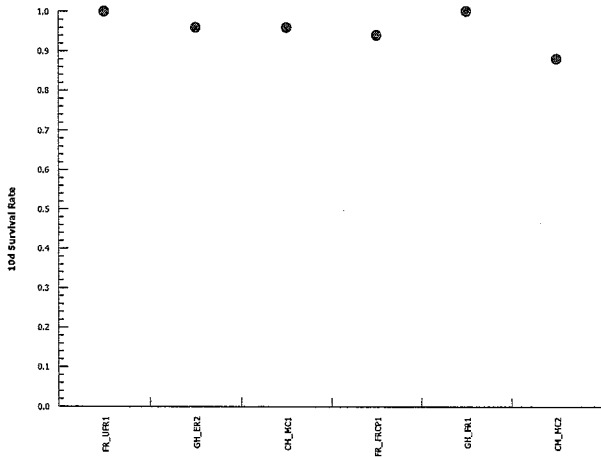
Endpoint: *20* 10d Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

10d Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
CM_MC1	10/10	10/10	10/10	8/10	10/10
FR_FRCP1	9/10	10/10	9/10	10/10	9/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
CM_MC2	9/10	10/10	6/10	9/10	10/10

Graphics



**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 5 of 8)  
 Test Code: 171093 | 19-3128-5603

<b>Hyalella 28-d Survival and Growth <sup>water only</sup> Sediment Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 08-4194-1005	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 08 Dec-17 13:56	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung			
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water			
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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	0.6913	1.0000	Exact	Non-Significant Effect
GH_ER2		FR_FRCP1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	1	1.0000	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.1343	0.6717	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect	
FR_UFR1	50	0	50	1	0	-4.17%	
GH_ER2	Reference Sed	48	2	50	0.96	0.04	0.0%
CM_MC1		48	2	50	0.96	0.04	0.0%
FR_FRCP1		47	3	50	0.94	0.06	2.08%
GH_FR1		50	0	50	1	0	-4.17%
CM_MC2		44	6	50	0.88	0.12	8.33%

**10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
CM_MC1	1	1	1	0.8	1
FR_FRCP1	0.9	1	0.9	1	0.9
GH_FR1	1	1	1	1	1
CM_MC2	0.9	1	0.6	0.9	1

**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 6 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth <sup>water only</sup> Sediment Test**

Nautilus Environmental

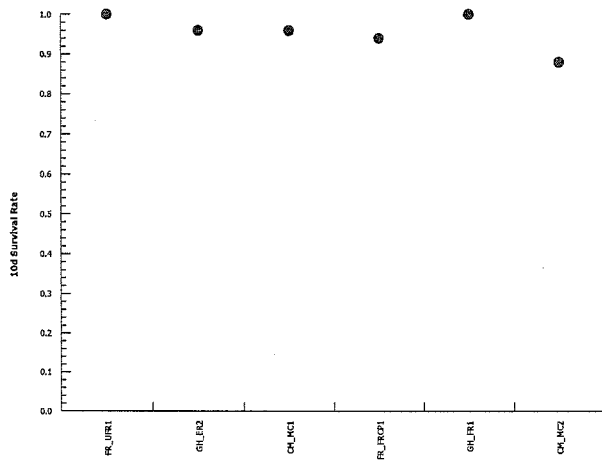
Analysis ID: 08-4194-1005      Endpoint: <sup>20</sup>10d Survival Rate  
 Analyzed: 08 Dec-17 13:56      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**10d Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
CM_MC1	10/10	10/10	10/10	8/10	10/10
FR_FRCP1	9/10	10/10	9/10	10/10	9/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
CM_MC2	9/10	10/10	6/10	9/10	10/10

**Graphics**





**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 7 of 8)  
 Test Code: 171093 | 19-3128-5603

Hyalella 28-d Survival and Growth <sup>water only</sup> <del>Sediment</del> Test			Nautilus Environmental		
Analysis ID: 10-3729-9073	Endpoint: 10d Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 08 Dec-17 13:58	Analysis: STP 2x2 Contingency Tables	Official Results: Yes			
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung			
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water			
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_ER2	0.6913	1.0000	Exact	Non-Significant Effect
CM_MC1		FR_FRCP1	0.5	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.1343	0.6717	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	50	0	50	1	0	-4.17%
GH_ER2	48	2	50	0.96	0.04	0.0%
CM_MC1	48	2	50	0.96	0.04	0.0%
FR_FRCP1	47	3	50	0.94	0.06	2.08%
GH_FR1	50	0	50	1	0	-4.17%
CM_MC2	44	6	50	0.88	0.12	8.33%

**10d Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	1	1	1	1	1
GH_ER2	1	1	1	0.9	0.9
CM_MC1	1	1	1	0.8	1
FR_FRCP1	0.9	1	0.9	1	0.9
GH_FR1	1	1	1	1	1
CM_MC2	0.9	1	0.6	0.9	1

**CETIS Analytical Report**

Report Date: 08 Dec-17 13:59 (p 8 of 8)  
 Test Code: 171093 | 19-3128-5603

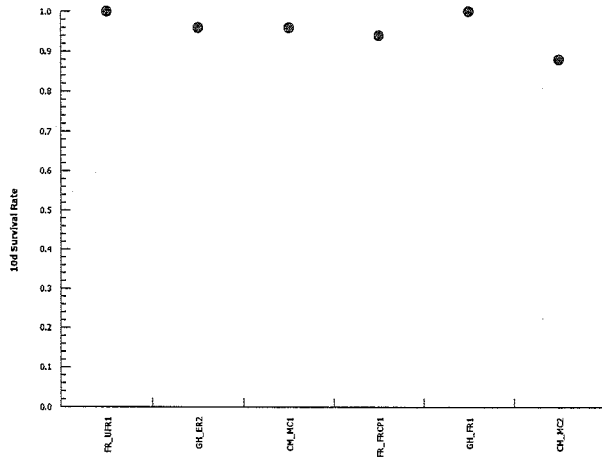
*water only*  
 Hyalella 28-d Survival and Growth Sediment Test Nautilus Environmental

Analysis ID: 10-3729-9073      Endpoint: *10d* Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 08 Dec-17 13:58      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

**10d Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	10/10	10/10	10/10	10/10	10/10
GH_ER2	10/10	10/10	10/10	9/10	9/10
CM_MC1	10/10	10/10	10/10	8/10	10/10
FR_FRCP1	9/10	10/10	9/10	10/10	9/10
GH_FR1	10/10	10/10	10/10	10/10	10/10
CM_MC2	9/10	10/10	6/10	9/10	10/10

**Graphics**



**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 1 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyaella 28-d Survival and Growth <sup>post-trial</sup> Sediment Test**

**Nautilus Environmental**

Analysis ID: 08-7130-4108	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Dec-17 13:54	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 02 Nov-17	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	01-7123-2313	05 Oct-17	05 Oct-17	NA		
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °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_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	27.8%	

**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	19	16	0	8	0.1478	Asymp	Non-Significant Effect
		GH_ER2	18	16	0	8	0.0987	Asymp	Non-Significant Effect
		CM_MC1	16	16	0	8	0.0383	Asymp	Significant Effect
		FR_FRCP1	15	16	0	8	0.0222	Asymp	Significant Effect
		GH_FR1	15	16	0	8	0.0222	Asymp	Significant Effect
		CM_MC2	15	16	0	8	0.0222	Asymp	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3589363	0.05982272	6	4.555	0.0024	Significant Effect
Error	0.3677709	0.01313468	28			
Total	0.7267073		34			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	17.22	16.81	0.0085	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.892	0.9146	0.0024	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	0.6273	0.5933	0.6614	0.618	0.596	0.669	0.01227	4.38%	0.0%
FR_UFR1	5	0.5634	0.4768	0.65	0.578	0.457	0.644	0.03118	12.38%	10.19%
GH_ER2	5	0.4692	0.2603	0.6782	0.5033	0.2067	0.6322	0.07526	35.86%	25.2%
CM_MC1	5	0.4517	0.1987	0.7047	0.497	0.0975	0.609	0.09114	45.12%	28.0%
FR_FRCP1	5	0.4839	0.3996	0.5682	0.5089	0.378	0.556	0.03037	14.03%	22.86%
GH_FR1	5	0.4818	0.3699	0.5937	0.51	0.364	0.577	0.04029	18.7%	23.2%
CM_MC2	5	0.2746	0.1985	0.3506	0.252	0.2178	0.367	0.0274	22.31%	56.23%

*Water only*

Hyalella 28-d Survival and Growth Sediment Test

Nautilus Environmental

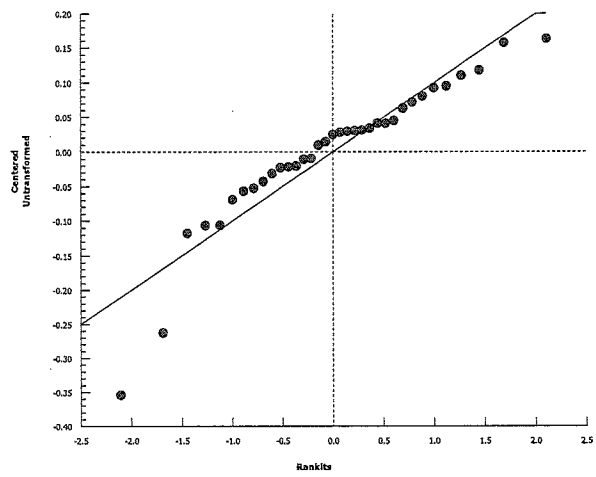
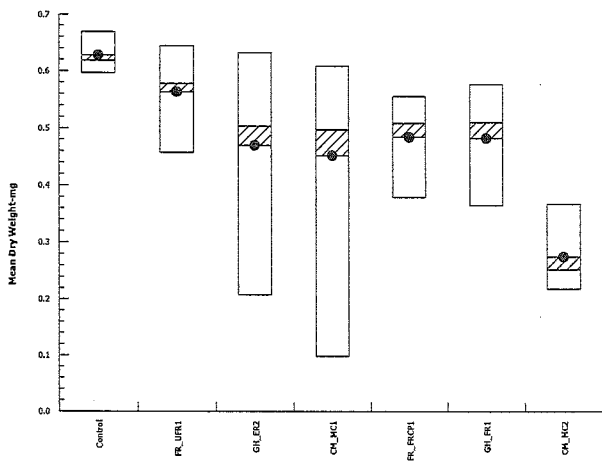
Analysis ID: 08-7130-4108      Endpoint: Mean Dry Weight-mg  
 Analyzed: 08 Dec-17 13:54      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control	0.6167	0.596	0.669	0.637	0.618
FR_UFR1	0.595	0.644	0.578	0.457	0.543
GH_ER2	0.417	0.2067	0.587	0.6322	0.5033
CM_MC1	0.493	0.497	0.609	0.0975	0.562
FR_FRCP1	0.5144	0.378	0.5089	0.556	0.4622
GH_FR1	0.545	0.364	0.51	0.413	0.577
CM_MC2	0.3044	0.367	0.2316	0.2178	0.252

Graphics



**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 3 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth <sup>sediment</sup> Test**

**Nautilus Environmental**

Analysis ID: 02-3107-8543	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Dec-17 13:55	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	32.7%	

**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		GH_ER2	23	16	0	8	0.4416	Asymp	Non-Significant Effect
		CM_MC1	23	16	0	8	0.4416	Asymp	Non-Significant Effect
		FR_FRCP1	20	16	0	8	0.1899	Asymp	Non-Significant Effect
		GH_FR1	20	16	0	8	0.1899	Asymp	Non-Significant Effect
		CM_MC2	15	16	0	8	0.0191	Asymp	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2303303	0.04606607	5	3.031	0.0293	Significant Effect
Error	0.3647579	0.01519825	24			
Total	0.5950882		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.956	15.09	0.0765	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8971	0.9031	0.0071	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	0.5634	0.4768	0.65	0.578	0.457	0.644	0.03118	12.38%	0.0%
GH_ER2	5	0.4692	0.2603	0.6782	0.5033	0.2067	0.6322	0.07526	35.86%	16.71%
CM_MC1	5	0.4517	0.1987	0.7047	0.497	0.0975	0.609	0.09114	45.12%	19.83%
FR_FRCP1	5	0.4839	0.3996	0.5682	0.5089	0.378	0.556	0.03037	14.03%	14.11%
GH_FR1	5	0.4818	0.3699	0.5937	0.51	0.364	0.577	0.04029	18.7%	14.48%
CM_MC2	5	0.2746	0.1985	0.3506	0.252	0.2178	0.367	0.0274	22.31%	51.26%

**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 4 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth Sediment Test**

**Nautilus Environmental**

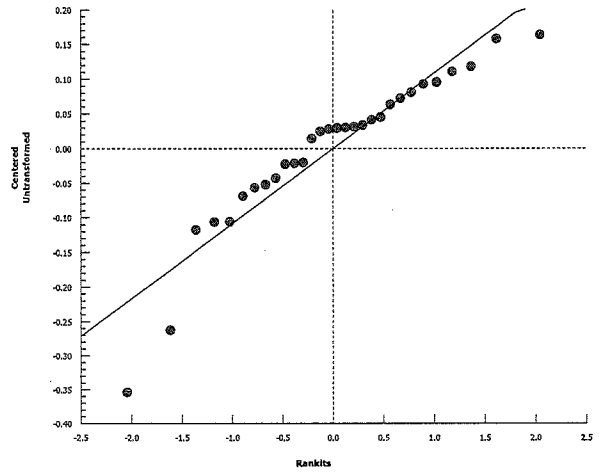
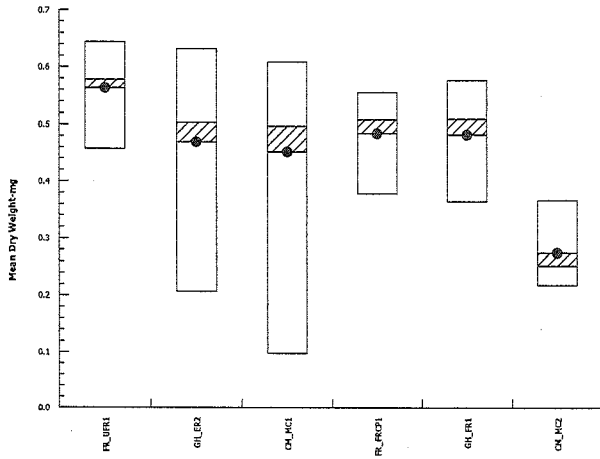
Analysis ID: 02-3107-8543 *interior*  
 Analyzed: 08 Dec-17 13:55 *12*  
 Endpoint: Mean Dry Weight-mg  
 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.595	0.644	0.578	0.457	0.543
GH_ER2	0.417	0.2067	0.587	0.6322	0.5033
CM_MC1	0.493	0.497	0.609	0.0975	0.562
FR_FRCP1	0.5144	0.378	0.5089	0.556	0.4622
GH_FR1	0.545	0.364	0.51	0.413	0.577
CM_MC2	0.3044	0.367	0.2316	0.2178	0.252

**Graphics**



**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 5 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth <sup>sediment</sup> Sediment Test**

Nautilus Environmental

Analysis ID: 15-8283-2009	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Dec-17 13:57	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 09-4382-7400	Test Type: Growth-Survival (10d)	Analyst: Eric Cheung
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	39.2%	

**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	16	0	8	0.9821	Asymp	Non-Significant Effect
		CM_MC1	26	16	0	8	0.7237	Asymp	Non-Significant Effect
		FR_FRCP1	27	16	0	8	0.8003	Asymp	Non-Significant Effect
		GH_FR1	26	16	0	8	0.7237	Asymp	Non-Significant Effect
		CM_MC2	20	16	0	8	0.1899	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2303303	0.04606607	5	3.031	0.0293	Significant Effect
Error	0.3647579	0.01519825	24			
Total	0.5950882		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.956	15.09	0.0765	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8971	0.9031	0.0071	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	0.5634	0.4768	0.65	0.578	0.457	0.644	0.03118	12.38%	0.0%
GH_ER2	5	0.4692	0.2603	0.6782	0.5033	0.2067	0.6322	0.07526	35.86%	16.71%
CM_MC1	5	0.4517	0.1987	0.7047	0.497	0.0975	0.609	0.09114	45.12%	19.83%
FR_FRCP1	5	0.4839	0.3996	0.5682	0.5089	0.378	0.556	0.03037	14.03%	14.11%
GH_FR1	5	0.4818	0.3699	0.5937	0.51	0.364	0.577	0.04029	18.7%	14.48%
CM_MC2	5	0.2746	0.1985	0.3506	0.252	0.2178	0.367	0.0274	22.31%	51.26%

**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 6 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth <sup>in water only</sup> Sediment Test**

**Nautilus Environmental**

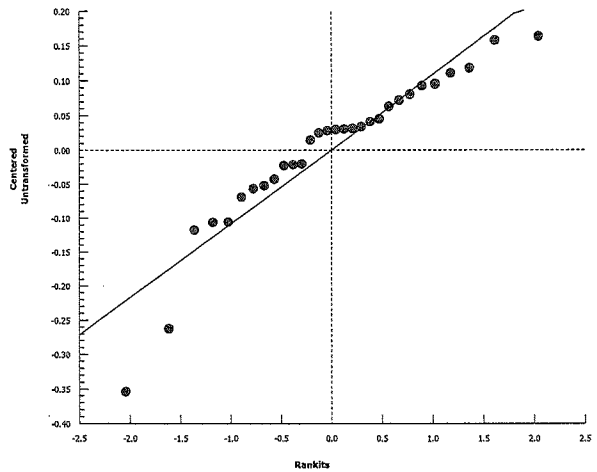
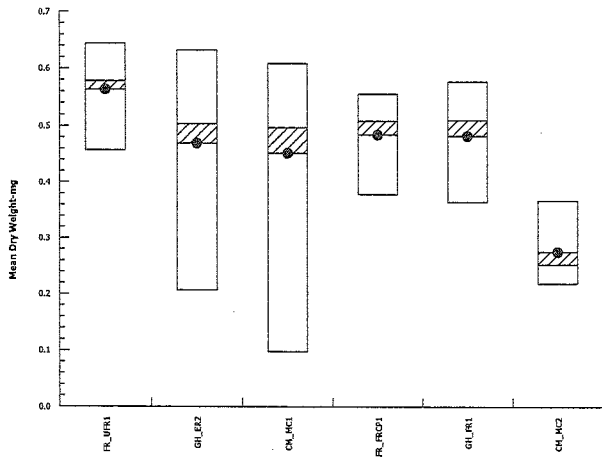
Analysis ID: 15-8283-2009      Endpoint: Mean Dry Weight-mg  
 Analyzed: 08 Dec-17 13:57      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.595	0.644	0.578	0.457	0.543
GH_ER2	0.417	0.2067	0.587	0.6322	0.5033
CM_MC1	0.493	0.497	0.609	0.0975	0.562
FR_FRCP1	0.5144	0.378	0.5089	0.556	0.4622
GH_FR1	0.545	0.364	0.51	0.413	0.577
CM_MC2	0.3044	0.367	0.2316	0.2178	0.252

**Graphics**





**CETIS Analytical Report**

Report Date: 08 Dec-17 14:45 (p 7 of 8)  
 Test Code: 171093 | 19-3128-5603

**Hyalella 28-d Survival and Growth Sediment Test**

Nautilus Environmental

Analysis ID: 11-3282-6093	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 08 Dec-17 13:58	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 09-4382-7400	Test Type: Growth-Survival (28d)	Analyst: Eric Cheung
Start Date: 05 Oct-17	Protocol: EPA/600/R-99/064 (2000)	Diluent: Reconstituted Water
Ending Date: 02 Nov-17	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	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	60h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	61h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	55h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	59h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	59h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	54h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	40.8%	

**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	32	16	0	8	0.9821	Asymp	Non-Significant Effect
		GH_ER2	29	16	0	8	0.9104	Asymp	Non-Significant Effect
		FR_FRCP1	26	16	0	8	0.7237	Asymp	Non-Significant Effect
		GH_FR1	27	16	0	8	0.8003	Asymp	Non-Significant Effect
		CM_MC2	20	16	0	8	0.1899	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2303303	0.04606607	5	3.031	0.0293	Significant Effect
Error	0.3647579	0.01519825	24			
Total	0.5950882		29			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	9.956	15.09	0.0765	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8971	0.9031	0.0071	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	0.5634	0.4768	0.65	0.578	0.457	0.644	0.03118	12.38%	0.0%
GH_ER2	5	0.4692	0.2603	0.6782	0.5033	0.2067	0.6322	0.07526	35.86%	16.71%
CM_MC1	5	0.4517	0.1987	0.7047	0.497	0.0975	0.609	0.09114	45.12%	19.83%
FR_FRCP1	5	0.4839	0.3996	0.5682	0.5089	0.378	0.556	0.03037	14.03%	14.11%
GH_FR1	5	0.4818	0.3699	0.5937	0.51	0.364	0.577	0.04029	18.7%	14.48%
CM_MC2	5	0.2746	0.1985	0.3506	0.252	0.2178	0.367	0.0274	22.31%	51.26%

Hyaella 28-d Survival and Growth <sup>water sed</sup> Sediment Test

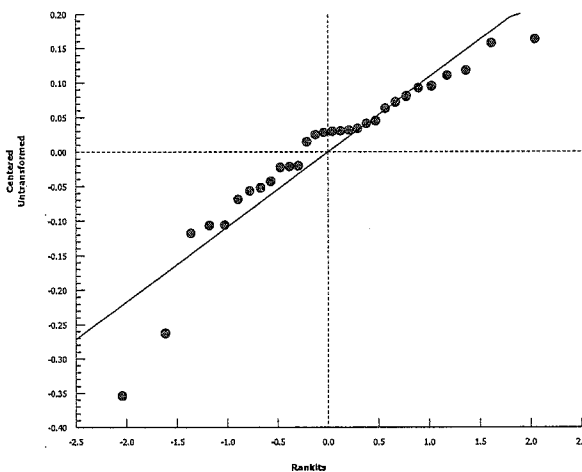
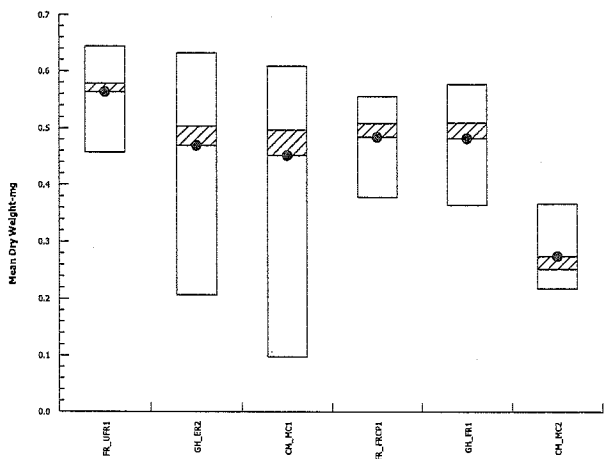
Nautilus Environmental

Analysis ID: 11-3282-6093      Endpoint: Mean Dry Weight-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 08 Dec-17 13:58      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
FR_UFR1	0.595	0.644	0.578	0.457	0.543
GH_ER2	0.417	0.2067	0.587	0.6322	0.5033
CM_MC1	0.493	0.497	0.609	0.0975	0.562
FR_FRCP1	0.5144	0.378	0.5089	0.556	0.4622
GH_FR1	0.545	0.364	0.51	0.413	0.577
CM_MC2	0.3044	0.367	0.2316	0.2178	0.252

Graphics



Client: Teck

W.O.#: 17/03

### Hardness and Alkalinity Datasheet

Day 0 Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
Control	Oct 5/17	Oct 18/17	50	3.3	3.4	64	100	1.6	160	AW?
FR-4FR1			50	7.5	7.6	148	100	2.6	260	
GH-ER2				7.3	7.4	144		2.4	240	
CM-MC1				7.2	7.4	140		1.8	180	
FR-FRCP1				10.1	10.3	198		8.0	800	
GH-FR1				9.9	10.2	192		5.8	580	
CM-MC2				9.7	9.8	192		5.8	580	

Notes: ① Diluted to 100ml w DI

Reviewed by: JBH

Date Reviewed: Dec. 8/17

Client: Teck (Q4)

W.O.#: 171093

### Hardness and Alkalinity Datasheet

Day 28 Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
Control	Nov 21/17	Nov 21/17	50	3.5	3.6	68	50	6.9	138	AWZ
FR-VFRI			50	7.7	7.9	150	50	9.6	192	
GH-ER2				7.7	7.9	150	50	8.2	164	
CM-MC1				7.3	7.4	144	50	7.5	150	
FR-FRCPI				11.6	11.7	230	100	8.6	860	
GH-FR1				10.6	10.8	208	100	5.6	560	
CM-MC2				10.7	10.9	210	100	6.0	600	

Notes: ① Diluted to 100 mL w/ D.I.

Reviewed by: JGh

Date Reviewed: Dec. 8/17

**APPENDIX D – *Pimephales promelas* Toxicity Test Data**

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Method FMD 32 Day ELS Client NAU104

CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
Sample: 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**Organism Information**

Source: Aquatox Batch: 20171005FMELS Egg Stage: 13 somites

Organisms Received in Good Condition: Yes of No

**Test Log**

Date	Day	Time	Technicians	Chem Cart Used	Fed		Feeding Rate	Sample Pre-Aeration Time	Bench Sheet Review	
					AM	PM			First	Second
2017/10/05	0	1630	JW/HS	2	-	-	-	60 min	HS	JW
2017/10/06	1	1400	HS/JW	2	-	-	-	60 min	HS	JW
2017/10/07	2	1830	EP	2	-	-	-	60 min	LC	EP
2017/10/08	3	1430	SS	2	-	-	-	60 min	SS	AP
2017/10/09	4	1000	HS	2	-	-	-	60 min	HS	JW
2017/10/10	5	1130	JW/HS	2	-	✓	0.5mL	60 min	JW	HS
2017/10/11	6	1100	JW	2	✓	✓	1 mL	60 min	JW	SS
2017/10/12	7	1200	HS	2	✓	✓	1 mL	60 min	HS	JW
2017/10/13	8	1045	HS/JW	2	✓	✓	1 mL	60 min	JW	HS
2017/10/14	9	1130	SS	2	✓	✓	1 mL	60 min	SS	EP
2017/10/15	10	1430	JW/HS	2	✓	✓	1 mL	60 min	HS	JW
2017/10/16	11	1040	JW	2	✓	✓	1 mL	60 min	JW	HS
2017/10/17	12	1030	HS	2	✓	✓	1.5mL	60 min	HS	SS
2017/10/18	13	1200	JW/AP	2	✓	✓	1.5mL	60 min	AP	JW
2017/10/19	14	1400	EP/EP	2	✓	✓	1.5mL	60 min	SS	EP
2017/10/20	15	1215	EP/CB	2	✓	✓	1.5mL	60 min	EP	SS
2017/10/21	16	1430	JC/AP	2	✓	✓	1.5mL	60 min	AP	LC
2017/10/22	17	1230	JW/CB	2	✓	✓	1.5mL	60 min	JW	CB
2017/10/23	18	1205	EP/EP	2	✓	✓	1.5mL	60 min	CB	AP
2017/10/24	19	1400	AP/CB	2	✓	✓	1.5mL	60 min	AP	AP
2017/10/25	20	1215	CB/EP	2	✓	✓	1.5mL	60 min	AP	CB
2017/10/26	21	1400	CB/EP	2	✓	✓	1.5mL	60 min	CB	SS
2017/10/27	22	1120	AP/EP	2	✓	✓	1.5mL	60 min	AP	SS
2017/10/28	23	1310	SS/AP	2	✓	✓	1.5mL	60 min	JC	SS
2017/10/29	24	1200	JW/HS	2	✓	✓	1.5mL	60 min	HS	JW
2017/10/30	25	1100	EP/CB	2	✓	✓	1.5mL	60 min	HS	SS
2017/10/31	26	1115	SS/AP	2	✓	✓	1.5mL	60 min	SS	HS
2017/11/01	27	1205	EP/AP	2	✓	✓	1.5mL	60 min	AP	JW
2017/11/02	28	1200	HS/EP	2	✓	✓	1.5mL	60 min	HS	SS
2017/11/03	29	1200	CB/EP	2	✓	✓	1.5mL	60 min	SS	LC
2017/11/04	30	1015	AP/AP	2	✓	✓	1.5mL	60 min	AP	JC
2017/11/05	31	1315	CB	2	✓	✓	1.5mL	60 min	CB	HS
2017/11/06	32	1400	HS/SS	2	-	-	-	-	HS	SS

10/13 - 260 (20µg/L) confirmed not being tested anymore

Reviewed by: JP

Date reviewed: 2017/12/10

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/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-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		0259 (20µg)		0260 (20µg)		0261 (20µg)		0263 (20µg)	
	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	15	0	15	0	15	0	14	1	15	0	15	0	15	0
b	15	0	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	15	0
d	15	0	15	0	15	0	15	0	15	0	15	0	15	0
e	30	0	30	0	28	2	30	0	29	1	28	2	30	0
f	30	0	30	0	29	1	30	0	30	0	30	0	29	1

Comments/Observations:

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT			CTL-Cu (10µg)			CTL-Cu (20µg)			0259 (20µg)		
	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	2	15	14	1	15	15	0	15	8	7	15
b	10	5	15	15	0	15	14	1	15	13	2	15
c	14	1	15	15	0	15	15	0	15	13	2	15
d	12	3	15	14	1	15	15	0	15	10	5	15
e	30	0		29	1		28	0		29	1	
f	30	0		29	1		29	0		29	0	

replicate	0260 (20µg)			0261 (20µg)			0263 (20µg)		
	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	13	2	15	13	2	15	13	2	15
b	13	2	15	13	2	15	12	3	15
c	14	1	15	15	0	15	14	1	15
d	15	0	15	15	0	15	15	0	15
e	29	0		28	0		30	0	
f	29	1		30	0		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:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
Sample: 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		0259 (20µg)		0260 (20µg)		0261 (20µg)		0263 (20µg)	
	Day 3		Day 3		Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	14 <sup>3</sup>	2	13	2	14 <sup>3</sup>	2	14	1	11	4	15	0	12	3
b	15	0	15	0	15 <sup>4</sup>	21	13	2	13	2	13	2	14	1
c	13	2	13	2	14 <sup>3</sup>	12	14	1	14	1	11	4	15	0
d	15	0	15	0	15 <sup>8</sup>	80	14 <sup>7</sup>	8	13	2	13	2	14 <sup>1</sup>	01

Comments/Observations:

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		0259 (20µg)		0260 (20µg)		0261 (20µg)		0263 (20µg)	
	Day 4		Day 4		Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	6	9	4	11	2	13	4	11	5	10	2	13	3	12
b	8 <sup>5</sup>	9	3	12	7	8	6	9	10	5	0	15	3	12
c	8 <sup>10</sup>	9	4	11	8	7	5	10	2	13	5	10	2	13
d	5	10	8 <sup>1</sup>	13	3	12	3	12	5	10	2	13	3	12

Comments/Observations: CTL UNT 2B - 2 dead unhatched  
CTL CU (10) d - 1 dead unhatched

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		0259 (20µg)		0260 (20µg)		0261 (20µg)		0263 (20µg)	
	Day 5		Day 5		Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	14	15 <sup>24</sup>	14	(2)	13		14		14		12		13	
b	14		15		15 <sup>4*</sup>		14		15		15		15	
c	15		15		14		14		15		14		15	
d	15		13	(1) <sup>*</sup>	15	(1)	15		15		13		13	

Comments/Observations: CTL CU 20A - 1 dead egg  
CTL CU 10 - 2 half hatched  
CTL CU 20B - 2 dead eggs  
CTL CU 10 - 2 half hatched

replicate	CTL-UNT		CTL-Cu (10µg)		CTL-Cu (20µg)		0259 (20µg)		0260 (20µg)		0261 (20µg)		0263 (20µg)	
	Day 6		Day 6		Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	15	15 <sup>24</sup>	14		13		14		14		11		13	
b	14		15		15		14		15	(1)	15		15	
c	14	15	15		14		14		15		14		15	
d	15		13	(1)	15	(1)	14		14	(1)	12	(1)	13	(1)

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06



Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	15	14	13	14	14	11	13
b	14	15	15	14	15	15	15(1)
c	15	15	14	14	15	14	15(1)
d	15	13	15, 14	14	14	12(1)	12x

Comments/Observations: *x microbial growth on dead FM*

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	15	14(1)	13	14(1)	14	11	13
b	14	15	15	14(1)	15	15	15(1)
c	15	15	14	14	15	14	15
d	15	13	14	14	14	12(1)	12

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	15	14(1)	13	14(1)	<del>not being tested</del>	11(1)	13 FM
b	14	15(1)	14	14(1)	<del>not being tested</del>	15	15(2)
c	15	15	14	14(1)	<del>not being tested</del>	14	13x
d	15	13	14	14	<del>not being tested</del>	12	10x

Comments/Observations: *x microbial growth*

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	15	14(1)	13	14(1)	<del>not being tested</del>	11(2)	13
b	14(1)	15(1)	14	14(1)	<del>not being tested</del>	15(1)	15(2)
c	15	15	14	14(1)	<del>not being tested</del>	14	13
d	15	13	14	14	<del>not being tested</del>	12	10(1)

Comments/Observations:

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
Sample: 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		15(1)	13	13	14(1)	/	11(1)	13(1)
b		14(2)	15	14(1)	14(1)		15(2)	14(1)
c		15	15(1)	14	14(1)		14	12
d		15	13	14	14		12	10

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		15(1)	12	13	14(1)	/	10	11
b		14(1)	15(1)	13	14(1)		14	14(1)
c		15	15	14	12		14	12
d		15	13	14	14		12	9

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		14	12	13	14(1)	/	10	11
b		13(1)	14	13(1)	14(1)		14(2)	13
c		15	14	14(1)	12(1)		14	12
d		14	13	14	14(1)		12	8*

Comments/Observations: 0263 (20µg) D: m1001011.

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		14	10	13	13	/	10	11
b		12	14	12	13		14(1)	13(1)
c		15	14	14	12(2)		14	11(1)
d		13/14	15(1)	14	14(1)		12(1)	8

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT Day 15	CTL-Cu (10µg) Day 15	CTL-Cu (20µg) Day 15	0259 (20µg) Day 15	0260 (20µg) Day 15	0261 (20µg) Day 15	0263 (20µg) Day 15
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	13	13	/	10	11
b	12	14	12	13		14(1)	10
c	14	14	14	12		14	7
d	14	13(1)	14	14		12	8

Comments/Observations:

	CTL-UNT Day 16	CTL-Cu (10µg) Day 16	CTL-Cu (20µg) Day 16	0259 (20µg) Day 16	0260 (20µg) Day 16	0261 (20µg) Day 16	0263 (20µg) Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	13	13	/	10	11
b	12	4	12	13		14(1)	12
c	<del>12</del> 14	14	14	12		14	10
d	14	13(1)	14	<del>12</del>		12(1)	8

Comments/Observations:

	CTL-UNT Day 17	CTL-Cu (10µg) Day 17	CTL-Cu (20µg) Day 17	0259 (20µg) Day 17	0260 (20µg) Day 17	0261 (20µg) Day 17	0263 (20µg) Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13	12	13(1)	13	/	10	11
b	12(1)	14	12	13(1)		13	12
c	14	14	14	11(1)		14	10
d	14(1)	12	14(1)	14(1)		12(1)	8

Comments/Observations:

	CTL-UNT Day 18	CTL-Cu (10µg) Day 18	CTL-Cu (20µg) Day 18	0259 (20µg) Day 18	0260 (20µg) Day 18	0261 (20µg) Day 18	0263 (20µg) Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	13(1)	12	13(1)	13	/	10	11
b	12(1)	14	12(1)	13(1)		13	12
c	14	14	14(1)	14(1)		14	10
d	13	12	14(2)	13		12(1)	8

Comments/Observations:

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
Sample: 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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	Alive Hatched
a	13(1)	12	13(1)	13(1)*	/	18	11	
b	12	14	12(1)	12(1)*	/	13	12	
c	14	14	14(1)	11(1)	/	14	10	
d	13	12	14(2)	13	/	12(1)	8	

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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	Alive Hatched
a	13(1)	12	13(1)	13	/	10	11	
b	11	14	12(1)	12	/	13	11	
c	14	14	14(1)	11(1)	/	13	10	
d	13	12	14(1)	13	/	12(1)	8	

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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	Alive Hatched
a	13(1)	12	13	13	/	10	11	
b	11	14	12(1)	12(1)	/	13	11	
c	14	14	13	11(1)	/	13	10	
d	13	12	14	13(1)	/	12(2)	8	

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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	Alive Hatched
<sup>1718</sup> a	13(1)	12	12(1)	13	/	10	11	
b	11	14	4	11	/	13	11	
c	14	14	13	12(1)	/	13	10	
d	13	12	14	13	/	12(1)	8	

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**Number of Alive Embryos and Hatched Organisms**

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	12 12	12	11(1)	12 13 <sup>pw</sup>	10 <sup>ss</sup>	10	13 11
b	10 11	14	11	10 11 <sup>pw</sup>	13	13	11 11
c	11 14	14	13	11		13	ss 11 10
d	14 12	12	14	13		11	13 8

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	13	12	11(1)	13		10(1)	11
b	11	14	11	11		13	11
c	14	14	13	10		13	10
d	12	12	14	13		11	8

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	12 13 14	12	11(1)	13		9	11
b	11	14	11	11		13	11
c	14	14	13	10		13	10
d	12	12	14	13		11	8

Comments/Observations:

	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	12 11 13 <sup>ss</sup>	12	11(1)	13		9	11
b	11	14	11	11		13	11
c	14	14	13	10		13	10
d	12	12	14	13		11	8

Comments/Observations:

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L),  
Sample: 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

		Number of Alive Embryos and Hatched Organisms						
		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		12	12	11(1)	13	/	9	11
b		11	14	11	11	/	13	11
c		14	14	13	10	/	13	10
d		12	12	14	13	/	11	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		12	12	11	13	/	9	4
b		4	14	11	11	/	13	11
c		14	14	13	10	/	13	10
d		12	12	14	13	/	11	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		12	11	11	13	/	9	4
b		11	14	11	11	/	13	11
c		14	14	13	10	/	13	10
d		12	11	14	13	/	11	8

Comments/Observations:

		CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
		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		12	11	11	13	/	9	4
b		11	14	11	11	/	13	11
c		14	14	13	10	/	13	10
d		12	11	14	13	/	11	8

Comments/Observations:

Reviewed by JP Date reviewed 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

Number of Alive Embryos and Hatched Organisms							
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	12	11	11	13	/	9	11
b	11	14	11	11	/	13	11
c	14	14	13	10	/	13	10
d	12	11	14	13	/	11	8

Comments/Observations:

Number of Alive Embryos and Hatched Organisms							
	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
	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	12	11	11	13	/	9	11
b	11	14	11	11	/	13	45% all
c	14	14	13	10	/	13	10
d	12	11	14	13	/	11	8

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

**New Solutions**

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day							
	pH (units)						
0	8.2	8.2	8.2	8.2	8.3	8.2	8.2
1	8.2	8.2	8.2	8.3	8.4	8.3	8.3
2	8.3	8.3	8.3	8.3	8.4	8.4	8.4
3	8.3	8.3	8.3	8.3	8.4	8.4	8.3
4	8.2	8.2	8.2	8.3	8.3	8.3	8.2
5	8.2	8.3	8.3	8.3	8.4	8.4	8.3
6	8.2	8.2	8.2	8.3	8.3	8.3	8.2
7	8.2	8.2	8.2	8.2	-	8.3	8.2
8	8.2	8.2	8.2	8.2	-	8.2	8.1

**Old Solutions**

CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
pH (units)						
0						
1	8.0	8.1	8.1	8.3	8.2	8.3
2	8.1	8.1	8.1	8.1	8.2	8.2
3	8.2	8.2	8.2	8.1	8.3	8.1
4	8.2	8.2	8.2	8.1	8.3	8.3
5	8.3	8.3	8.3	8.1	8.3	8.1
6	8.2	8.2	8.2	8.0	8.1	8.2
7	8.2	8.2	8.2	8.0	8.2	8.1
8	8.2	8.2	8.2	7.9	-	8.1

**Conductance (µS/cm)**

0	388	406	410	1206	463	809	1090
1	380	400	401	1243	334	826	981
2	385	410	415	1256	388	850	994
3	384	364	376	1204	393	804	959
4	380	381	380	1235	350	818	978
5	381	399	400	1232	363	826	975
6	390	400	409	1219	363	818	891
7	369	390	393	1223	-	951	964
8	384	374	379	1208	-	980	965

**Conductance (µS/cm)**

0							
1	392	357	361	1250	372	825	991
2	366	378	378	1275	400	848	1001
3	353	364	405	1196	431	798	967
4	380	365	373	1152	430	793	949
5	383	364	381	1197	396	791	959
6	401	378	391	1035	434	781	935
7	390	389	392	1182	368	759	924
8	387	394	402	1141	-	915	954

**Dissolved Oxygen (mg/L) (40-100% saturation)**

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	7.3	7.3
2	7.2	7.2	7.2	7.2	7.2	7.2	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	7.2	7.3	7.3
7	7.3	7.3	7.3	7.2	7.2	7.3	7.3
8	7.3	7.3	7.3	7.3	-	7.3	7.3

**Dissolved Oxygen (mg/L) (40-100% saturation)**

0							
1	7.0	7.0	7.0	7.0	7.0	6.9	6.9
2	7.0	7.0	6.9	6.9	6.9	6.9	6.9
3	7.0	7.2	7.2	7.2	7.3	7.3	7.4
4	7.2	7.2	7.2	7.1	7.2	7.2	7.2
5	6.9	6.9	7.0	6.9	6.9	7.2	7.2
6	7.0	7.0	7.1	6.9	7.1	7.1	7.1
7	6.9	7.0	6.9	7.1	6.9	6.9	7.0
8	6.9	6.9	6.9	6.4	-	6.9	7.0

**Temperature (°C)**

0	23.6	23.6	23.6	23.6	23.6	23.6	23.7
1	23.7	23.7	23.7	23.6	23.7	23.7	23.7
2	24.7	24.7	24.7	24.7	24.7	24.7	24.7
3	23.7	23.6	23.6	23.7	23.7	23.7	23.8
4	23.7	23.7	23.7	23.7	23.7	23.7	23.8
5	23.8	23.8	23.8	23.8	23.8	23.6	23.6
6	23.6	23.7	23.7	23.7	24.0	23.7	23.3
7	24.0	24.1	24.1	24.0	24.0	24.0	24.1
8	24.0	24.1	24.0	24.2	-	24.0	24.1

**Temperature (°C)**

0							
1	23.5	23.5	23.6	23.6	23.5	23.5	23.6
2	23.6	23.6	23.6	23.6	23.7	23.7	23.7
3	24.0	24.2	24.0	23.8	23.7	23.7	23.7
4	23.7	23.7	23.7	23.9	23.7	23.6	23.7
5	23.6	23.7	23.7	23.9	23.7	23.7	23.7
6	24.1	24.1	24.2	24.3	24.3	24.2	24.2
7	24.0	24.1	24.0	24.0	24.0	23.9	25.6
8	24.4	24.2	24.1	24.1	-	24.0	23.8

**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:**

\* 260 (20) - not being done anymore

Reviewed by: JP Date reviewed 2017/12/10



Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

New Solutions							
Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day	pH (units)						
9	8.2	8.3	8.3	8.2	-	8.3	8.3
10	8.2	8.2	8.2	8.2	-	8.3	8.2
11	8.2	8.2	8.3	8.2	-	8.4	8.2
12	8.2	8.2	8.2	8.2	-	8.3	8.2
13	8.2	8.2	8.3	8.1	-	8.2	8.2
14	8.1	7.9	8.1	8.1	-	8.2	7.9
15	8.2	8.2	8.2	8.2	-	8.2	8.2
16	8.2	8.2	8.3	8.1	-	8.2	8.3
17	8.2	8.3	8.3	8.2	-	8.4	8.3
Conductance (µS/cm)							
9	401	403	407	1158	-	954	952
10	400	411	420	1234	-	972	950
11	420	421	417	1207	-	965	949
12	411	420	419	1222	-	970	956
13	418	421	421	1204	-	1027	1010
14	406	395	458	1271	-	922	982
15	421	410	420	1408	-	941	1030
16	410	403	395	1364	-	915	1010
17	376	396	395	1367	-	921	997
Dissolved Oxygen (mg/L) (40-100% saturation)							
9	7.3	7.3	7.3	7.2	-	7.2	7.2
10	7.3	7.3	7.3	7.3	-	7.3	7.3
11	7.3	7.3	7.3	7.3	-	7.2	7.3
12	7.3	7.3	7.3	7.3	-	7.2	7.2
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	7.4	7.3	7.3	7.3	-	7.3	7.3
16	7.3	7.3	7.3	4.3	-	7.3	7.3
17	7.3	7.3	7.3	7.3	-	7.3	7.3
Temperature (°C)							
9	24.0	24.0	24.3	24.8	-	24.9	24.9
10	24.1	24.0	24.0	24.1	-	24.3	24.2
11	24.0	24.0	24.0	24.4	-	24.7	24.1
12	24.0	24.1	24.1	24.2	-	24.6	24.6
13	24.0	24.0	24.0	24.1	-	24.0	24.0
14	24.1	24.1	24.0	24.1	-	24.0	24.0
15	24.0	24.0	24.0	23.8	-	24.0	24.0
16	23.8	24.1	24.1	23.7	-	24.0	24.0
17	24.0	24.0	24.0	24.0	-	24.0	24.0

Old Solutions							
CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)	
pH (units)							
9	8.2	8.2	8.2	8.79	-	8.0	7.9
10	8.2	8.2	8.3	8.0	-	8.0	8.0
11	8.2	8.2	8.2	7.9	-	8.0	8.0
12	8.2	8.2	8.2	8.0	-	8.1	8.1
13	8.1	8.1	8.2	7.9	-	8.1	8.0
14	8.1	8.1	8.1	7.9	-	8.0	7.9
15	8.1	8.0	8.1	7.9	-	8.0	8.0
16	8.1	8.1	8.1	7.9	-	8.0	8.0
17	8.1	8.1	7.9	7.9	-	8.0	7.9
Conductance (µS/cm)							
9	388	402	408	1153	-	954	950
10	386	403	413	1191	-	961	947
11	398	378	414	1196	-	972	948
12	400	408	422	1175	-	964	941
13	405	435	460	1272	-	1025	1004
14	418	435	457	1240	-	988	948
15	403	422	429	1294	-	939	957
16	408	415	468	1324	-	891	985
17	406	421	405	1345	-	948	866
Dissolved Oxygen (mg/L) (40-100% saturation)							
9	6.9	7.0	6.9	6.8	-	7.0	7.0
10	6.9	6.9	6.8	6.9	-	6.9	6.9
11	6.7	6.7	6.8	6.8	-	6.8	6.8
12	6.6	6.5	6.4	6.4	-	6.7	6.5
13	6.9	6.8	6.8	6.9	-	7.0	6.9
14	7.3	7.3	7.3	7.3	-	7.3	7.3
15	7.0	7.0	6.9	6.7	-	6.8	6.8
16	7.3	6.9	7.0	7.1	-	7.2	7.0
17	6.5	6.4	6.2	6.2	-	6.2	6.1
Temperature (°C)							
9	23.8	23.8	23.8	23.7	-	23.7	23.7
10	23.9	24.0	24.1	23.9	-	23.9	23.8
11	24.0	24.0	24.0	24.0	-	24.0	24.0
12	24.0	24.1	24.1	24.1	-	24.0	23.9
13	23.8	23.7	23.6	23.5	-	23.8	23.9
14	24.2	24.3	24.0	24.0	-	24.1	24.0
15	24.0	24.0	24.0	24.0	-	24.0	24.0
16	24.1	23.9	23.8	23.9	-	23.9	23.9
17	23.5	23.5	23.9	23.9	-	23.5	23.6

**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: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

New Solutions

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day							
	pH (units)						
18	8.2	8.3	8.3	8.1	18.7	8.2	
19	8.3	8.3	8.3	8.2	15.8	8.3	
20	8.3	8.4	8.4	8.3	8.4	8.4	
21	8.2	8.2	8.2	8.2	8.3	8.2	
22	8.3	8.3	8.3	8.3	8.4	8.3	
23	8.3	8.3	8.3	8.1	8.3	8.3	
24	8.2	8.2	8.2	8.2	8.3	8.2	
25	8.0	8.1	8.1	8.0	8.1	8.1	
26	8.2	8.2	8.2	8.0	8.2	8.2	

Old Solutions

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day							
	pH (units)						
18	8.0	8.2	8.2	8.1	8.0	8.1	
19	8.0	8.2	8.2	8.0	8.0	8.1	
20	8.3	8.1	8.1	8.0	8.1	8.1	
21	8.1	7.9	8.0	7.9	8.0	7.9	
22	8.0	8.1	8.1	8.0	8.0	8.1	
23	8.0	8.0	7.9	7.9	8.0	8.0	
24	7.9	7.8	7.7	7.9	8.0	7.9	
25	7.7	7.7	7.8	7.8	8.0	7.9	
26	8.1	7.9	7.9	7.9	8.1	8.0	

Conductance (µS/cm)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	388	406	397	1384	926	1004	
19	422	410	405	1301	915	990	
20	236	340	337	1079	724	799	
21	372	306	331	1023	765	736	
22	319	399	318	984	736	714	
23	359	318	318	990	765	732	
24	336	339	339	1006	762	728	
25	321	323	319	1007	750	722	
26	315	329	332	999	764	730	

Conductance (µS/cm)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	358	416	404	1143	927	988	960
19	424	416	407	1132	918	990	
20	331	334	331	1085	758	797	
21	325	341	342	1072	728	762	
22	403	338	342	992	763	715	
23	332	270	321	1012	714	733	
24	300	330	327	947	758	726	
25	326	326	357	997	734	707	
26	335	329	328	998	713	732	

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	7.3	7.3	7.2	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	7.3	7.3	7.3	7.3	7.3	
23	7.1	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	

Dissolved Oxygen (mg/L) (40-100% saturation)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	6.7	6.8	6.9	7.0	7.1	7.1	
19	7.1	7.0	7.0	7.0	7.0	7.0	
20	7.3	7.3	7.3	7.3	7.3	7.3	
21	7.3	7.3	7.5	7.3	7.1	7.1	
22	7.3	7.3	7.3	7.0	6.9	6.9	
23	6.4	6.4	6.4	6.5	6.7	6.7	
24	5.9	5.8	5.8	5.9	5.9	5.8	
25	7.3	7.3	7.3	7.3	7.2	7.2	
26	7.3	7.3	7.3	7.3	7.3	7.3	

Temperature (°C)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	24.0	24.0	24.0	24.1	24.9	24.9	
19	24.0	23.9	23.9	23.9	23.9	23.8	
20	24.0	24.0	24.0	24.0	24.0	24.1	
21	24.0	24.0	24.0	24.0	24.0	24.0	
22	23.8	23.7	23.7	23.9	24.0	24.0	
23	23.8	23.9	23.9	23.8	24.0	24.0	
24	24.0	24.0	24.0	24.0	24.0	24.0	
25	24.0	24.0	24.0	24.0	24.0	24.0	
26	24.0	24.0	24.0	24.0	24.0	24.0	

Temperature (°C)

Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
18	23.9	23.8	23.8	24.0	24.0	24.0	
19	23.9	23.8	23.6	23.6	23.5	23.8	23.9
20	24.0	24.0	24.0	24.0	24.0	24.0	
21	24.0	24.0	24.0	24.0	24.0	24.0	
22	23.9	23.9	23.9	23.8	24.0	24.0	
23	23.5	23.5	23.5	23.5	23.5	23.9	
24	24.0	23.5	23.5	23.5	23.5	23.5	
25	24.0	24.0	24.0	24.0	24.0	24.0	
26	23.6	24.0	24.0	23.9	23.9	23.8	

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: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/L)

New Solutions

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
pH (units)							
27	8.2	8.2	8.2	8.1		8.3	8.2
28	8.2	8.2	8.2	8.2		8.3	8.2
29	8.2	8.3	8.3	8.2		8.3	8.2
30	8.1	8.1	8.1	8.0		8.2	8.1
31	8.3	8.3	8.3	8.2		8.3	8.3
32							

Old Solutions *0259 UF*

Conc. (%)	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
Day	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
pH (units)							
27	7.8	7.9	7.9	7.9	7.9	8.1	7.9
28	7.8	7.9	7.9	7.9	7.9	8.1	7.9
29	7.8	7.9	7.9	7.9	7.9	8.1	8.0
30	7.8	7.8	7.9	7.9	7.8	7.9	8.0
31	7.8	7.8	7.8	7.8	7.8	8.0	7.9
32	7.8	8.0	8.0	7.9	8.1	8.1	

Conductance (µS/cm)

27	236	250	251	227		569	536
28	241	243	239	209		552	629
29	238	246	253	270		556	618
30	233	244	253	281		555	613
31	214	243	253	211		556	621
32							

Conductance (µS/cm) *27.0*

27	257	250	248	227	570	549	549
28	256	250	243		742	562	538
29	254	253	259		763	558	600
30	241	248	256		747	564	611
31	237	248	256		773	539	601
32	233	251	262		798	547	620

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		7.2	7.3
31	7.3	7.3	7.3	7.3		7.3	7.3
32							

Dissolved Oxygen (mg/L) (40-100% saturation)

27	7.3	7.3	7.3	7.3	7.3	7.3	7.3
28	6.7	6.7	6.5		6.5	6.2	6.2
29	7.2	7.2	7.2		7.2	7.2	7.2
30	7.3	7.3	7.3		7.3	7.3	7.3
31	7.3	7.3	7.2		6.9	6.9	6.8
32	7.1	7.1	7.1		6.9	7.0	6.9

Temperature (°C) *24.0*

27	24.0	24.0	24.0	24.0		24.0	24.0
28	24.0	24.0	24.0	24.0		24.0	24.0
29	24.0	24.0	24.0	24.0		24.0	24.0
30	24.0	23.5	24.0	23.5		24.0	24.0
31	24.0	24.0	24.0	24.0		24.0	24.0
32							

Temperature (°C)

27	24.0	24.0	23.9	24.0	24.0	24.0	24.0
28	24.0	24.0	24.0		24.0	24.0	24.0
29	24.0	24.0	24.0		24.0	24.0	24.0
30	23.5	23.5	23.5		24.0	24.0	24.0
31	24.0	24.0	24.0		24.0	24.0	24.0
32	24.0	24.0	24.0		24.0	24.0	24.0

**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: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/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 H5

CTL-UNT	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	14	N	1	13	N	1	9	N	1	13	N
	2	11	↓	2	12	↓	2	12	↓	2	12	↓
	3	14	↓	3	15	↓	3	10	↓	3	13	↓
	4	13	↓	4	12	↓	4	11	↓	4	9	↓
	5	10	↓	5	13	↓	5	15	↓	5	10	↓
	6	12	↓	6	12	↓	6	12	↓	6	11	↓
	7	12	↓	7	11	↓	7	9	↓	7	11	↓
	8	10	↓	8	9	↓	8	11	↓	8	12	↓
	9	14	↓	9	10	↓	9	13	↓	9	10	↓
	10	13	↓	10	11	↓	10	10	↓	10	9	↓
	11	13	↓	11	12	↓	11	9	↓	11	11	↓
	12	14	↓	12	-	-	12	12	↓	12	12	↓
	13	-	-	13	-	-	13	10	↓	13	-	-
	14	-	-	14	-	-	14	11	↓	14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

CTL-Cu (10µg)	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	10	N	1	10	N	1	10	N
	2	14	↓	2	12	↓	2	11	↓	2	11	↓
	3	12	↓	3	14	↓	3	10	↓	3	9	↓
	4	9	↓	4	9	↓	4	10	↓	4	12	↓
	5	11	↓	5	11	↓	5	9	↓	5	11	↓
	6	12	↓	6	12	↓	6	12	↓	6	10	↓
	7	11	↓	7	10	↓	7	11	↓	7	11	↓
	8	10	↓	8	10	↓	8	10	↓	8	10	↓
	9	13	↓	9	11	↓	9	12	↓	9	12	↓
	10	11	↓	10	12	↓	10	12	↓	10	11	↓
	11	10	↓	11	10	↓	11	10	↓	11	10	↓
	12	-	-	12	9	↓	12	12	↓	12	-	-
	13	-	-	13	10	↓	13	9	↓	13	-	-
	14	-	-	14	11	↓	14	11	↓	14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/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-Cu (20µg)	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	10	N	1	11	N	1	10	N
	2	11		2	9		2	12		2	10	
	3	12		3	11		3	10		3	10	
	4	9		4	11		4	11		4	10	
	5	10		5	10		5	9		5	11	
	6	10		6	12		6	10		6	11	
	7	12		7	11		7	11		7	13	
	8	13		8	9		8	12		8	12	
	9	11		9	10		9	12		9	11	
	10	9		10	9		10	11		10	10	
	11	9		11	10		11	10		11	12	
	12	-	-	12	-	-	12	9		12	9	
	13	-	-	13	-	-	13	<del>9</del>	<del> </del>	13	10	
	14	-	-	14	-	-	14	-	-	14	10	
	15	-	-	15	-	-	15	-	-	15	-	-

Comments  
\* 1 organism in rep C lost during takedown and not weighed- JP

0259  
(20µg)

0259 (20µg)	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	12	N	1	10	N	1	12	N
	2	10		2	10		2	11		2	13	
	3	10		3	9		3	13		3	11	
	4	10		4	10		4	12		4	13	
	5	12		5	11		5	11		5	8	
	6	12		6	13		6	10		6	10	
	7	13		7	9		7	9		7	11	
	8	9		8	10		8	10		8	12	
	9	10		9	11		9	10		9	10	
	10	11		10	12		10	10		10	10	
	11	10		11	10		11	-	-	11	10	
	12	12		12	-	-	12	-	-	12	12	
	13	9		13	-	-	13	-	-	13	11	
	14	-	-	14	-	-	14	-	-	14	-	-
	15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/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. **0260 (20µg)**

Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	Fish	Length (mm)	Normal/Abnormal	Replicate #	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 HS

**0261 (20µg)**

Replicate # <u>A</u>	Fish	Length (mm)	Normal/Abnormal	Replicate # <u>B</u>	Fish	Length (mm)	Normal/Abnormal	Replicate # <u>C</u>	Fish	Length (mm)	Normal/Abnormal	Replicate # <u>D</u>	Fish	Length (mm)	Normal/Abnormal
	1	10	N		1	11	N		1	10	N		1	12	N
	2	11	↓		2	12	↓		2	10	↓		2	11	↓
	3	12	↓		3	10	↓		3	12	↓		3	11	↓
	4	10	↓		4	9	↓		4	11	↓		4	12	↓
	5	13	↓		5	10	↓		5	12	↓		5	8	↓
	6	4	↓		6	11	↓		6	10	↓		6	9	↓
	7	12	↓		7	10	↓		7	9	↓		7	11	↓
	8	10	↓		8	12	↓		8	11	↓		8	10	↓
	9	10	↓		9	10	↓		9	9	↓		9	9	↓
	10	-	-		10	9	↓		10	10	↓		10	8	↓
	11	-	-		11	10	↓		11	9	↓		11	10	↓
	12	-	-		12	9	↓		12	10	↓		12	-	-
	13	-	-		13	10	↓		13	*	↓*		13	-	-
	14	-	-		14	-	-		14	-	-		14	-	-
	15	-	-		15	-	-		15	-	-		15	-	-

Comments \*1 organism in rep C lost during takedown -JP

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259 (20µg/L), 1718-0260 (20µg/L), 1718-0261 (20µg/L), 1718-0263 (20µg/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.  
**0263**  
**(20µg)**

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	11	N	1	10	N	1	8	N
2	11		2	10		2	11		2	7	
3	10		3	11		3	12		3	10	
4	10		4	10		4	9		4	11	
5	8		5	8		5	11		5	10	
6	11		6	12		6	12		6	12	
7	12		7	11		7	9		7	11	
8	10		8	11		8	11		8	9	↓
9	11		9	10		9	10		9	-	-
10	10		10	11		10	11		10	-	-
11	10	↓	11	10	↓	11	-	-	11	-	-
12	-	-	12	-	-	12	-	-	12	-	-
13	-	-	13	-	-	13	-	-	13	-	-
14	-	-	14	-	-	14	-	-	14	-	-
15	-	-	15	-	-	15	-	-	15	-	-

Comments

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample CTL-UNT, CTL-Cu (10µg/L), CTL-Cu (20µg/L), 1718-0259, 1718-0260, 1718-0261, 1718-0263 (20µg/L)

Date of change 2017/10/11 Day of change 11

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
A	1.5mL	1.5mL	1.5mL	1.5 mL	1.5 mL	1.5mL	1.5mL
B	↓	↓	↓	↓	↓	↓	↓
C							
D	↓	↓	↓	↓	↓	↓	↓

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
A							
B							
C							
D							

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
A							
B							
C							
D							

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration							
Replicate	CTL-UNT	CTL-Cu (10µg)	CTL-Cu (20µg)	0259 (20µg)	0260 (20µg)	0261 (20µg)	0263 (20µg)
A							
B							
C							
D							

\*Feeding volume is maintained following a feeding change until a new feeding regime is recorded

Reviewed by: JP Date reviewed: 2017/12/06



Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

**Organism Information**

Source: Aquatox Batch: 20171005FM ELS Egg Stage: 13 somites

Organisms Received in Good Condition: Yes or No Yes

**Test Log**

Date	Day	Time	Technicians	Chem Cart Used	Fed		Feeding Rate	Sample Pre-Aeration Time	Bench Sheet Review	
					AM	PM			First	Second
2017/10/05	0	1630	JW/HS	2	-	-	60 min r/t	-	HS	JW
2017/10/06	1	1400	HS/JW	2	-	-	-	60 mins	HS	JW
2017/10/07	2	1300	EP	2	-	-	-	60 min	LC	HS
2017/10/08	3	1445	SS	2	-	-	-	60 min	SS	AP
2017/10/09	4	1000	HS	2	-	-	-	60 min	HS	JW
2017/10/10	5	1130	JW/HS	2	-	✓	0.5 mL	60 min	JW	HS
2017/10/11	6	1100	JW	2	✓	✓	1 mL	60 min	JW	SS
2017/10/12	7	1200	HS	2	✓	✓	1 mL	60 min	HS	JW
2017/10/13	8	1100	HS/JW	2	✓	✓	1 mL	60 min	JW	HS
2017/10/14	9	1130	SS	2	✓	✓	1 mL	60 min	SS	EP
2017/10/15	10	1430	SS/HS	2	✓	✓	1 mL	60 min	HS	JW
2017/10/16	11	1040	JW	2	✓	✓	1 mL	60 min	JW	HS
2017/10/17	12	1030	HS	2	✓	✓	* 1.5 mL	60 min	HS	SS
2017/10/18	13	1200	JW/AP	2	✓	✓	1.5 mL	60 min	JW	AP
2017/10/19	14	1400	EP/LF	2	✓	✓	1.5 mL	60 min	SS	EP
2017/10/20	15	1215	EP/LF	2	✓	✓	1.5 mL	60 min	EP	SS
2017/10/21	16	1430	LC/AP	2	✓	✓	1.5 mL	60 min	AP	LC
2017/10/22	17	1230	JW/LB	2	✓	✓	1.5 mL	60 min	JW	CB
2017/10/23	18	1215	EP/LF	2	✓	✓	1.5 mL	60 min	CB	AP
2017/10/24	19	1400	CB	2	✓	✓	1.5 mL	60 min	AP	JW
2017/10/25	20	1145	CB/LF	2	✓	✓	1.5 mL	60 min	AP	CB
2017/10/26	21	1400	CB/LF	2	✓	✓	1.5 mL	60 min	CB	SS
2017/10/27	22	1120	AP/LF	2	✓	✓	1.5 mL	60 min	AP	SS
2017/10/28	23	1310	SS/AP	2	✓	✓	1.5 mL	60 min	LC	SS
2017/10/29	24	1300	HS/JW	2	✓	✓	1.5 mL	60 min	HS	JW
2017/10/30	25	1100	CB/LF	2	✓	✓	1.5 mL	60 min	HS	SS
2017/10/31	26	1115	SS/AP	2	✓	✓	1.5 mL	60 min	SS	HS
2017/11/01	27	1205	LF/AP	2	✓	✓	1.5 mL	60 min	AP	JW
2017/11/02	28	1200	HS/LF	2	✓	✓	1.5 mL	60 min	HS	SS
2017/11/03	29	1200	CB/LF	2	✓	✓	1.5 mL	60 min	SS	LC
2017/11/04	30	1230	AP/AP	2	✓	✓	1.5 mL	60 min	AP	LC
2017/11/05	31	1315	CB	2	✓	✓	1.5 mL	60 min	CB	HS
2017/11/06	32	1400	HS/SS	2	-	-	-	-	SS	HS

Reviewed by: JP

Date reviewed 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

**Number of Alive Embryos and Hatched Organisms**

replicate	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	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	15	0	14	1	15	0	15	0	15	0
d	15	0	15	0	15	0	15	0	15	0	15	0
e	30	0	30	0	30	0	29	1	29	1	29	1
f	28	2	29	1	30	0	30	0	29	1	30	0

Comments/Observations:

**Number of Alive Embryos and Hatched Organisms**

replicate	1718-0259			1718-0260			1718-0261			1718-0262		
	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	1	15	<del>14</del> 13	<del>0</del> 1	15	15	0	15	14	1	15
b	15	0	15	14	0	15	14	1	15	15	0	15
c	12	3	15	14	0	15	14	0	15	14	1	15
d	11	4	15	15	0	15	14	1	15	13	2	15
e	30	0		28	2		27	3		28	1	
f	28	0		29	1		28	2		27	3	

replicate	1718-0263			1718-0264		
	Day 2			Day 2		
	Alive Embryos	Dead Embryos	Cull to 15	Alive Embryos	Dead Embryos	Cull to 15
a	14	1	15	8	7	15
b	15	0	15	15	0	15
c	8	7	15	12	3	15
d	15	0	15	11	4	15
e	28	1		10	19	
f	29	0		25	5	

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: 2017/12/10

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

replicate	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	Day 3		Day 3		Day 3		Day 3		Day 3		Day 3	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	14	1	13	2	8	7	14	1	7*	3*	8	7
b	5	10	15	0	11	4	14	1	8	7	10	5
c	14	1	15	0	13	2	15	0	12	1*	13	2
d	14	1	15	0	15	0	14	1	2*	3*	11	3*

Comments/Observations: \*0263A - 5 dead hatched (microbial growth), 1 dead hatched attached to embryo  
0263C - 2 dead hatched (" " ) 0263D - 2 dead unhatched, 2 dead hatched (microbial gm)

replicate	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	Day 4		Day 4		Day 4		Day 4		Day 4		Day 4	
	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched	Alive Embryos	Alive Hatched
a	3	11	4	11	2	13	1	14	0	7	2	10
b	0	14	6	9	4	11	2	13	0	12	2	13
c	5	9	9	6	1	14	4	11	3	9	3	12
d	7	7	6	9	3	12	4	10	0	10	2	11

Comments/Observations: 0259A - dead unhatched; 0259B - one dead hatched; 0259C - one dead unhatched; 0259D - one dead hatched; 0262D - one dead embryo; 0263A - 3 dead hatched; 0263B - 3 dead hatched; 0263C - 3 dead hatched; 0263D - 1 dead unhatched; 0264A - 7 dead unhatched; 0264B - one dead hatched; 0264C - 1 dead hatched; 0264D - 1 dead hatched; microbial growth

replicate	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	Day 5		Day 5		Day 5		Day 5		Day 5		Day 5	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	13		14	(1)	14		14		5		14	
b	13		15		15*		15		12		15(1)	
c	14(1)		15(1)		15(1)		15(1)		6		15	
d	14		15		15		14		9		13(1)	

Comments/Observations: 0260A - 1 dead hatched - microbial; 0261A - 1 dead hatched; 0261B - 1 still egg; 0262A - 1 dead hatched; 0263C - 6 dead hatched - microbial

replicate	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	Day 6		Day 6		Day 6		Day 6		Day 6		Day 6	
	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched	Alive	Hatched
a	13		13		13		14		5		14	
b	12		15(1)		14		14		12		14	
c	13(1)		15(1)		15(1)*		15(1)		5		14	
d	14		15		15(1)*		14		9		13(1)	

Comments/Observations: 0261B - 1 dead egg; 0261C - 1 still half-hatched only

Reviewed by JP Date reviewed: 2016<sup>08</sup>/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	11*	13	13(1)	14	2(1)*	14
b	7*	15(1)	14	14	9*	14
c	11*	15	14	14	4*	14
d	12*	15	14	14	9 <del>8</del> HS*	13

Comments/Observations: \*microbial growth

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	9*	13	13(1)	14	2(1)	14
b	3*	15(1)	14	14	7*	14
c	5*	15	14	14	4	14
d	10*	15	14	14	8	12

Comments/Observations:

\*microbial growth

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	7*	13	12	14	1(1)	14
b	1*	15(1)	14	14	3*	14
c	5	15	13 <sup>SS</sup> (1) <sup>P</sup>	14	4	14
d	6*	15	14	14	8	12

Comments/Observations:

\*microbial growth

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	7(1)	13	10 11 <sup>PM</sup>	14	0	14
b	1	14	14	14	2	14
c	4(1)*	15	11	14	4	14
d	5*	15	14	14	8	12

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

Number of Alive Embryos and Hatched Organisms						
	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	5	13	11(1)	14	0	14
b	1	14(2)	14(1)	14	2(1)	14(1)
c	3(1)	15(1)	11	14	2*	14
d	5	15	14(1)	14	8	11

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	13(1)	11(1)	14	0	14
b	1	13(1)	14(1)	14	15(1)	14(1)
c	2	15	11	14	3	14
d	5	15	14(1)	14	8	11

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	5	13(1)	10(1)	13	0	13
b	1	13(1)	12(1)	14	1	13
c	2	14	11	14	3	14
d	5	15	14(1)	13	8	9

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	3	12(1)	11(1)	13	0	12(1)
b	1	12	13	14	1	13
c	2	14	9/10**	14	3	14(1)
d	4(1)	15	12	12(1)	8	9

Comments/Observations:

Reviewed by JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

**Number of Alive Embryos and Hatched Organisms**

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	3	12(u)	10	13	0	12
b	1	10	13	14	1	13
c	2	14	9 10 m	14	3	14(u)
d	4(u)	15	12	12	8	9

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	3	12	10	13	0	10
b	1	12	12	14	1	13
c	2	14	9 10 m	14	3	14
d	4	15	11	12	8	8

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	3	12	10	13	0	9
b	1	12	12	14	1	13
c	2	13	10	14	3	13
d	4	15	11	12	8	8

Comments/Observations:

	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
	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	3	12	10	13	0	8
b	1	12	12	14	1	13
c	2	13	10	14	3	13
d	4	15	11	12	8	8

Comments/Observations:

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

		Number of Alive Embryos and Hatched Organisms					
		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
replicate	Alive Hatched						
a		3	12	10	13	0	8
b		1	12	12	14	1	13
c		2	13	10	14	3	13
d		4	15	11	12	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
replicate	Alive Hatched						
a		3	12	10	13	0	8
b		1	12	12	14	1	13
c		2	13	10	14	3	13
d		4	15	11	12	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
replicate	Alive Hatched						
a		3	12	10	13	0	8
b		1	12	12	14	1	13
c		2	13	10	14	3	13
d		4	15	11	12	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
replicate	Alive Hatched						
a		3	12(1)	10	13	0	8
b		1	12	11	14	1	13
c		2	13	10	14	3	13
d		4(1)	15	11	11	8	8

Comments/Observations:

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

		Number of Alive Embryos and Hatched Organisms					
		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	12 (1)	10	13	0	8
b		1	12	11	14	1	13
c		2	13	10	14	3	13
d		4	15	11	10	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	12 (1)	10	13	0	8
b		1	12	11	14	1	13
c		2	12	10	14	3	12
d		4	15	11	10	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	12 (1)	10	13	0	8
b		1	12	11	14	1	13
c		2	12 (1)	10	14	3	12
d		4	15	11	10	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	12 (1)	10	13	0	8
b		1	12	11	14	1	13
c		2	11	10	14	3	12
d		4	15	11	10	8	8

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06



Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

		Number of Alive Embryos and Hatched Organisms					
		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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	3	12(1)	10	13	0	8	
b	1	12	11	14	1	13	
c	2	11	10	14	3	12	
d	4	15	11	10	8	8	

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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	3	12(1)	10	13	0	8	
b	1	12	11	14	1	13	
c	2	11	10	14	3	12	
d	4	15	11	10	8	8	

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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	3	12(1)	10	13	0	7	
b	1	12	11	13	1	13	
c	2	11	10	13	3(1)	12	
d	4	15	11	10	8	8	

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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	3	11	10	13	0	7	
b	1	12	11	13	1	13	
c	2	11	10	13	2	12	
d	4	15	11	10	8	8	

Comments/Observations:

Reviewed by: JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

		Number of Alive Embryos and Hatched Organisms					
		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	11	10	13	0	6
b		1	12	11	13	1	13
c		2	11	10	13	2	12
d		4	15	11	10	8	8

Comments/Observations:

		1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
		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		3	11	10	13	0	6
b		1	12	11	13 15+13+11	1	13
c		2	11	10	13	2	12
d		4	15	11	10	8	8

Comments/Observations:

Reviewed by JP Date reviewed 2017/12/10

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µl)

New Solutions						
Conc. (%)	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
Day						
	pH (units)					
0	8.2	8.2	8.2	8.2	8.2	8.3
1	8.3	8.4	8.3	8.3	8.3	8.3
2	8.3	8.3	8.3	8.3	8.3	8.3
3	8.2	8.4	8.4	8.4	8.3	8.4
4	8.2	8.2	8.2	8.3	8.2	8.2
5	8.3	8.3	8.3	8.4	8.2	8.4
6	8.2	8.3	8.3	8.3	8.2	8.3
7	8.2	8.2	8.2	8.3	8.2	8.2
8	8.2	8.3	8.2	8.3	8.1	8.2
	Conductance (µS/cm)					
0	1335	3097	848	339	1086	321
1	1214	3558	808	298	960	288
2	1245	375	820	315	969	299
3	1223	393	790	307	964	335
4	1214	365	792	307	948	286
5	1215	362	809	305	962	297
6	1130	377	784	293	969	288
7	1203	363	946	307	992	306
8	1120	364	962	309	954	319
	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	7.2	7.2	7.2	7.1	7.1	7.1
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
	Temperature (°C)					
0	23.6	23.7	23.6	23.7	23.6	23.6
1	23.6	23.6	23.6	23.6	23.6	23.6
2	24.6	24.6	24.6	24.6	24.7	24.7
3	23.7	23.7	23.8	23.8	23.7	23.7
4	23.5	23.6	23.7	23.7	23.7	23.5
5	23.6	23.7	24.0	23.9	23.9	23.7
6	23.6	23.6	23.8	23.8	23.7	23.6
7	24.0	24.1	24.0	24.1	24.1	24.1
8	24.0	24.0	24.0	24.1	24.2	24.0

Old Solutions						
Conc. (%)	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
Day						
	pH (units)					
0						
1	8.2	8.3	8.2	8.3	8.1	8.1
2	8.2	8.2	8.3	8.2	8.2	8.2
3	8.1	8.2	8.1	8.3	8.0	8.1
4	8.1	8.3	8.1	8.3	8.0	8.2
5	8.1	8.3	8.1	8.2	8.1	8.4
6	8.0	8.2	8.1	8.3	8.0	8.3
7	8.0	8.2	8.0	8.2	8.0	8.2
8	7.9	8.2	8.0	8.2	7.9	8.2
	Conductance (µS/cm)					
0						
1	1176	378	806	320	955	324
2	1245	378	815	344	962	333
3	1170	437	792	361	924	350
4	1181	402	773	343	926	344
5	1172	433	797	346	953	319
6	1197	461	787	345	910	345
7	1235	389	766	349	922	352
8	1169	409	867	374	937	333
	Dissolved Oxygen (mg/L) (40-100% saturation)					
0						
1	6.9	6.9	7.0	7.0	6.9	6.9
2	7.0	7.0	7.0	7.0	7.0	7.0
3	7.2	7.2	7.2	7.2	7.2	7.3
4	7.2	7.2	7.2	7.2	7.2	7.2
5	7.1	7.1	7.1	7.1	7.1	7.2
6	7.2	7.1	7.1	7.1	7.1	7.1
7	7.1	7.0	7.1	7.1	7.1	7.1
8	7.0	6.9	6.9	7.0	6.9	6.9
	Temperature (°C)					
0						
1	23.5	23.5	23.6	23.6	23.5	23.5
2	23.6	23.6	23.6	23.6	23.6	23.6
3	23.7	23.7	23.6	23.6	23.8	23.9
4	23.6	23.7	23.6	23.6	23.6	23.6
5	23.6	23.7	23.7	23.7	23.8	23.7
6	24.1	24.1	24.0	24.1	24.2	24.1
7	24.4	24.7	24.8	24.6	25.1	25.1
8	24.1	24.1	24.3	24.5	24.6	24.7

**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: 20/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µ)

New Solutions						
Conc. (%)	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
Day						

pH (units)						
9	8.2	8.5	8.3	8.4	8.2	8.4
10	8.2	8.4	8.2	8.5	8.1	8.4
11	8.2	8.4	8.3	8.3	8.2	8.3
12	8.2	8.4	8.3	8.4	8.1	8.4
13	8.2	8.4	8.2	8.3	8.0	8.2
14	8.2	8.3	8.2	8.2	8.2	8.1
15	8.2	8.2	8.2	8.2	8.1	8.1
16	8.2	8.3	8.2	8.2	8.1	8.2
17	8.3	8.4	8.2	8.4	8.2	8.4

Conductance (µS/cm)						
9	1207	398	924	331	944	324
10	1210	381	942	320	949	302
11	1140	355	921	297	933	283
12	1207	382	951	317	951	314
13	1271	374	962	323	995	318
14	1370	399	888	326	984	312
15	1353	382	915	327	1009	307
16	1353	389	914	343	1003	306
17	1347	379	909	319	996	312

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	7.3	7.2	7.2	7.2	7.2	7.2
10	7.3	7.3	7.3	7.3	7.2	7.3
11	7.2	7.3	7.2	7.2	7.2	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	24.4	24.8	24.8	24.9	24.9	24.8
10	24.2	24.1	24.2	24.3	24.2	24.2
11	24.5	24.3	24.5	24.7	24.6	24.2
12	24.1	24.2	24.1	24.2	24.3	24.2
13	24.0	23.9	24.1	23.9	23.8	23.9
14	24.0	24.1	24.0	24.0	24.0	24.1
15	24.0	23.9	23.9	23.9	23.9	24.0
16	24.6	23.9	23.9	23.9	23.9	23.8
17	24.0	24.0	24.0	24.0	24.0	24.0

Old Solutions					
1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264

pH (units)						
9	7.9	8.2	8.1	8.2	7.9	8.2
10	8.0	8.4	8.1	8.3	8.0	8.3
11	8.0	8.3	8.0	8.2	7.9	8.3
12	8.1	8.4	8.1	8.3	8.0	8.3
13	8.0	8.3	8.1	8.2	7.9	8.3
14	8.0	8.3	8.0	8.2	7.9	8.2
15	8.0	8.3	8.0	8.2	8.0	8.2
16	7.9	8.3	8.0	8.3	7.9	8.2
17	7.9	8.3	8.0	8.2	7.9	8.2

Conductance (µS/cm)						
9	1179	443	890	362	910	364
10	1138	395	927	323	935	321
11	1108	408	904	341	911	355
12	1161	388	930	360	932	323
13	1243	423	985	356	968	352
14	1201	396	953	358	993	375
15	1349	383	910	321	976	332
16	1241	439	912	375	963	368
17	1346	473	887	374	965	409

Dissolved Oxygen (mg/L) (40-100% saturation)						
9	7.1	7.1	7.1	7.1	7.1	7.1
10	7.1	7.1	7.0	7.1	6.9	6.9
11	6.8	6.9	6.8	6.8	6.7	6.8
12	6.5	6.5	6.5	6.5	6.4	6.6
13	7.0	6.9	6.9	6.8	6.7	6.7
14	7.1	7.2	7.3	7.2	7.2	7.2
15	7.0	6.9	7.1	7.0	7.1	7.1
16	7.2	7.2	7.1	6.9	6.9	6.9
17	6.7	6.7	6.5	6.3	6.3	6.3

Temperature (°C)						
9	23.7	23.7	23.7	23.8	23.9	23.8
10	23.9	24.0	24.0	23.9	23.8	23.9
11	23.5	23.6	23.6	23.7	23.7	23.7
12	23.5	23.6	23.7	23.7	23.7	23.7
13	23.5	23.6	23.9	24.0	24.3	24.3
14	24.0	24.0	24.0	24.0	24.1	24.1
15	24.0	24.0	24.0	24.0	24.0	24.0
16	23.9	24.3	24.5	25.6	26.2	26.2
17	23.6	23.5	23.5	23.9	24.2	24.5

**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: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µ)

New Solutions						
Conc. (%)	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
Day						
	pH (units)					
18	8.2	8.3	8.2	8.2	8.1	8.3
19	8.2	8.4	8.3	8.4	8.2	8.3
20	8.3	8.5	8.4	8.5	8.2	8.5
21	8.2	8.3	8.3	8.3	8.2	8.3
22	8.3	8.5	8.4	8.4	8.3	8.4
23	8.2	8.4	8.3	8.4	8.4	8.4
24	8.2	8.3	8.2	8.3	8.2	8.2
25	8.1	8.2	8.2	8.2	8.0	8.2
26	8.0	8.3	8.2	8.2	8.0	8.2
	Conductance (µS/cm)					
18	1372	382	915	324	1000	307
19	1309	424	902	339	972	313
20	1107	311	800	251	805	229
21	978	305	744	275	708	284
22	964	346	737	273	695	285
23	960	362	741	283	674	284
24	909	338	743	273	701	288
25	977	331	743	272	704	293
26	967	365	745	289	694	297
	Dissolved Oxygen (mg/L) (40-100% saturation)					
18	7.2	7.2	7.2	7.2	7.2	7.2
19	7.2	7.2	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	7.2
26	7.3	7.3	7.3	7.3	7.3	7.3
	Temperature (°C)					
18	24.8	24.9	24.8	24.9	24.9	25.0
19	24.0	24.0	24.0	23.7	23.8	23.8
20	24.0	24.0	24.0	24.0	24.0	24.0
21	24.0	24.0	24.0	24.0	24.0	24.0
22	24.0	24.0	24.0	24.0	24.0	24.0
23	24.1	24.0	24.1	23.9	24.1	24.1
24	24.0	24.0	24.0	24.0	24.0	24.0
25	24.0	24.0	24.0	24.0	24.0	24.0
26	23.7	23.7	23.8	23.8	23.8	24.0

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						
1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264	
	pH (units)					
18	8.1	8.4	8.2	8.4	8.1	8.4
19	8.0	8.4	8.1	8.4	8.1	8.4
20	8.0	8.3	8.1	8.3	8.0	8.3
21	7.9	8.3	8.0	8.3	7.9	8.2
22	8.0	8.3	8.1	8.3	8.1	8.3
23	7.9	8.2	8.0	8.7	8.0	8.1
24	7.8	7.9	7.9	8.1	8.0	7.9
25	7.9	7.9	7.9	8.0	7.8	7.9
26	8.0	8.2	8.1	8.2	8.0	8.1
	Conductance (µS/cm)					
18	1360	370	860	400	963	347
19	1309	424	902	361	971	364
20	1111	309	725	263	778	257
21	1103	392	728	380	765	250
22	985	332	734	309	719	287
23	969	363	732	294	695	307
24	950	257	727	300	675	352
25	957	348	720	782	676	388
26	967	365	745	279	674	309
	Dissolved Oxygen (mg/L) (40-100% saturation)					
18	7.2	7.1	7.1	7.0	7.2	7.2
19	7.2	7.2	7.3	7.0	7.1	7.1
20	7.3	7.3	7.2	7.3	7.2	7.2
21	7.3	7.3	7.3	7.1	7.0	7.0
22	7.1	7.0	7.0	7.0	7.2	7.0
23	6.9	6.9	6.9	6.9	6.8	6.8
24	7.0	6.9	6.0	6.0	6.1	6.2
25	7.2	7.3	7.3	7.4	7.2	7.2
26	7.3	7.3	7.3	7.3	7.3	7.3
	Temperature (°C)					
18	24.0	23.8	23.7	23.8	24.0	24.0
19	24.0	24.0	24.0	24.0	24.0	24.0
20	24.0	24.0	24.0	24.0	24.0	24.0
21	24.0	24.0	24.0	24.0	24.0	24.0
22	23.9	23.8	23.8	23.8	23.9	24.0
23	23.9	23.9	23.9	23.5	23.5	23.9
24	23.5	23.5	23.5	23.5	24.6	23.5
25	24.0	24.0	24.0	24.0	24.0	24.0
26	23.7	23.7	23.8	23.8	23.8	23.7

Reviewed by JP Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µ)

New Solutions						
Conc. (%)	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264

Old Solutions					
1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264

Day	pH (units)					
27	8.2	8.3	8.3	8.3	8.2	8.3
28	8.2	8.3	8.3	8.3	8.2	8.2
29	8.3	8.4	8.3	8.3	8.1	8.3
30	8.1	8.3	8.2	8.3	8.0	8.2
31	8.3	8.4	8.3	8.4	8.2	8.4
32						

Day	pH (units)					
27	7.9	8.2	8.1	8.1	8.0	8.1
28	8.0	8.2	8.1	8.2	8.0	8.1
29	7.9	8.1	8.1	8.2	7.9	8.2
30	7.8	8.0	7.9	8.2	7.8	8.1
31	7.9	8.2	8.2	8.1	8.0	8.1
32	8.0	8.2	8.2	8.3	7.9	8.1

Day	Conductance (µS/cm)					
27	706	246	528	212	514	215
28	804	248	538	201	608	205
29	790	208	553	195	621	184
30	784	252	552	208	608	192
31	790	222	554	196	612	187
32						

Day	Conductance (µS/cm)					
27	700	291	550	220	508	240
28	729	293	536	222	513	241
29	770	260	544	215	587	209
30	774	265	540	220	588	216
31	762	241	537	199	590	192
32	786	248	549	213	610	226

Day	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						

Day	Dissolved Oxygen (mg/L) (40-100% saturation)					
27	7.2	7.2	7.3	7.2	7.3	7.3
28	6.9	6.8	6.6	6.6	6.5	6.6
29	7.2	7.2	7.3	7.1	7.2	7.2
30	7.3	7.3	7.1	7.1	7.1	7.1
31	7.3	7.2	7.2	7.3	7.3	7.3
32	6.9	7.0	6.9	7.0	7.0	7.0
	7.3	7.3	7.1	6.9	6.9	7.1

Day	Temperature (°C) 24.0 24.0 TW					
27	25.9	23.8	23.8	23.7	23.7	23.8
28	24.0	24.0	24.0	24.0	24.0	24.0
29	24.0	24.0	24.0	24.0	24.0	24.0
30	24.0	24.0	24.0	24.0	24.0	24.0
31	24.0	24.0	24.0	24.0	24.0	24.0
32						

Day	Temperature (°C) 24.0 24.0 TW					
27	24.0	23.9	24.0	23.9	24.1	24.2
28	24.0	24.0	24.0	24.0	24.0	24.0
29	24.0	24.0	24.0	24.0	24.0	24.0
30	23.7	23.6	23.9	23.8	24.0	24.0
31	24.0	24.0	24.0	24.0	24.0	24.0
32	24.0	24.0	24.0	24.0	24.0	24.0

**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: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/

**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. 1718-0259 (10 µg/L)

1718-0259	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	16	N	1	16	N	1	12	N	1	12	N
	2	13	↓	2	-	-	2	13	↓	2	12	↓
	3	11	↓	3	-	-	3	-	-	3	13	↓
	4	-	-	4	-	-	4	-	-	4	8	↓
	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

1718-0260	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	9	N	1	10	N	1	9	N	1	9	N
	2	9	↓	2	9	↓	2	9	↓	2	9	↓
	3	10	↓	3	9	↓	3	9	↓	3	9	↓
	4	11	↓	4	9	↓	4	11	↓	4	11	↓
	5	10	↓	5	11	↓	5	10	↓	5	11	↓
	6	10	↓	6	11	↓	6	10	↓	6	9	↓
	7	10	↓	7	10	↓	7	11	↓	7	10	↓
	8	10	↓	8	10	↓	8	11	↓	8	10	↓
	9	10	↓	9	10	↓	9	11	↓	9	10	↓
	10	11	↓	10	10	↓	10	11	↓	10	9	↓
	11	10	↓	11	10	↓	11	9	↓	11	10	↓
	12	-	-	12	11	↓	12	-	-	12	11	↓
	13	-	-	13	-	-	13	-	-	13	10	↓
	14	-	-	14	-	-	14	-	-	14	10	↓
	15	-	-	15	-	-	15	-	-	15	10	↓

Comments

Reviewed by: JP

Date reviewed: 2017/12/06

Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg)

**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.

1718-0261

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	9	N	1	10	N	1	10	N
2	11		2	11		2	10		2	9	
3	10		3	10		3	10		3	10	
4	10		4	10		4	9		4	10	
5	10		5	10		5	11		5	10	
6	13		6	9		6	11		6	9	
7	10		7	11		7	12		7	11	
8	9		8	11		8	11		8	12	
9	10		9	9		9	11		9	11	
10	10		10	10		10	11		10	9	
11	-		11	9		11	-		11	10	
12	-		12	-		12	-		12	-	
13	-		13	-		13	-		13	-	
14	-		14	-		14	-		14	-	
15	-		15	-		15	-		15	-	

Comments

1718-0262

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	9	N	1	10	N	1	12	N
2	9		2	12		2	11		2	11	
3	9		3	10		3	9		3	10	
4	11		4	11		4	10		4	11	
5	10		5	9		5	10		5	10	
6	10		6	10		6	10		6	10	
7	10		7	10		7	11		7	10	
8	10		8	10		8	10		8	11	
9	11		9	10		9	9		9	11	
10	10		10	10		10	11		10	11	
11	10		11	10		11	10		11	-	
12	10		12	10		12	10		12	-	
13	10		13	10		13	10		13	-	
14	-		14	-		14	-		14	-	
15	-		15	-		15	-		15	-	

Comments

Reviewed by: JP

Date reviewed: 2017/12/06



Method FMD 32 Day ELS Client NAU104

Sample: 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg)

**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. <sup>55</sup>

1718-0263	Replicate # <u>          </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	15	N	1	14	N	1	10	N
2				2	-	-	2	12	↓	2	10	↓
3				3	-	-	3	-	-	3	10	↓
4				4	-	-	4	-	-	4	10	↓
5				5	-	-	5	-	-	5	9	↓
6				6	-	-	6	-	-	6	11	↓
7				7	-	-	7	-	-	7	11	↓
8				8	-	-	8	-	-	8	10	↓
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												

1718-0264	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	10	N	1	10	N	1	11	N
2	10		↓	2	10	↓	2	9	↓	2	11	↓
3	12		↓	3	9	↓	3	10	↓	3	10	↓
4	13		↓	4	11	↓	4	12	↓	4	13	↓
5	10		↓	5	10	↓	5	9	↓	5	10	↓
6	-		-	6	10	↓	6	10	↓	6	10	↓
7	-		-	7	10	↓	7	9	↓	7	10	↓
8	-		-	8	10	↓	8	10	↓	8	10	↓
9	-		-	9	10	↓	9	11	↓	9	-	-
10	-		-	10	10	↓	10	11	↓	10	-	-
11	-		-	11	10	↓	11	10	↓	11	-	-
12	-		-	12	10	↓	12	10	↓	12	-	-
13	-		-	13	10	↓	13	-	-	13	-	-
14	-		-	14	-	-	14	-	-	14	-	-
15	-		-	15	-	-	15	-	-	15	-	-
Comments												

Reviewed by JP

Date reviewed 2017/12/06

Method FMD 32 Day ELS Client NAU104 Sample 1718-0259, 1718-0260, 1718-0261, 1718-0262, 1718-0263, 1718-0264 (10µg/L)

Date of change 2017/10/16 Day of change 11

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration						
Replicate	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
A	1mL	1.5mL	1.5mL	1.5mL	-	1.5mL
B	0.5mL	↓	↓	↓	0.5mL	↓
C	0.5mL	↓	↓	↓	0.5mL	↓
D	1mL	↓	↓	↓	1mL	↓

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration						
Replicate	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
A						
B						
C						
D						

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration						
Replicate	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
A						
B						
C						
D						

Date of change \_\_\_\_\_ Day of change \_\_\_\_\_

Volume (mL) of <i>Artemia</i> Fed to Each Test Replicate of Each Sample / Concentration						
Replicate	1718-0259	1718-0260	1718-0261	1718-0262	1718-0263	1718-0264
A						
B						
C						
D						

\*Feeding volume is maintained following a feeding change until a new feeding regime is recorded

# Organism Weights Bench Sheet

Client NAU104 Sample 10-49/L Cu Organism FM Batch 20171005FMELS Initial weights due: 2017/11/07

Final weights due: 2017/11/12

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2017/11/01	LF	Mettler 1
Final Weight (mg):	dried pan + organisms	2017/11/18	AD	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	1718-0259		1718-0260		1718-0261		1718-0262		1718-0263		1718-0264	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1002.98	1013.60	1036.22	1047.46	1003.25	1015.88	1034.64	1044.57	991.83	—	1018.94	1032.20
b	999.27	1005.33	1000.84	1011.84	1017.40	1030.37	1008.57	1018.10	1007.77	1014.34	1033.27	<del>1033.48</del> AD
c	992.17	<del>998.04</del> AD	1023.16	1035.57	1019.50	1031.99	1013.62	1024.18	1015.97	1022.57	1024.84	1033.48
d	1041.58	1049.81	977.14	989.14	1007.25	1019.75	964.73	975.27	979.53	986.67	997.02	1007.66
e												

(c) 997.98

(b) 1044.52

### Concentration

Replicate												
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a												
b												
c												
d												
e												

### Balance Calibration Check:

	Initial	Final
first pan weighed:	0259 A	0263 D
weight of first pan:	1002.98	986.67
first pan after all		
other pans weighed:	1003.01	986.70

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: 2017/11/30

# Organism Weights Bench Sheet

Client NAU104 Sample 20<sup>ug</sup>/L Cu + CHS Organism FM Batch 20171005 FMEWS Initial weights due: 2017/11/07  
 Final weights due: 2017/11/12

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2017/11/01	LF	Mettler 1
Final Weight (mg):	dried pan + organisms	2017/11/18	AD	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-UNT		CTL-Cu10 <sup>ug</sup> /L		CTL-Cu20 <sup>ug</sup> /L		1718-0259		1718-0260		1718-0261	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1005.66	1018.23	1003.06	1016.48	1009.58	1020.89	1012.98	1027.22	1020.91		983.99	997.52
b	967.73	980.70	1021.11	1032.09	1005.03	1017.05	1002.86	1015.26	1025.99		1018.19	1029.75
c	1002.84	1014.07	1019.80	1032.09	998.14	1008.96	998.05	1010.60	1009.35		1022.34	1033.20
d	1014.14	1026.58	1024.15	1035.66	972.19	987.22	1034.97	1049.23	1022.54		1021.45	1039.0
e												

(d) 1035.44

### Concentration

Replicate	1718-0263											
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	1006.17	1018.87										
b	1010.92	1021.27										
c	1004.46	1015.48										
d	1029.99	1042.63										
e												

(a) 1018.96

### Balance Calibration Check:

	Initial	Final
first pan weighed:	CTL-UNTA	0259 C
weight of first pan:	1005.66	1010.60
first pan after all other pans weighed:	1005.66	1010.65

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: 2017/11/30

**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: 20171005FM

**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): 8.1  
conductance (µS/cm): 355  
dissolved oxygen (mg/L): 7.6  
NH<sub>4</sub><sup>+</sup> (mg/L): -  
hardness (mg CaCO<sub>3</sub>/L): 120  
alkalinity (mg CaCO<sub>3</sub>/L): 104  
total residual chlorine (mg/L): <0.01

**Comments:** none.

The test data and results are authorized and verified correct.



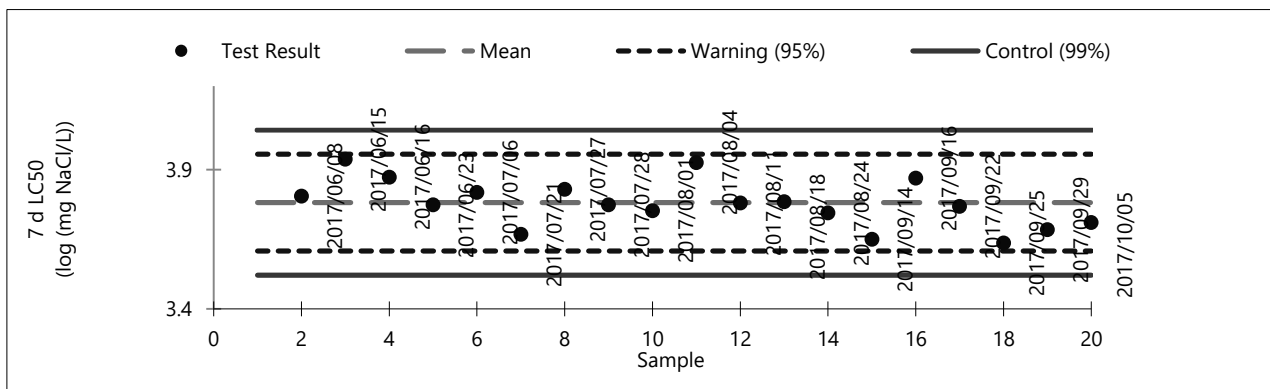
Senior Verifier

## Mortality Current Test

toxicant	Sodium Chloride (NaCl)			
started on	2017/10/05	ended on	2017/10/12	
Result (7 d LC50):	3.71	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.65	upper	3.77

## Historical Values

mean	3.78	sd	0.09	cv(%)	13.2
	lower	upper			
warning limits ( $\pm 2$ sd)	3.61	3.96	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.52	4.04	(99% confidence limits)		

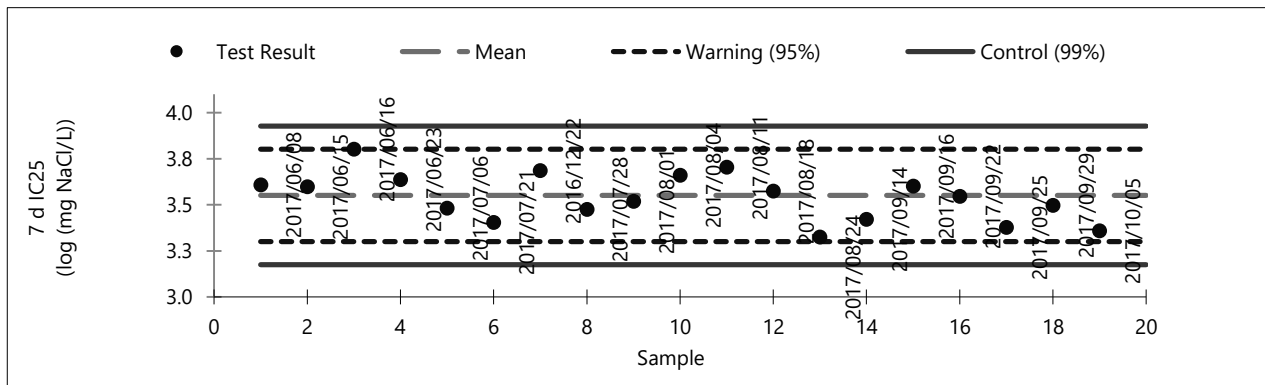


## Biomass

started on	2017/10/05	ended on	2017/10/12	
Result (7 d IC25):	3.36	log (mg NaCl/L); geometric mean		
Confidence Limits (95%)	lower	3.12	upper	3.57

## Historical Values

mean	3.55	sd	0.13	cv(%)	19.2
	lower	upper			
warning limits ( $\pm 2$ sd)	3.30	3.80	(95% confidence limits)		
control limits ( $\pm 3$ sd)	3.17	3.93	(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**

Report Date: 18 Dec-17 15:40 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Batch ID: 11-8745-1376      Test Type: Survival-Development-Growth      Analyst: Emma Marus  
 Start Date: 05 Oct-17 16:30      Protocol: ASTM E1241-05 (2013)      Diluent:  
 Ending Date: 06 Nov-17 14:00      Species: Pimephales promelas      Brine:  
 Duration: 31d 22h      Source: Aquatox, AR      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Lab Control (10µg/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

- and GH\_FR1
- FR\_UFR1, GH\_ER2, ~~CM\_MC1~~ are reference sites  
or CM\_MC1
  - all samples and reference sites spiked w/ 10 µg/L Cu
  - FR\_FRCP1, CM\_MC2 and GH\_FR1 spiked w/ 20 µg/L Cu  
 as well as 10 µg/L Cu

statistics  
 against control (spiked w/ 10 µg/L Cu)

**CETIS Summary Report**

Report Date: 18 Dec-17 15:40 (p 2 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**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	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
Cu Ctrl 10µg/L	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
Cu Ctrl 20 µg/L	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
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	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
FR_FRCP1	4	0.9667	0.9054	1	0.9333	1	0.01925	0.03849	3.98%	1.7%
GH_FR1	4	0.9833	0.9303	1	0.9333	1	0.01667	0.03333	3.39%	0.0%
CM_MC2	4	0.95	0.8484	1	0.8667	1	0.03191	0.06383	6.72%	3.39%
FR_FRCP1 20 µg	4	0.95	0.897	1	0.9333	1	0.01667	0.03333	3.51%	3.39%
CM_MC2 (20 µg)	4	0.9333	0.8108	1	0.8667	1	0.03849	0.07698	8.25%	5.09%
GH_FR1 (20 µg)	4	0.9167	0.8151	1	0.8667	1	0.03191	0.06383	6.96%	6.78%

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	11.56	10.38	12.75	10.86	12.5	0.3732	0.7464	6.45%	0.0%
Cu Ctrl 10µg/L	4	10.88	10.26	11.5	10.64	11.45	0.1946	0.3893	3.58%	5.92%
Cu Ctrl 20 µg/L	4	10.55	10.16	10.95	10.18	10.73	0.1255	0.2511	2.38%	8.73%
FR_UFR1	4	10.07	9.76	10.39	9.867	10.33	0.09832	0.1966	1.95%	12.9%
GH_ER2	4	10	9.566	10.44	9.769	10.3	0.1367	0.2734	2.73%	13.52%
CM_MC1	4	10.55	9.346	11.76	10.08	11.67	0.3785	0.757	7.18%	8.77%
FR_FRCP1	4	13.27	10.07	16.47	11.25	16	1.005	2.011	15.15%	-14.75%
GH_FR1	4	10.22	9.818	10.62	10.09	10.6	0.1265	0.2531	2.48%	11.62%
CM_MC2	3	12.71	6.621	18.8	10.13	15	1.415	2.451	19.28%	-9.89%
FR_FRCP1 20 µg	4	10.7	10.34	11.06	10.46	11	0.1121	0.2243	2.1%	7.48%
CM_MC2 (20 µg)	4	10.27	9.679	10.86	9.75	10.6	0.1856	0.3712	3.62%	11.2%
GH_FR1 (20 µg)	4	10.39	9.739	11.05	10.09	11	0.2054	0.4109	3.95%	10.13%

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.8202	0.7406	0.8997	0.7487	0.8647	0.02499	0.04998	6.09%	0.0%
Cu Ctrl 10µg/L	4	0.8033	0.6909	0.9158	0.732	0.8947	0.03533	0.07067	8.8%	2.05%
Cu Ctrl 20 µg/L	4	0.8197	0.6193	1.02	0.7213	1.002	0.06296	0.1259	15.36%	0.06%
FR_UFR1	4	0.7775	0.7079	0.8471	0.7333	0.8273	0.02186	0.04372	5.62%	5.2%
GH_ER2	4	0.676	0.6229	0.7291	0.6353	0.704	0.0167	0.03339	4.94%	17.58%
CM_MC1	4	0.7298	0.528	0.9316	0.576	0.884	0.06342	0.1268	17.38%	11.01%
FR_FRCP1	4	0.5122	0.274	0.7504	0.3873	0.7087	0.07485	0.1497	29.23%	37.55%
GH_FR1	4	0.8432	0.8194	0.867	0.8327	0.8647	0.007475	0.01495	1.77%	-2.8%
CM_MC2	4	0.3385	-0.02166	0.6987	0	0.476	0.1132	0.2263	66.87%	58.73%
FR_FRCP1 20 µg	4	0.8908	0.7819	0.9997	0.8267	0.9507	0.03422	0.06844	7.68%	-8.62%
CM_MC2 (20 µg)	4	0.78	0.6522	0.9078	0.69	0.8527	0.04017	0.08034	10.3%	4.9%
GH_FR1 (20 µg)	4	0.8323	0.672	0.9927	0.724	0.9327	0.05038	0.1008	12.11%	-1.48%

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	4	0.8167	0.6832	0.9501	0.7333	0.9333	0.04194	0.08389	10.27%	0.0%
Cu Ctrl 10µg/L	4	0.8333	0.6496	1	0.7333	0.9333	0.05774	0.1155	13.86%	-2.04%
Cu Ctrl 20 µg/L	4	0.8167	0.6575	0.9758	0.7333	0.9333	0.05	0.1	12.24%	0.0%
FR_UFR1	4	0.8167	0.6159	1	0.7333	1	0.0631	0.1262	15.45%	0.0%
GH_ER2	4	0.8	0.65	0.95	0.6667	0.8667	0.04714	0.09428	11.79%	2.04%
CM_MC1	4	0.65	0.2995	1	0.4	0.8667	0.1101	0.2203	33.89%	20.41%
FR_FRCP1	4	0.1667	0.02972	0.3036	0.06667	0.2667	0.04303	0.08607	51.64%	79.59%
GH_FR1	4	0.7	0.6388	0.7612	0.6667	0.7333	0.01925	0.03849	5.5%	14.29%
CM_MC2	4	0.1833	0	0.5646	0	0.5333	0.1198	0.2396	130.7%	77.55%
FR_FRCP1 20 µg	4	0.7833	0.6242	0.9425	0.6667	0.8667	0.05	0.1	12.77%	4.08%
CM_MC2 (20 µg)	4	0.6667	0.5166	0.8167	0.5333	0.7333	0.04714	0.09428	14.14%	18.37%
GH_FR1 (20 µg)	4	0.7667	0.5635	0.9698	0.6	0.8667	0.06383	0.1277	16.65%	6.12%



**CETIS Summary Report**

Report Date: 18 Dec-17 15:40 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**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	0.9333	1	1
Cu Ctrl 10µg/L	0.9333	1	1	0.8667
Cu Ctrl 20 µg/L	0.8667	1	0.9333	1
FR_UFR1	1	1	1	1
GH_ER2	1	1	1	0.9333
CM_MC1	0.9333	1	1	0.8667
FR_FRCP1	0.9333	1	0.9333	1
GH_FR1	1	0.9333	1	1
CM_MC2	1	1	0.9333	0.8667
FR_FRCP1 20 µg	0.9333	0.9333	0.9333	1
CM_MC2 (20 µg)	0.8667	1	1	0.8667
GH_FR1 (20 µg)	0.8667	1	0.9333	0.8667

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12.5	11.82	10.86	11.08
Cu Ctrl 10µg/L	11.45	10.79	10.64	10.64
Cu Ctrl 20 µg/L	10.73	10.18	10.67	10.64
FR_UFR1	10	10.33	10.09	9.867
GH_ER2	9.769	10.17	9.769	10.3
CM_MC1	11.67	10.08	10.08	10.38
FR_FRCP1	13.33	16	12.5	11.25
GH_FR1	10.1	10.09	10.6	10.09
CM_MC2		15	13	10.13
FR_FRCP1 20 µg	10.46	10.64	10.7	11
CM_MC2 (20 µg)	10.27	10.45	10.6	9.75
GH_FR1 (20 µg)	11	10.23	10.25	10.09

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.838	0.8647	0.7487	0.8293
Cu Ctrl 10µg/L	0.8947	0.732	0.8193	0.7673
Cu Ctrl 20 µg/L	0.754	0.8013	0.7213	1.002
FR_UFR1	0.7493	0.7333	0.8273	0.8
GH_ER2	0.662	0.6353	0.704	0.7027
CM_MC1	0.884	0.75	0.576	0.7093
FR_FRCP1	0.7087	0.404	0.3873	0.5487
GH_FR1	0.842	0.8647	0.8327	0.8333
CM_MC2	0	0.438	0.44	0.476
FR_FRCP1 20 µg	0.9493	0.8267	0.8367	0.9507
CM_MC2 (20 µg)	0.8527	0.69	0.7347	0.8427
GH_FR1 (20 µg)	0.902	0.7707	0.724	0.9327

# CETIS Summary Report

Report Date: 18 Dec-17 15:40 (p 4 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

## 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	0.8	0.7333	0.9333	0.8
Cu Ctrl 10µg/L	0.7333	0.9333	0.9333	0.7333
Cu Ctrl 20 µg/L	0.7333	0.7333	0.8667	0.9333
FR_UFR1	0.7333	0.8	0.7333	1
GH_ER2	0.8667	0.8	0.8667	0.6667
CM_MC1	0.4	0.8667	0.8	0.5333
FR_FRCP1	0.2	0.06667	0.1333	0.2667
GH_FR1	0.6667	0.7333	0.6667	0.7333
CM_MC2	0	0.06667	0.1333	0.5333
FR_FRCP1 20 µg	0.8667	0.7333	0.6667	0.8667
CM_MC2 (20 µg)	0.7333	0.7333	0.6667	0.5333
GH_FR1 (20 µg)	0.6	0.8667	0.8667	0.7333

### 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	13/15
Cu Ctrl 20 µg/L	13/15	15/15	14/15	15/15
FR_UFR1	15/15	15/15	15/15	15/15
GH_ER2	15/15	15/15	15/15	14/15
CM_MC1	14/15	15/15	15/15	13/15
FR_FRCP1	14/15	15/15	14/15	15/15
GH_FR1	15/15	14/15 ✓	15/15	15/15 ✓
CM_MC2	15/15	15/15	14/15	13/15 ✓
FR_FRCP1 20 µg	14/15	14/15	14/15	15/15
CM_MC2 (20 µg)	13/15	15/15	15/15	13/15
GH_FR1 (20 µg)	13/15	15/15	14/15	13/15

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	11/15	14/15	12/15
Cu Ctrl 10µg/L	11/15	14/15	14/15	11/15
Cu Ctrl 20 µg/L	11/15	11/15	13/15	14/15
FR_UFR1	11/15	12/15	11/15	15/15
GH_ER2	13/15	12/15	13/15	10/15
CM_MC1	6/15	13/15	12/15	8/15
FR_FRCP1	3/15	1/15	2/15	4/15
GH_FR1	10/15	11/15	10/15	11/15
CM_MC2	0/15	1/15	2/15	8/15
FR_FRCP1 20 µg	13/15	11/15	10/15	13/15
CM_MC2 (20 µg)	11/15	11/15	10/15	8/15
GH_FR1 (20 µg)	9/15	13/15	13/15	11/15

**CETIS Analytical Report**

Report Date: 18 Dec-17 15:35 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-7646-8865	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:34	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Lab Control (10µg/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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%)
Cu Ctrl 10µg/L		FR_UFR1	0.5	0.5000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_ER2	0.407	0.8140	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC1	0.01802	0.0721	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		FR_FRCP1	0	<0.0001	Exact	Significant Effect
Cu Ctrl 10µg/L		GH_FR1	0.06499	0.1950	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 10µg/L Negative Contr	50	10	60	0.8333	0.1667	0.0%
FR_UFR1	49	11	60	0.8167	0.1833	2.0%
GH_ER2	48	12	60	0.8	0.2	4.0%
CM_MC1	39	21	60	0.65	0.35	22.0%
FR_FRCP1	10	50	60	0.1667	0.8333	80.0%
GH_FR1	42	18	60	0.7	0.3	16.0%
CM_MC2	11	49	60	0.1833	0.8167	78.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	0.7333	0.9333	0.9333	0.7333
FR_UFR1	0.7333	0.8	0.7333	1
GH_ER2	0.8667	0.8	0.8667	0.6667
CM_MC1	0.4	0.8667	0.8	0.5333
FR_FRCP1	0.2	0.06667	0.1333	0.2667
GH_FR1	0.6667	0.7333	0.6667	0.7333
CM_MC2	0	0.06667	0.1333	0.5333

} all samples spiked w/ 10µg/L Cu

# CETIS Analytical Report

Report Date: 18 Dec-17 15:35 (p 2 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

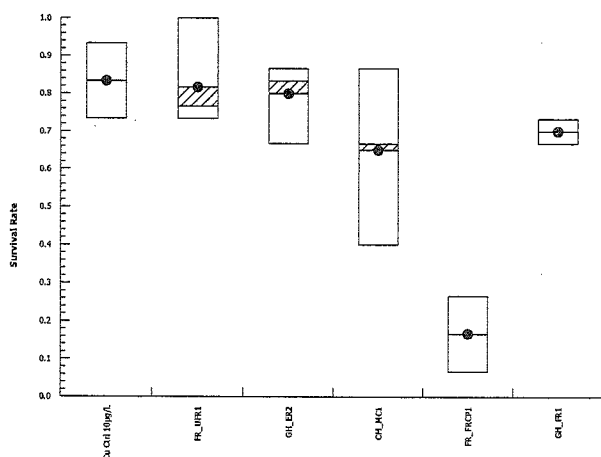
Analysis ID: 11-7646-8865      Endpoint: Survival Rate  
 Analyzed: 18 Dec-17 15:34      Analysis: STP 2x2 Contingency Tables

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	11/15	14/15	14/15	11/15
FR_UFR1	11/15	12/15	11/15	15/15
GH_ER2	13/15	12/15	13/15	10/15
CM_MC1	6/15	13/15	12/15	8/15
FR_FRCP1	3/15	1/15	2/15	4/15
GH_FR1	10/15	11/15	10/15	11/15
CM_MC2	0/15	1/15	2/15	8/15

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:39 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 07-3200-0407	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:37	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Lab Control (10µg/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	25.5%	

**Steel Many-One Rank Sum Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	17	10	0	6	0.7639	Asymp	Non-Significant Effect
		GH_ER2	10	10	0	6	0.0480	Asymp	Significant Effect
		CM_MC1	14	10	0	6	0.3760	Asymp	Non-Significant Effect
		FR_FRCP1	10	10	0	6	0.0480	Asymp	Significant Effect
		GH_FR1	22	10	0	6	0.9934	Asymp	Non-Significant Effect
		CM_MC2	10	10	0	6	0.0480	Asymp	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.7909049	0.1318175	6	9.418	<0.0001	Significant Effect
Error	0.2939088	0.01399566	21			
Total	1.084814		27			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	20.71	16.81	0.0021	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9257	0.8975	0.0481	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	0.8033	0.6909	0.9158	0.7933	0.732	0.8947	0.03533	8.8%	0.0%
FR_UFR1	4	0.7775	0.7079	0.8471	0.7747	0.7333	0.8273	0.02186	5.62%	3.22%
GH_ER2	4	0.676	0.6229	0.7291	0.6823	0.6353	0.704	0.0167	4.94%	15.85%
CM_MC1	4	0.7298	0.528	0.9316	0.7297	0.576	0.884	0.06342	17.38%	9.15%
FR_FRCP1	4	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	36.24%
GH_FR1	4	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	-4.96%
CM_MC2	4	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	57.86%

# CETIS Analytical Report

Report Date: 18 Dec-17 15:39 (p 4 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

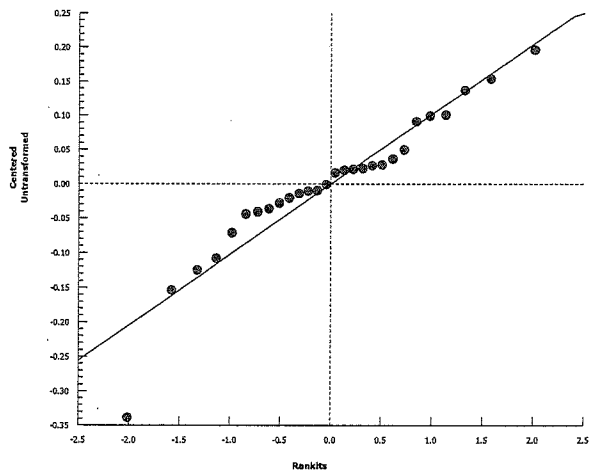
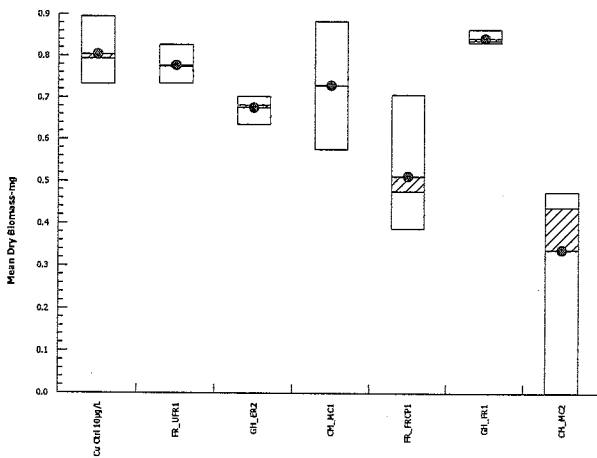
Nautilus Environmental

Analysis ID: 07-3200-0407      Endpoint: Mean Dry Biomass-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Dec-17 15:37      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

### Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	0.8947	0.732	0.8193	0.7673
FR_UFR1	0.7493	0.7333	0.8273	0.8
GH_ER2	0.662	0.6353	0.704	0.7027
CM_MC1	0.884	0.75	0.576	0.7093
FR_FRCP1	0.7087	0.404	0.3873	0.5487
GH_FR1	0.842	0.8647	0.8327	0.8333
CM_MC2	0	0.438	0.44	0.476

### Graphics



**CETIS Analytical Report**

Report Date: 17 Jan-18 09:54 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 12-7546-3969	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 16 Jan-18 16:24	Analysis: Nonparametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Lab Control (10µg/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.4%	

**Wilcoxon Rank Sum Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 10µg/L		FR_UFR1	10	NA	0	6	0.0143	Exact	Significant Effect
		GH_ER2	10	NA	0	6	0.0143	Exact	Significant Effect
		CM_MC1	14	NA	0	6	0.1714	Exact	Non-Significant Effect
		FR_FRCP1	25	NA	0	6	0.9857	Exact	Non-Significant Effect
		GH_FR1	10	NA	0	6	0.0143	Exact	Significant Effect
		CM_MC2	14	NA	0	5	0.8000	Exact	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	40.06236	6.677059	6	4.974	0.0029	Significant Effect
Error	26.84677	1.342338	20			
Total	66.90912		26			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	27.49	16.81	0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8428	0.8944	0.0008	Non-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	10.88	10.26	11.5	10.71	10.64	11.45	0.1946	3.58%	0.0%
FR_UFR1	4	10.07	9.76	10.39	10.05	9.867	10.33	0.09832	1.95%	7.42%
GH_ER2	4	10	9.566	10.44	9.968	9.769	10.3	0.1367	2.73%	8.08%
CM_MC1	4	10.55	9.346	11.76	10.23	10.08	11.67	0.3785	7.18%	3.03%
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	-21.98%
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	6.06%
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	-16.81%

**CETIS Analytical Report**

Report Date: 17 Jan-18 09:54 (p 2 of 2)

Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 12-7546-3969  
 Analyzed: 16 Jan-18 16:24

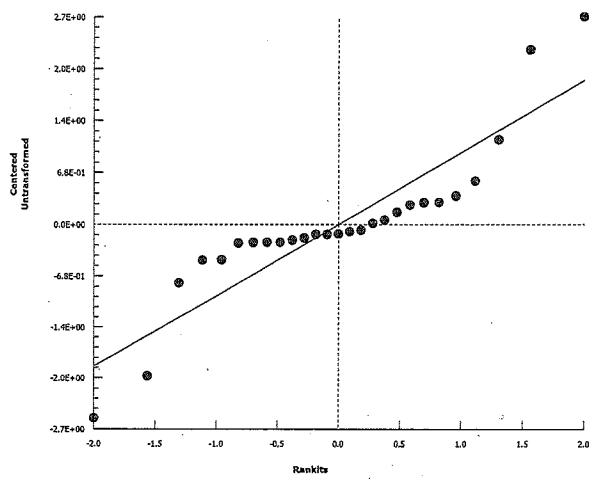
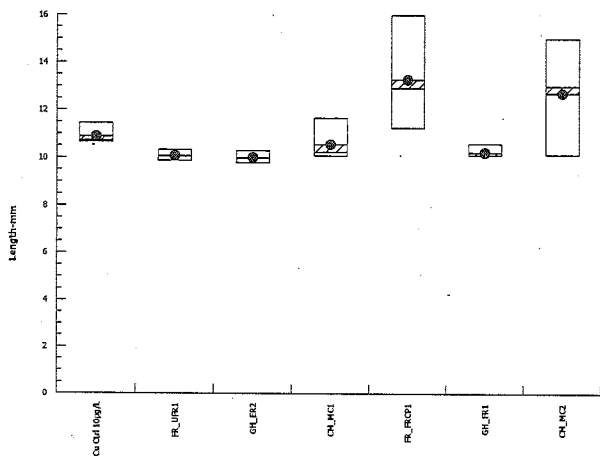
Endpoint: Length-mm  
 Analysis: Nonparametric-Two Sample

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	11.45	10.79	10.64	10.64
FR_UFR1	10	10.33	10.09	9.867
GH_ER2	9.769	10.17	9.769	10.3
CM_MC1	11.67	10.08	10.08	10.38
FR_FRCP1	13.33	16	12.5	11.25
GH_FR1	10.1	10.09	10.6	10.09
CM_MC2	15	13	10.13	

**Graphics**





**CETIS Analytical Report**

Report Date: 18 Dec-17 15:39 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 16-6792-0636	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:38	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 10µg/L	Water Sample	Teck Coal	Lab Control (10µg/L Cu)		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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%)
Cu Ctrl 10µg/L		FR_UFR1	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		GH_ER2	1	1.0000	Exact	Non-Significant Effect
Cu Ctrl 10µg/L		CM_MC1	0.6603	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	0.6603	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	57	3	60	0.95	0.05	0.0%
FR_UFR1	60	0	60	1	0	-5.26%
GH_ER2	59	1	60	0.9833	0.01667	-3.51%
CM_MC1	57	3	60	0.95	0.05	0.0%
FR_FRCP1	58	2	60	0.9667	0.03333	-1.75%
GH_FR1	59	1	60	0.9833	0.01667	-3.51%
CM_MC2	57	3	60	0.95	0.05	0.0%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 10µg/L	0.9333	1	1	0.8667
FR_UFR1	1	1	1	1
GH_ER2	1	1	1	0.9333
CM_MC1	0.9333	1	1	0.8667
FR_FRCP1	0.9333	1	0.9333	1
GH_FR1	1	0.9333	1	1
CM_MC2	1	1	0.9333	0.8667

# CETIS Analytical Report

Report Date: 18 Dec-17 15:39 (p 2 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

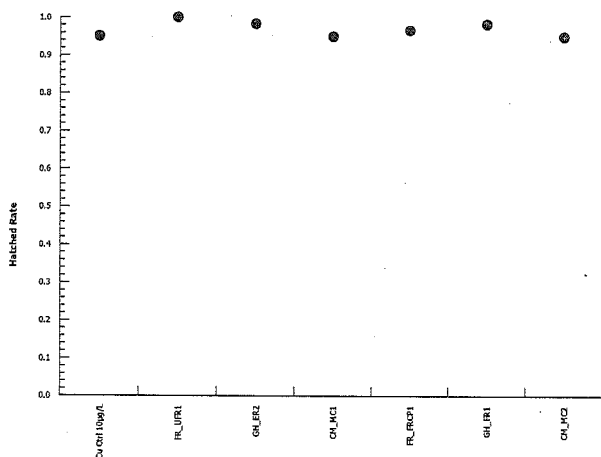
Nautilus Environmental

Analysis ID: 16-6792-0636      Endpoint: Hatched Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 18 Dec-17 15:38      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	14/15	15/15	15/15	13/15
FR_UFR1	15/15	15/15	15/15	15/15
GH_ER2	15/15	15/15	15/15	14/15
CM_MC1	14/15	15/15	15/15	13/15
FR_FRCP1	14/15	15/15	14/15	15/15
GH_FR1	15/15	14/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	13/15

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:36 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 19-7051-8766	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:35	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20 µg)		

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 20 µg/L		FR_FRCP1 20 µg	0.4099	0.4099	Exact	Non-Significant Effect
Cu Ctrl 20 µg/L		CM_MC2 (20 µg)	0.04717	0.1415	Exact	Non-Significant Effect
Cu Ctrl 20 µg/L		GH_FR1 (20 µg)	0.3268	0.6536	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20 µg/L Negative Contr	49	11	60	0.8167	0.1833	0.0%
FR_FRCP1 20 µg	47	13	60	0.7833	0.2167	4.08%
CM_MC2 (20 µg)	40	20	60	0.6667	0.3333	18.37%
GH_FR1 (20 µg)	46	14	60	0.7667	0.2333	6.12%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	0.7333	0.7333	0.8667	0.9333
FR_FRCP1 20 µg	0.8667	0.7333	0.6667	0.8667
CM_MC2 (20 µg)	0.7333	0.7333	0.6667	0.5333
GH_FR1 (20 µg)	0.6	0.8667	0.8667	0.7333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	11/15	11/15	13/15	14/15
FR_FRCP1 20 µg	13/15	11/15	10/15	13/15
CM_MC2 (20 µg)	11/15	11/15	10/15	8/15
GH_FR1 (20 µg)	9/15	13/15	13/15	11/15

\* spiked with 20 µg/L Cu

# CETIS Analytical Report

Report Date: 18 Dec-17 16:36 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

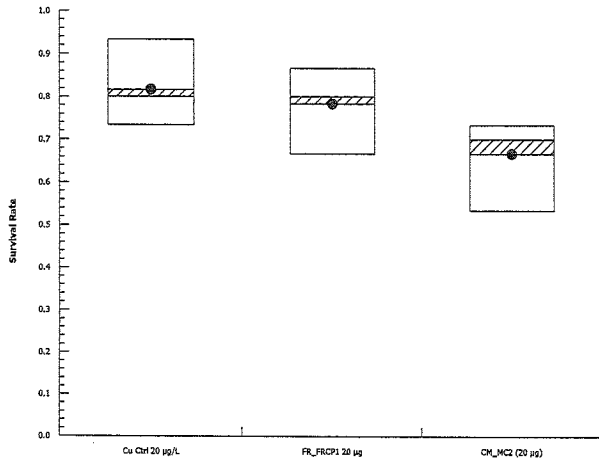
Nautilus Environmental

Analysis ID: 19-7051-8766  
Analyzed: 18 Dec-17 16:35

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:36 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 11-8249-2388	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:35	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.0%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20 µg/L		FR_FRCP1 20 µg	-1.044	2.287	0.156	6	0.9643	CDF	Non-Significant Effect
		CM_MC2 (20 µg)	0.5821	2.287	0.156	6	0.5098	CDF	Non-Significant Effect
		GH_FR1 (20 µg)	-0.1859	2.287	0.156	6	0.8112	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02524348	0.008414494	3	0.9061	0.4668	Non-Significant Effect
Error	0.1114384	0.009286536	12			
Total	0.1366819		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.117	11.34	0.7730	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9039	0.8408	0.0928	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20 µg/L	4	0.8197	0.6193	1.02	0.7777	0.7213	1.002	0.06296	15.36%	0.0%
FR_FRCP1 20 µg	4	0.8908	0.7819	0.9997	0.893	0.8267	0.9507	0.03422	7.68%	-8.68%
CM_MC2 (20 µg)	4	0.78	0.6522	0.9078	0.7887	0.69	0.8527	0.04017	10.3%	4.84%
GH_FR1 (20 µg)	4	0.8323	0.672	0.9927	0.8363	0.724	0.9327	0.05038	12.11%	-1.55%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	0.754	0.8013	0.7213	1.002
FR_FRCP1 20 µg	0.9493	0.8267	0.8367	0.9507
CM_MC2 (20 µg)	0.8527	0.69	0.7347	0.8427
GH_FR1 (20 µg)	0.902	0.7707	0.724	0.9327

# CETIS Analytical Report

Report Date: 18 Dec-17 16:36 (p 4 of 4)

Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

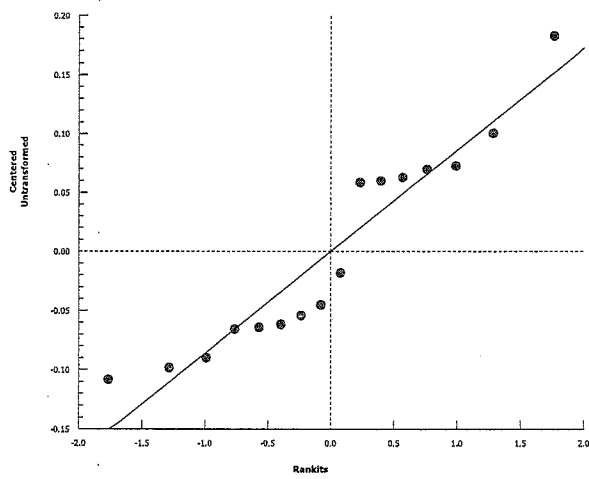
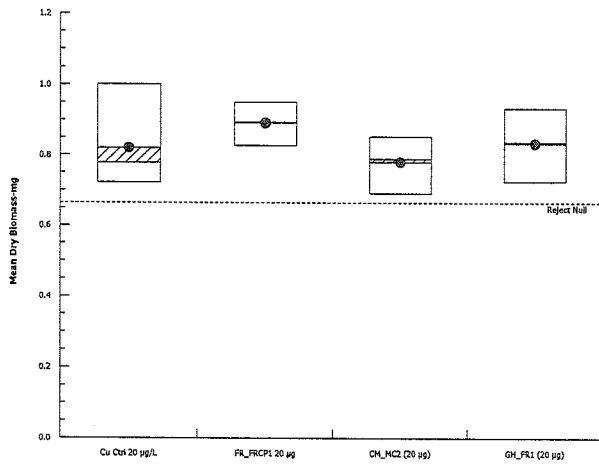
Analysis ID: 11-8249-2388      Endpoint: Mean Dry Biomass-mg

CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:35      Analysis: Parametric-Control vs Treatments

Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:36 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 08-5908-8523	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 16:35	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	4.97%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Cu Ctrl 20 µg/L		FR_FRCP1 20 µg	-0.6321	2.287	0.524	6	0.9150	CDF	Non-Significant Effect
		CM_MC2 (20 µg)	1.245	2.287	0.524	6	0.2480	CDF	Non-Significant Effect
		GH_FR1 (20 µg)	0.7059	2.287	0.524	6	0.4557	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.4228371	0.1409457	3	1.342	0.3069	Non-Significant Effect
Error	1.259882	0.1049901	12			
Total	1.682719		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.314	11.34	0.7257	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9921	0.8408	0.9999	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Cu Ctrl 20 µg/L	4	10.55	10.16	10.95	10.65	10.18	10.73	0.1255	2.38%	0.0%
FR_FRCP1 20 µg	4	10.7	10.34	11.06	10.67	10.46	11	0.1121	2.1%	-1.37%
CM_MC2 (20 µg)	4	10.27	9.679	10.86	10.36	9.75	10.6	0.1856	3.62%	2.7%
GH_FR1 (20 µg)	4	10.39	9.739	11.05	10.24	10.09	11	0.2054	3.95%	1.53%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	10.73	10.18	10.67	10.64
FR_FRCP1 20 µg	10.46	10.64	10.7	11
CM_MC2 (20 µg)	10.27	10.45	10.6	9.75
GH_FR1 (20 µg)	11	10.23	10.25	10.09

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-5908-8523

Endpoint: Length-mm

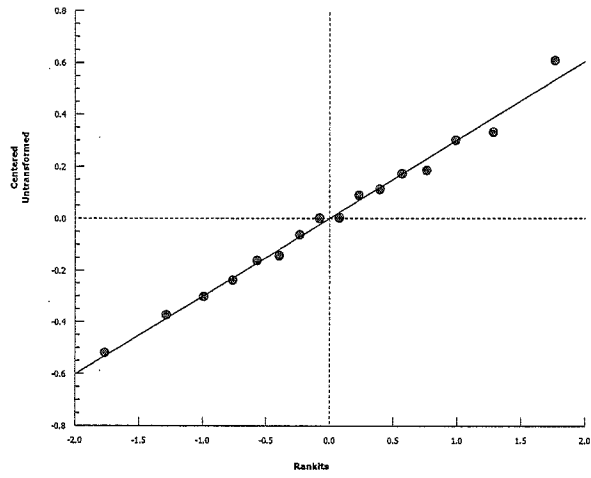
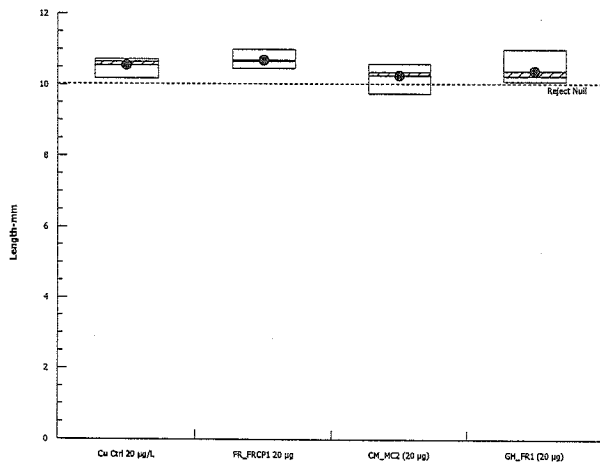
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:35

Analysis: Parametric-Control vs Treatments

Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 18 Dec-17 16:36 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 14-4036-3968	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:35	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20 µg)		

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 20 µg/L		FR_FRCP1 20 µg	0.6603	0.6603	Exact	Non-Significant Effect
Cu Ctrl 20 µg/L		CM_MC2 (20 µg)	0.5	1.0000	Exact	Non-Significant Effect
Cu Ctrl 20 µg/L		GH_FR1 (20 µg)	0.3585	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Cu Ctrl 20 µg/L Negative Contr	57	3	60	0.95	0.05	0.0%
FR_FRCP1 20 µg	57	3	60	0.95	0.05	0.0%
CM_MC2 (20 µg)	56	4	60	0.9333	0.06667	1.75%
GH_FR1 (20 µg)	55	5	60	0.9167	0.08333	3.51%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	0.8667	1	0.9333	1
FR_FRCP1 20 µg	0.9333	0.9333	0.9333	1
CM_MC2 (20 µg)	0.8667	1	1	0.8667
GH_FR1 (20 µg)	0.8667	1	0.9333	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Cu Ctrl 20 µg/L	13/15	15/15	14/15	15/15
FR_FRCP1 20 µg	14/15	14/15	14/15	15/15
CM_MC2 (20 µg)	13/15	15/15	15/15	13/15
GH_FR1 (20 µg)	13/15	15/15	14/15	13/15

# CETIS Analytical Report

Report Date: 18 Dec-17 16:36 (p 2 of 4)

Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-4036-3968

Endpoint: Hatched Rate

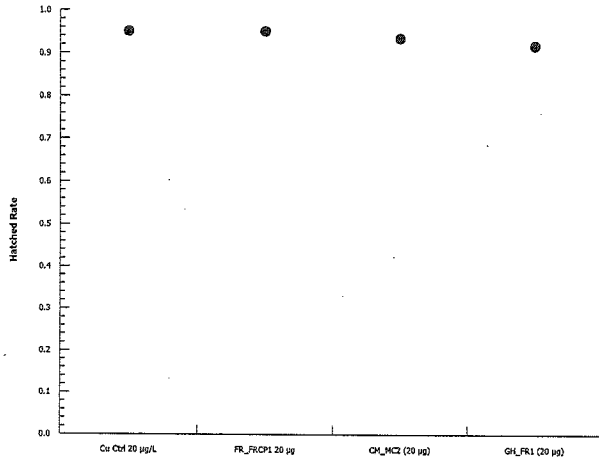
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:35

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:18 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 08-2930-4444	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 16:17	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-8737-2710	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h		
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h		

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	Lab Control (10µg/L Cu)		
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		

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 20 µg/L	0.593	0.5930	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Lab Control Lab Water	49	11	60	0.8167	0.1833	0.0%
Cu Ctrl 10µg/L	50	10	60	0.8333	0.1667	-2.04%
Cu Ctrl 20 µg/L	49	11	60	0.8167	0.1833	0.0%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.8	0.7333	0.9333	0.8
Cu Ctrl 10µg/L	0.7333	0.9333	0.9333	0.7333
Cu Ctrl 20 µg/L	0.7333	0.7333	0.8667	0.9333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12/15	11/15	14/15	12/15
Cu Ctrl 10µg/L	11/15	14/15	14/15	11/15
Cu Ctrl 20 µg/L	11/15	11/15	13/15	14/15

# CETIS Analytical Report

Report Date: 18 Dec-17 16:18 (p 2 of 2)  
Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

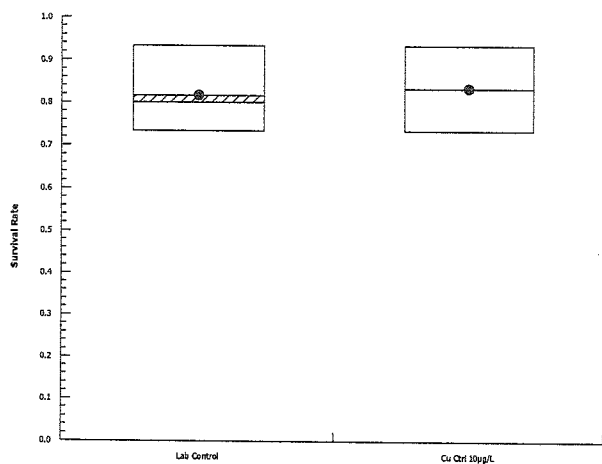
Nautilus Environmental

Analysis ID: 08-2930-4444  
Analyzed: 18 Dec-17 16:17

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:19 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 20-2302-0886	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:17	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-8737-2710	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h		
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h		

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	Lab Control (10µg/L Cu)		
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.6%	

**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	0.2699	2.18	0.136	6	0.5568	CDF	Non-Significant Effect
		Cu Ctrl 20 µg/L	0.008024	2.18	0.136	6	0.6635	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0007338448	0.0003669224	2	0.04715	0.9542	Non-Significant Effect
Error	0.07003933	0.007782148	9			
Total	0.07077318		11			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.269	9.21	0.3217	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9202	0.8025	0.2878	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	0.8202	0.7406	0.8997	0.8337	0.7487	0.8647	0.02499	6.09%	0.0%
Cu Ctrl 10µg/L	4	0.8033	0.6909	0.9158	0.7933	0.732	0.8947	0.03533	8.8%	2.05%
Cu Ctrl 20 µg/L	4	0.8197	0.6193	1.02	0.7777	0.7213	1.002	0.06296	15.36%	0.06%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	0.838	0.8647	0.7487	0.8293
Cu Ctrl 10µg/L	0.8947	0.732	0.8193	0.7673
Cu Ctrl 20 µg/L	0.754	0.8013	0.7213	1.002

# CETIS Analytical Report

Report Date: 18 Dec-17 16:19 (p 2 of 2)

Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

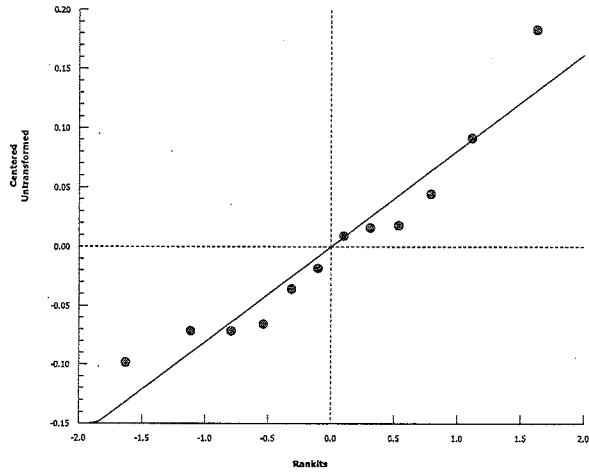
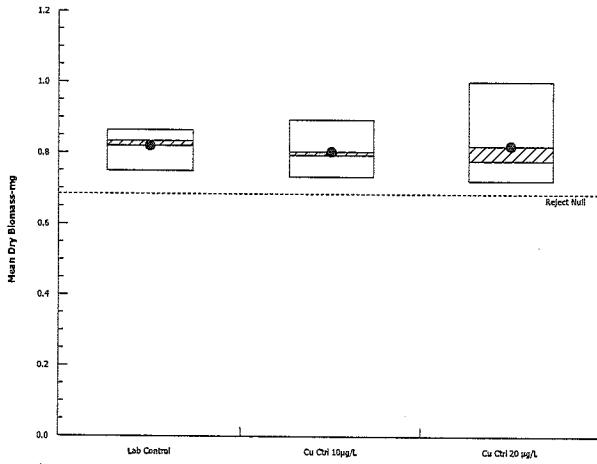
Analysis ID: 20-2302-0886      Endpoint: Mean Dry Biomass-mg

CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:17      Analysis: Parametric-Control vs Treatments

Official Results: Yes

### Graphics



# CETIS Analytical Report

Report Date: 18 Dec-17 16:19 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

<b>Analysis ID:</b> 18-5201-3257	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:17	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-8737-2710	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h		
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h		

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	Lab Control (10µg/L Cu)		
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.76%	

### 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	1.909	2.18	0.782	6	0.0762	CDF	Non-Significant Effect
		Cu Ctrl 20 µg/L	2.816	2.18	0.782	6	0.0181	CDF	Significant Effect

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.12644	1.06322	2	4.133	0.0533	Non-Significant Effect
Error	2.315109	0.2572343	9			
Total	4.441548		11			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.038	9.21	0.2190	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9736	0.8025	0.9450	Normal Distribution

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	4	11.56	10.38	12.75	11.45	10.86	12.5	0.3732	6.45%	0.0%
Cu Ctrl 10µg/L	4	10.88	10.26	11.5	10.71	10.64	11.45	0.1946	3.58%	5.92%
Cu Ctrl 20 µg/L	4	10.55	10.16	10.95	10.65	10.18	10.73	0.1255	2.38%	8.73%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	12.5	11.82	10.86	11.08
Cu Ctrl 10µg/L	11.45	10.79	10.64	10.64
Cu Ctrl 20 µg/L	10.73	10.18	10.67	10.64

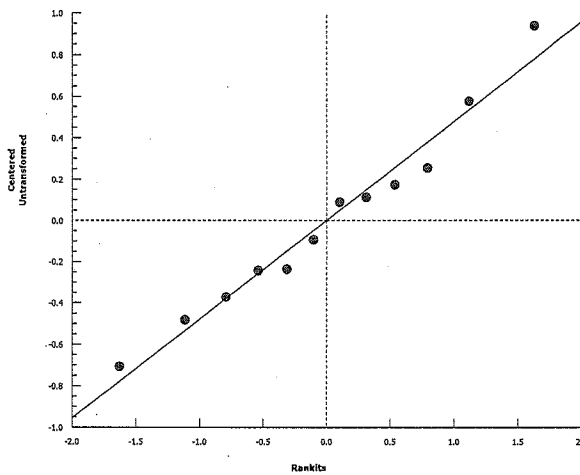
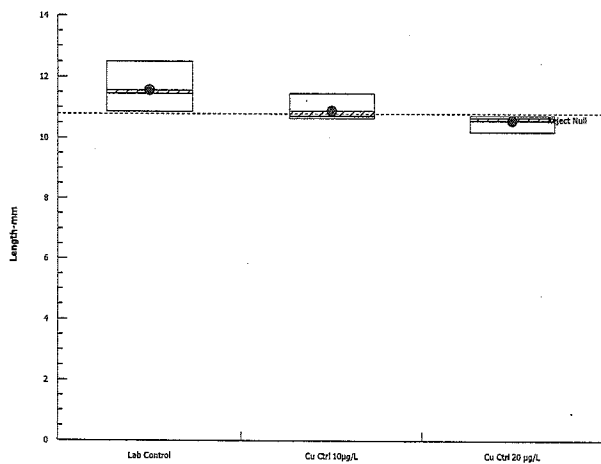
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 18-5201-3257      Endpoint: Length-mm  
Analyzed: 18 Dec-17 16:17      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 18 Dec-17 16:17 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 02-5047-4820	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:17	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	05-8737-2710	05 Oct-17	05 Oct-17	16h	Teck Coal	Teck Coal Q4
Cu Ctrl 10µg/L	02-6121-5839	05 Oct-17	05 Oct-17	16h		
Cu Ctrl 20 µg/L	11-6044-8730	05 Oct-17	05 Oct-17	16h		

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	Lab Control (10µg/L Cu)		
Cu Ctrl 20 µg/L	Water Sample	Teck Coal	Lab Control (20µg/L Cu)		

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	0.3093	0.6186	Exact	Non-Significant Effect
Lab Control		Cu Ctrl 20 µg/L	0.3093	0.6186	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	57	3	60	0.95	0.05	3.39%
Cu Ctrl 20 µg/L	57	3	60	0.95	0.05	3.39%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Lab Control	1	0.9333	1	1
Cu Ctrl 10µg/L	0.9333	1	1	0.8667
Cu Ctrl 20 µg/L	0.8667	1	0.9333	1

**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	13/15
Cu Ctrl 20 µg/L	13/15	15/15	14/15	15/15

# CETIS Analytical Report

Report Date: 18 Dec-17 16:17 (p 2 of 2)

Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-5047-4820

Endpoint: Hatched Rate

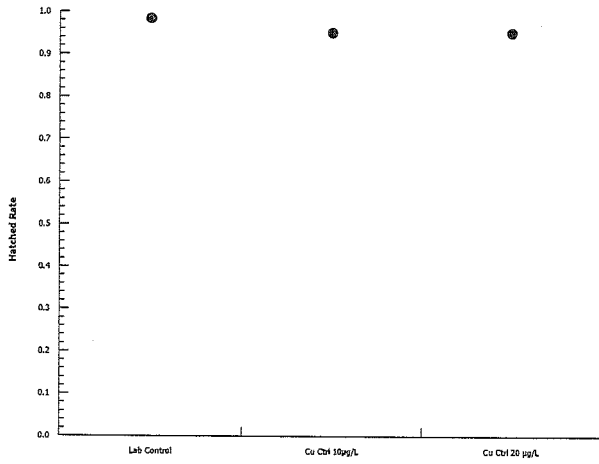
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:17

Analysis: STP 2x2 Contingency Tables

Official Results: Yes

### Graphics



# CETIS Analytical Report

Report Date: 18 Dec-17 15:59 (p 2 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-9883-9395	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:58	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

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 (20 µg)	1	1.0000	Exact	Non-Significant Effect

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	11	49	60	0.1833	0.8167	0.0%
CM_MC2 (20 µg)	40	20	60	0.6667	0.3333	-263.6%

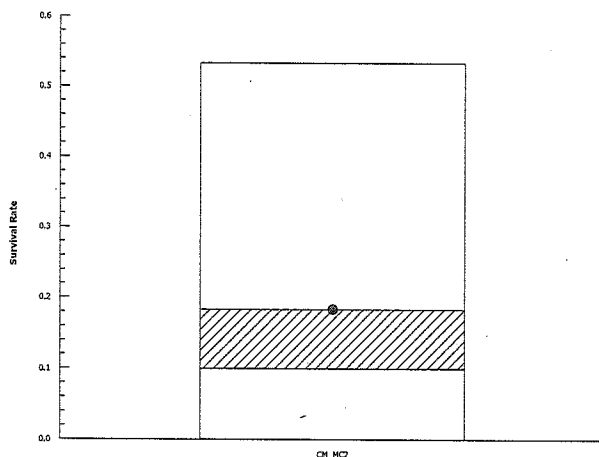
### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0	0.06667	0.1333	0.5333
CM_MC2 (20 µg)	0.7333	0.7333	0.6667	0.5333

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0/15	1/15	2/15	8/15
CM_MC2 (20 µg)	11/15	11/15	10/15	8/15

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:59 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 04-3141-8517	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:58	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	68.9%	

**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 (20 µg)	-3.676	1.943	0.233	6	0.9948	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.389846	0.389846	1	13.52	0.0104	Significant Effect
Error	0.1730537	0.02884229	6			
Total	0.5628998		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	7.937	47.47	0.1227	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8105	0.6451	0.0370	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	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	0.0%
CM_MC2 (20 µg)	4	0.78	0.6522	0.9078	0.7887	0.69	0.8527	0.04017	10.3%	-130.4%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0	0.438	0.44	0.476
CM_MC2 (20 µg)	0.8527	0.69	0.7347	0.8427

# CETIS Analytical Report

Report Date: 18 Dec-17 15:59 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

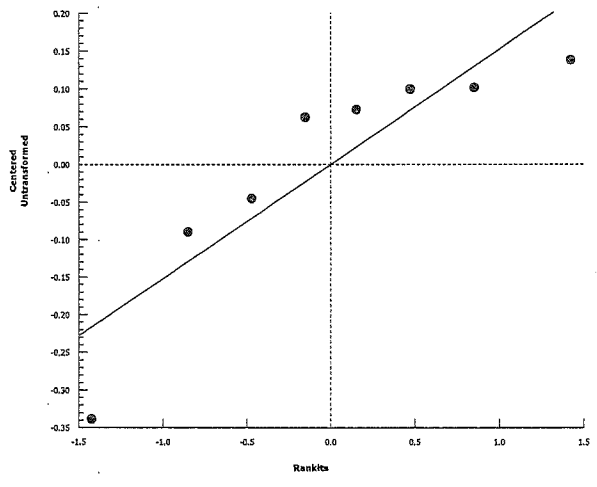
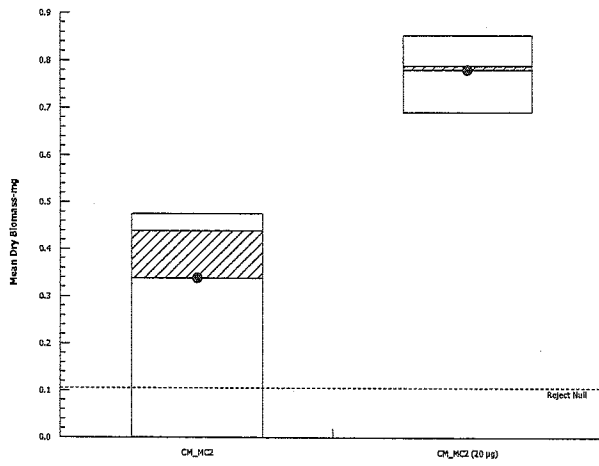
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 04-3141-8517      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Dec-17 15:58      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



# CETIS Analytical Report

Report Date: 18 Dec-17 15:59 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-5120-8698	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:58	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.1%	

### 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 (20 µg)	2.026	2.015	2.426	5	0.0493	CDF	Significant Effect

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	10.19794	10.19794	1	4.104	0.0986	Non-Significant Effect
Error	12.42378	2.484756	5			
Total	22.62172		6			

### Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	43.58	49.8	0.0121	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8957	0.5629	0.3058	Normal Distribution

### Length-mm Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	0.0%
CM_MC2 (20 µg)	4	10.27	9.679	10.86	10.36	9.75	10.6	0.1856	3.62%	19.19%

### Length-mm Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15	13	10.13	
CM_MC2 (20 µg)	10.27	10.45	10.6	9.75

# CETIS Analytical Report

Report Date: 18 Dec-17 15:59 (p 2 of 4)

Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 17-5120-8698

Endpoint: Length-mm

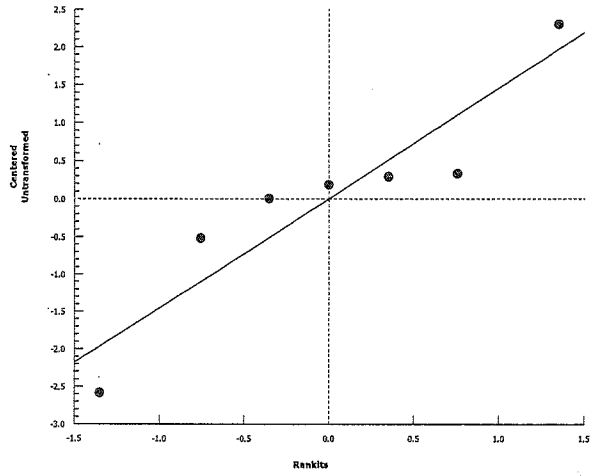
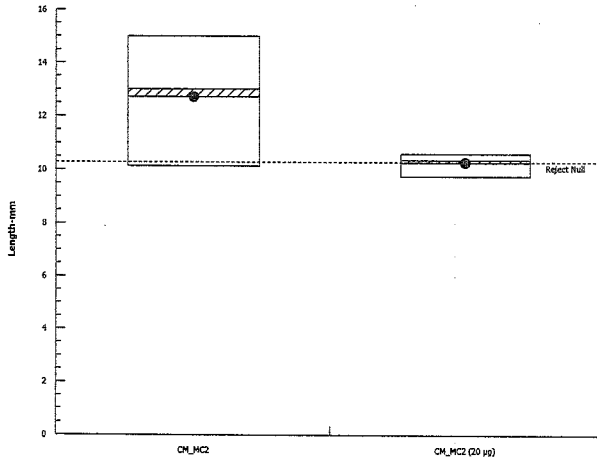
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 15:58

Analysis: Parametric-Two Sample

Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:59 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 03-1397-9220	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:58	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

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 (20 µg)	0.5	0.5000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	57	3	60	0.95	0.05	0.0%
CM_MC2 (20 µg)	56	4	60	0.9333	0.06667	1.75%

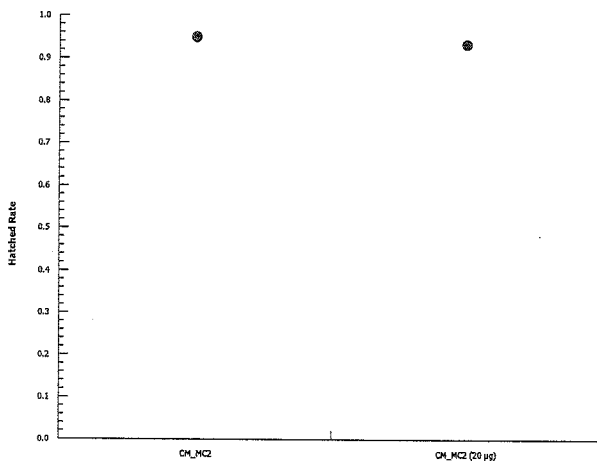
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	0.9333	0.8667
CM_MC2 (20 µg)	0.8667	1	1	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	14/15	13/15
CM_MC2 (20 µg)	13/15	15/15	15/15	13/15

**Graphics**





**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 4 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 03-1689-1884	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Dec-17 14:59	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µ		

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 (20 µg)	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	11	49	60	0.1833	0.8167	0.0%
CM_MC2 (20 µg)	40	20	60	0.6667	0.3333	-263.6%

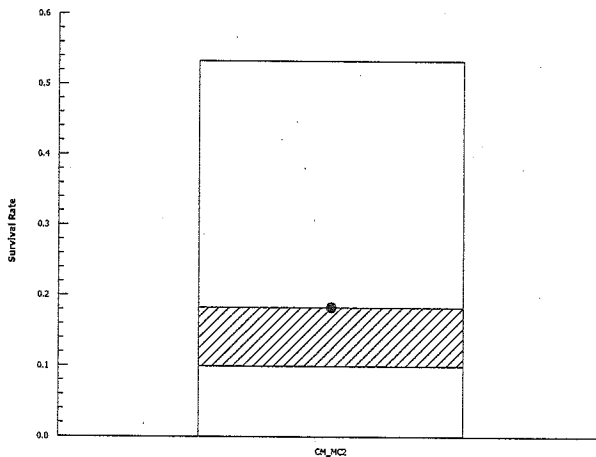
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0	0.06667	0.1333	0.5333
CM_MC2 (20 µg)	0.7333	0.7333	0.6667	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0/15	1/15	2/15	8/15
CM_MC2 (20 µg)	11/15	11/15	10/15	8/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 7 of 12)

Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 01-0440-0707	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	68.9%	

**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 (20 µg)	3.676	1.943	0.233	6	0.0052	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.389846	0.389846	1	13.52	0.0104	Significant Effect
Error	0.1730537	0.02884229	6			
Total	0.5628998		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	7.937	47.47	0.1227	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8105	0.6451	0.0370	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	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	0.0%
CM_MC2 (20 µg)	4	0.78	0.6522	0.9078	0.7887	0.69	0.8527	0.04017	10.3%	-130.4%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	0	0.438	0.44	0.476
CM_MC2 (20 µg)	0.8527	0.69	0.7347	0.8427

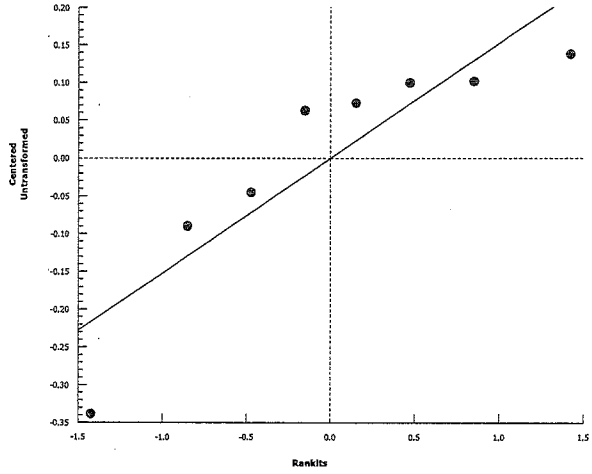
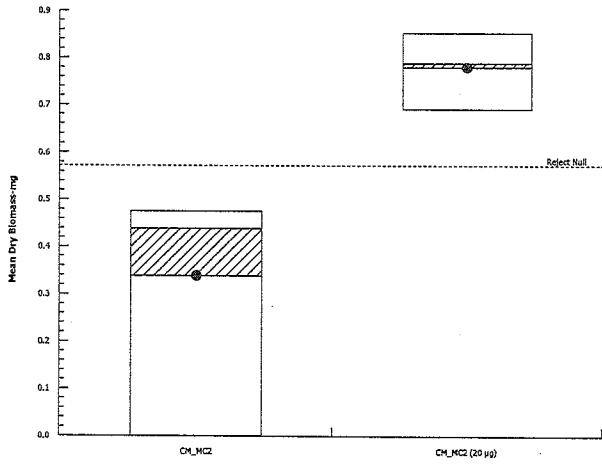
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-0440-0707      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Dec-17 14:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 1 of 12)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 15-2042-6167	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	19.1%	

**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 (20 µg)	-2.026	2.015	2.426	5	0.9507	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	10.19794	10.19794	1	4.104	0.0986	Non-Significant Effect
Error	12.42378	2.484756	5			
Total	22.62172		6			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	43.58	49.8	0.0121	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8957	0.5629	0.3058	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	0.0%
CM_MC2 (20 µg)	4	10.27	9.679	10.86	10.36	9.75	10.6	0.1856	3.62%	19.19%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15	13	10.13	
CM_MC2 (20 µg)	10.27	10.45	10.6	9.75

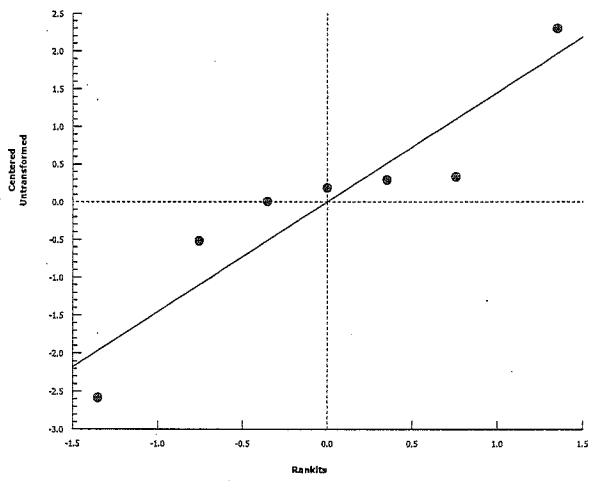
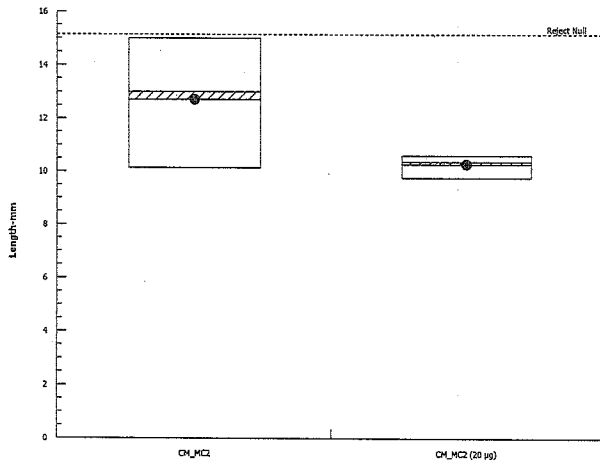
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 15-2042-6167      Endpoint: Length-mm  
Analyzed: 20 Dec-17 14:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 1 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 15-7190-1636	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Dec-17 14:59	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)	Teck Coal	
CM_MC2 (20 µg)	05-1986-4628	02 Oct-17 18:26	03 Oct-17 12:20	70h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
CM_MC2 (20 µg)	Water Sample	Teck Coal	CM_MC2_WS_20171003_N (20 µg)		

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 (20 µg)	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC2	57	3	60	0.95	0.05	0.0%
CM_MC2 (20 µg)	56	4	60	0.9333	0.06667	1.75%

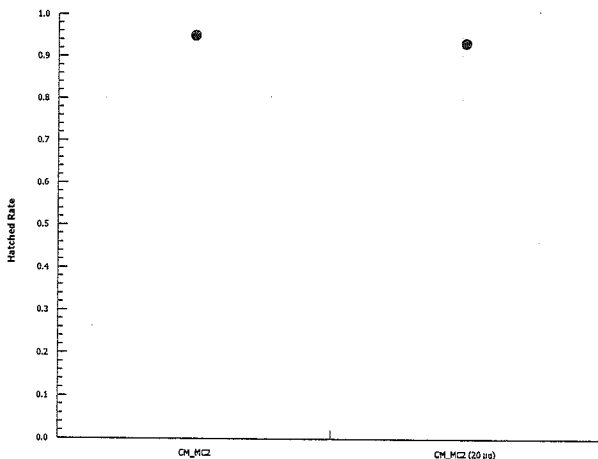
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	1	1	0.9333	0.8667
CM_MC2 (20 µg)	0.8667	1	1	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC2	15/15	15/15	14/15	13/15
CM_MC2 (20 µg)	13/15	15/15	15/15	13/15

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:03 (p 2 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 07-1764-1003	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:02	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

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 20 µg	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	10	50	60	0.1667	0.8333	0.0%
FR_FRCP1 20 µg	47	13	60	0.7833	0.2167	-370.0%

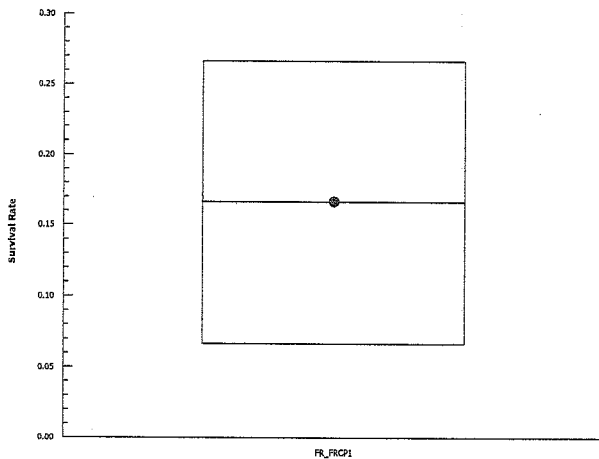
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.2	0.06667	0.1333	0.2667
FR_FRCP1 20 µg	0.8667	0.7333	0.6667	0.8667

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	3/15	1/15	2/15	4/15
FR_FRCP1 20 µg	13/15	11/15	10/15	13/15

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:02 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 03-2543-8546	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:02	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	31.2%	

**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 20 µg	-4.601	1.943	0.16	6	0.9982	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2867746	0.2867746	1	21.17	0.0037	Significant Effect
Error	0.08128212	0.01354702	6			
Total	0.3680567		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.784	47.47	0.2310	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9248	0.6451	0.4698	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	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	0.0%
FR_FRCP1 20 µg	4	0.8908	0.7819	0.9997	0.893	0.8267	0.9507	0.03422	7.68%	-73.93%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.7087	0.404	0.3873	0.5487
FR_FRCP1 20 µg	0.9493	0.8267	0.8367	0.9507



# CETIS Analytical Report

Report Date: 18 Dec-17 16:02 (p 4 of 4)

Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-2543-8546

Endpoint: Mean Dry Biomass-mg

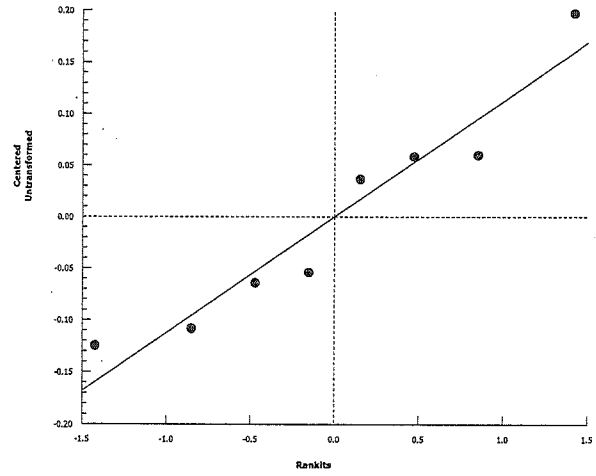
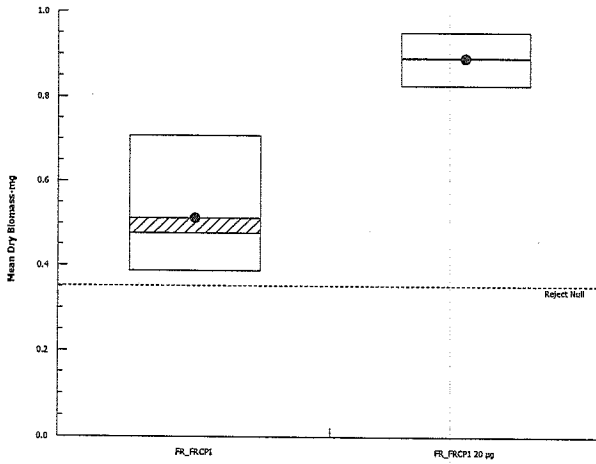
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 16:02

Analysis: Parametric-Two Sample

Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:02 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 20-5095-5842	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:02	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.9%	

**Unequal 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 20 µg	2.542	2.353	2.381	3	0.0423	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	13.22376	13.22376	1	6.461	0.0440	Significant Effect
Error	12.28112	2.046854	6			
Total	25.50488		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	80.38	47.47	0.0046	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8702	0.6451	0.1514	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	0.0%
FR_FRCP1 20 µg	4	10.7	10.34	11.06	10.67	10.46	11	0.1121	2.1%	19.38%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	13.33	16	12.5	11.25
FR_FRCP1 20 µg	10.46	10.64	10.7	11

Fathead Minnow 32-d Survival and Growth Test

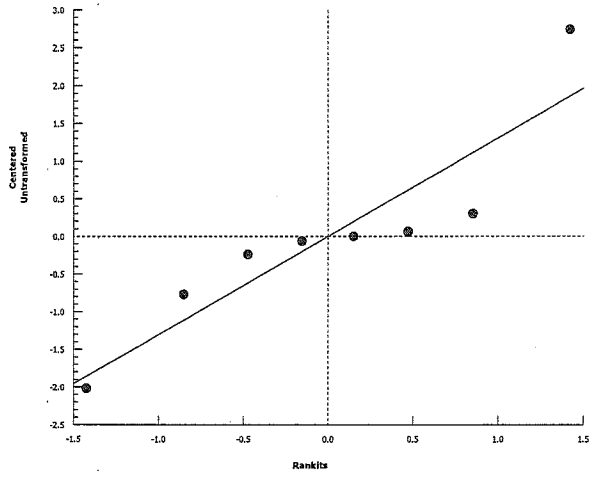
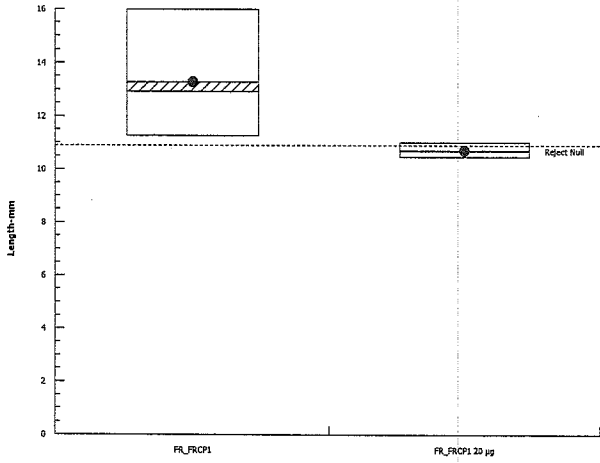
Nautilus Environmental

Analysis ID: 20-5095-5842  
Analyzed: 18 Dec-17 16:02

Endpoint: Length-mm  
Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:03 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

<b>Analysis ID:</b> 15-2224-5915	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:02	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

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 20 µg	0.5	0.5000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	58	2	60	0.9667	0.03333	0.0%
FR_FRCP1 20 µg	57	3	60	0.95	0.05	1.72%

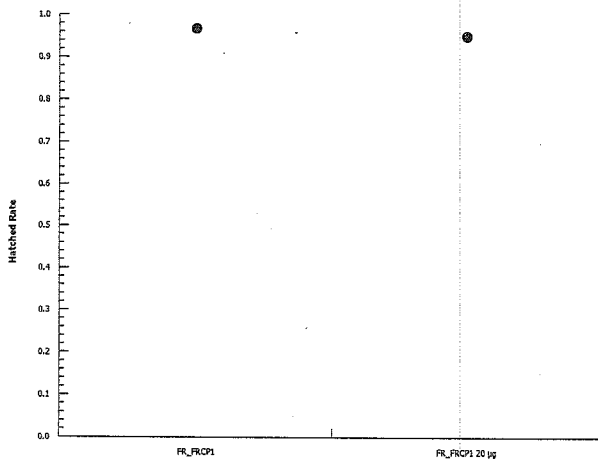
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.9333	1	0.9333	1
FR_FRCP1 20 µg	0.9333	0.9333	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	14/15	15/15	14/15	15/15
FR_FRCP1 20 µg	14/15	14/15	14/15	15/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 5 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 05-6164-9005	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

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 20 µg	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	10	50	60	0.1667	0.8333	0.0%
FR_FRCP1 20 µg	47	13	60	0.7833	0.2167	-370.0%

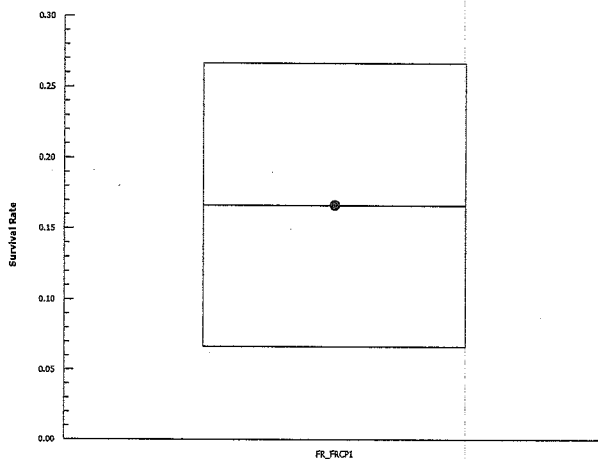
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.2	0.06667	0.1333	0.2667
FR_FRCP1 20 µg	0.8667	0.7333	0.6667	0.8667

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	3/15	1/15	2/15	4/15
FR_FRCP1 20 µg	13/15	11/15	10/15	13/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 9 of 12)  
 Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

<b>Analysis ID:</b> 16-6919-3815	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	31.2%	

**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 20 µg	4.601	1.943	0.16	6	0.0018	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.2867746	0.2867746	1	21.17	0.0037	Significant Effect
Error	0.08128212	0.01354702	6			
Total	0.3680567		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.784	47.47	0.2310	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9248	0.6451	0.4698	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	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	0.0%
FR_FRCP1 20 µg	4	0.8908	0.7819	0.9997	0.893	0.8267	0.9507	0.03422	7.68%	-73.93%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.7087	0.404	0.3873	0.5487
FR_FRCP1 20 µg	0.9493	0.8267	0.8367	0.9507

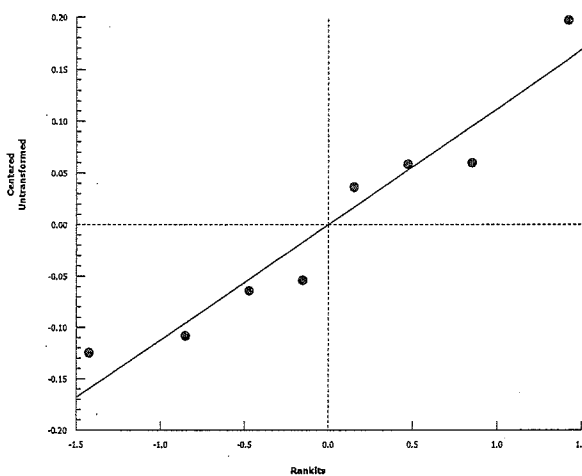
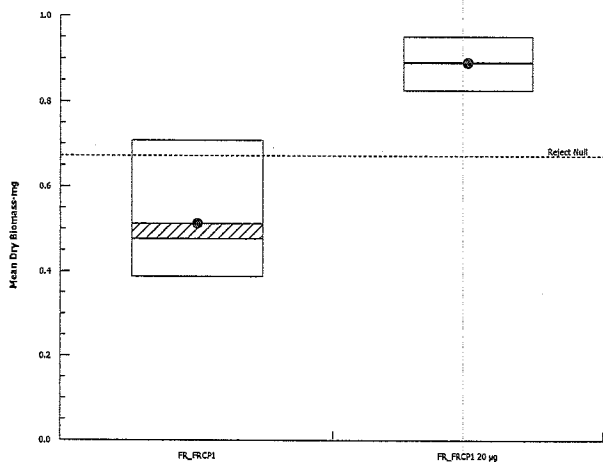
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-6919-3815      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Dec-17 14:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 3 of 12)  
 Test Code: 171094-171095a | 01-3538-9344

<b>Fathead Minnow 32-d Survival and Growth Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 20-7563-9682	Endpoint: Length-mm	CETIS Version: CETISv1.8.7			
Analyzed: 20 Dec-17 14:59	Analysis: Parametric-Two Sample	Official Results: Yes			
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus			
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:			
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:			
Duration: 31d 22h	Source: Aquatox, AR	Age:			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	17.9%	

**Unequal 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 20 µg	-2.542	2.353	2.381	3	0.9577	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	13.22376	13.22376	1	6.461	0.0440	Significant Effect
Error	12.28112	2.046854	6			
Total	25.50488		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	80.38	47.47	0.0046	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8702	0.6451	0.1514	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	0.0%
FR_FRCP1 20 µg	4	10.7	10.34	11.06	10.67	10.46	11	0.1121	2.1%	19.38%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	13.33	16	12.5	11.25
FR_FRCP1 20 µg	10.46	10.64	10.7	11



CETIS Analytical Report

Report Date: 20 Dec-17 15:00 (p 4 of 12)  
Test Code: 171094-171095a | 01-3538-9344

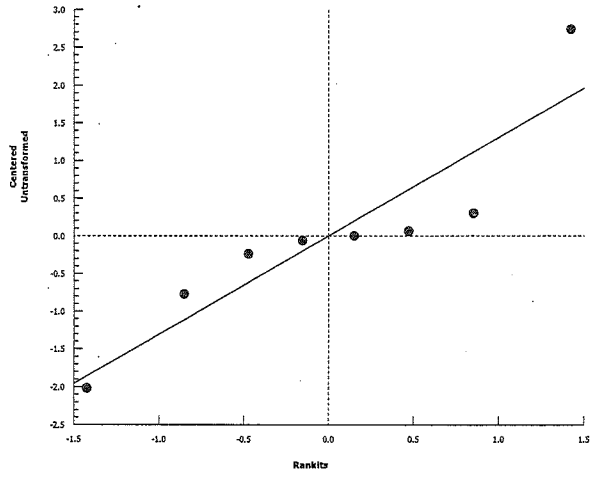
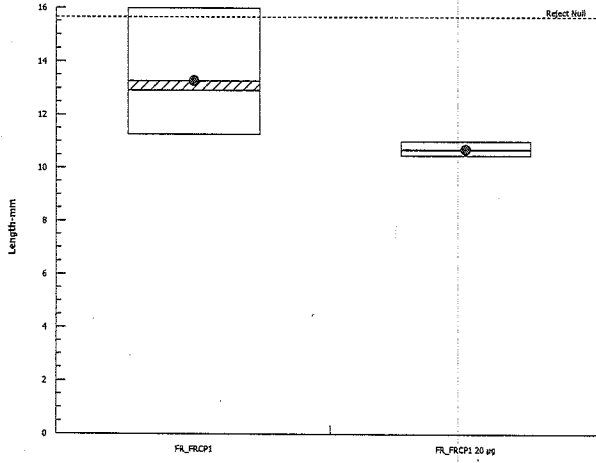
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 20-7563-9682      Endpoint: Length-mm  
Analyzed: 20 Dec-17 14:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 2 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

<b>Fathead Minnow 32-d Survival and Growth Test</b>			<b>Nautilus Environmental</b>		
<b>Analysis ID:</b> 09-5903-9263	<b>Endpoint:</b> Hatched Rate			<b>CETIS Version:</b> CETISv1.8.7	
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Single 2x2 Contingency Table			<b>Official Results:</b> Yes	
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth			<b>Analyst:</b> Emma Marus	
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)			<b>Diluent:</b>	
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas			<b>Brine:</b>	
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR			<b>Age:</b>	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)	Teck Coal	
FR_FRCP1 20 µg	02-8005-3566	02 Oct-17 13:17	03 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
FR_FRCP1 20 µg	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		

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 20 µg	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_FRCP1	58	2	60	0.9667	0.03333	0.0%
FR_FRCP1 20 µg	57	3	60	0.95	0.05	1.72%

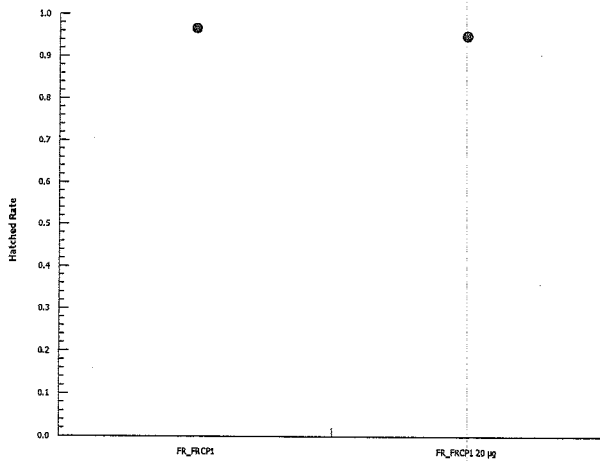
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	0.9333	1	0.9333	1
FR_FRCP1 20 µg	0.9333	0.9333	0.9333	1

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_FRCP1	14/15	15/15	14/15	15/15
FR_FRCP1 20 µg	14/15	14/15	14/15	15/15

**Graphics**



# CETIS Analytical Report

Report Date: 18 Dec-17 16:05 (p 2 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

## Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 03-2194-4213	Endpoint: Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 16:04	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

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 (20 µg)	1	1.0000	Exact	Non-Significant Effect

### Data Summary

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	42	18	60	0.7	0.3	0.0%
GH_FR1 (20 µg)	46	14	60	0.7667	0.2333	-9.52%

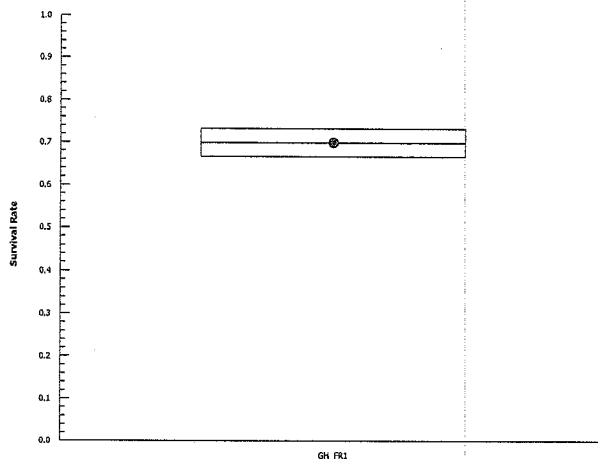
### Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.6667	0.7333	0.6667	0.7333
GH_FR1 (20 µg)	0.6	0.8667	0.8667	0.7333

### Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10/15	11/15	10/15	11/15
GH_FR1 (20 µg)	9/15	13/15	13/15	11/15

### Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:04 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 05-7377-4422	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 16:04	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.7%	

**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 (20 µg)	0.2127	1.943	0.099	6	0.4193	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0002347838	0.0002347838	1	0.04525	0.8386	Non-Significant Effect
Error	0.03113004	0.00518834	6			
Total	0.03136482		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	45.43	47.47	0.0107	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9713	0.6451	0.9084	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	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	0.0%
GH_FR1 (20 µg)	4	0.8323	0.672	0.9927	0.8363	0.724	0.9327	0.05038	12.11%	1.29%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.842	0.8647	0.8327	0.8333
GH_FR1 (20 µg)	0.902	0.7707	0.724	0.9327

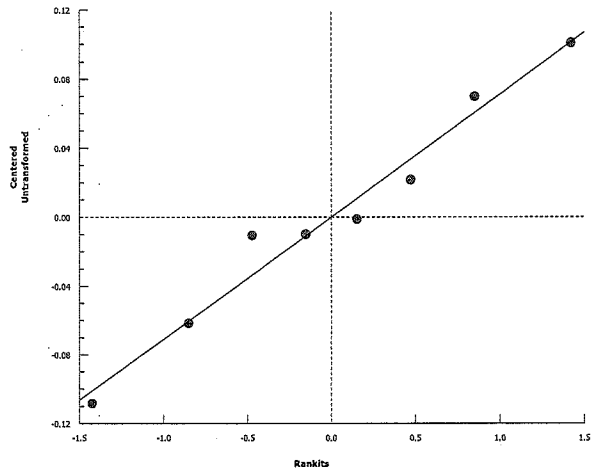
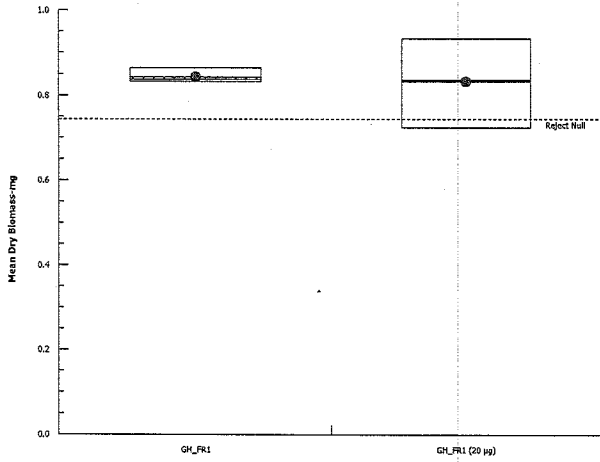
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 05-7377-4422      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Dec-17 16:04      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:04 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test** **Nautilus Environmental**

<b>Analysis ID:</b> 08-3814-7254	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 16:04	<b>Analysis:</b> Nonparametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	4.59%	

**Wilcoxon Rank Sum Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 (20 µg)	21	NA	1	6	0.8429	Exact	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05948825	0.05948825	1	0.5109	0.5016	Non-Significant Effect
Error	0.6986041	0.116434	6			
Total	0.7580923		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.636	47.47	0.4471	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7531	0.6451	0.0088	Non-normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	0.0%
GH_FR1 (20 µg)	4	10.39	9.739	11.05	10.24	10.09	11	0.2054	3.95%	-1.69%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10.1	10.09	10.6	10.09
GH_FR1 (20 µg)	11	10.23	10.25	10.09

# CETIS Analytical Report

Report Date: 18 Dec-17 16:04 (p 2 of 4)  
Test Code: 171094-171095a | 01-3538-9344

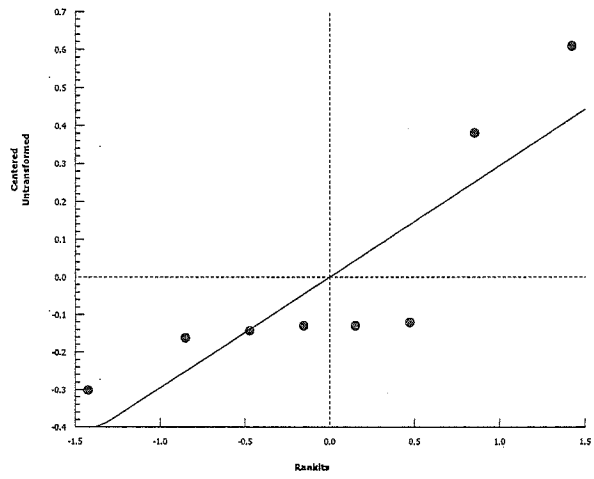
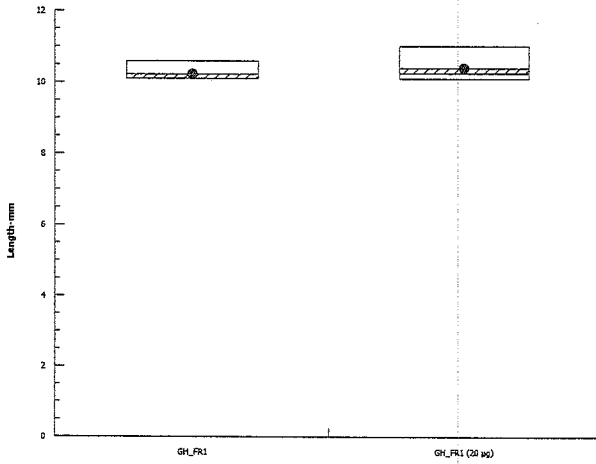
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 08-3814-7254      Endpoint: Length-mm  
Analyzed: 18 Dec-17 16:04      Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 16:05 (p 1 of 2)  
 Test Code: 171094-171095a | 01-3538-9344

<b>Fathead Minnow 32-d Survival and Growth Test</b>			<b>Nautilus Environmental</b>		
Analysis ID: 05-7746-4201	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7			
Analyzed: 18 Dec-17 16:04	Analysis: Single 2x2 Contingency Table	Official Results: Yes			
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus			
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:			
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:			
Duration: 31d 22h	Source: Aquatox, AR	Age:			

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

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 (20 µg)	0.1034	0.1034	Exact	Non-Significant Effect

**Data Summary**

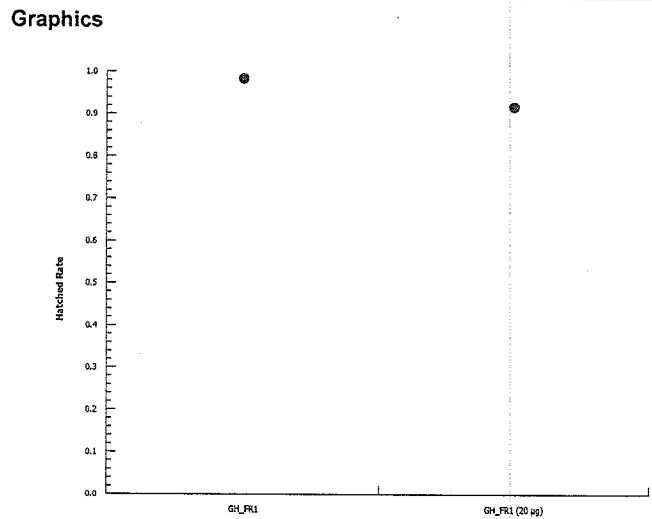
Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	59	1	60	0.9833	0.01667	0.0%
GH_FR1 (20 µg)	55	5	60	0.9167	0.08333	6.78%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1	0.9333	1	1
GH_FR1 (20 µg)	0.8667	1	0.9333	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	15/15	14/15	15/15	15/15
GH_FR1 (20 µg)	13/15	15/15	14/15	13/15





**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 6 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-8134-1681	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 20 Dec-17 14:59	<b>Analysis:</b> Single 2x2 Contingency Table	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

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 (20 µg)	0.2681	0.2681	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	42	18	60	0.7	0.3	0.0%
GH_FR1 (20 µg)	46	14	60	0.7667	0.2333	-9.52%

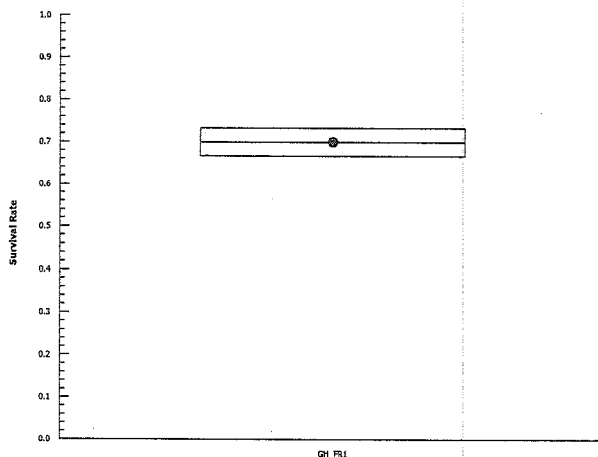
**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.6667	0.7333	0.6667	0.7333
GH_FR1 (20 µg)	0.6	0.8667	0.8667	0.7333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10/15	11/15	10/15	11/15
GH_FR1 (20 µg)	9/15	13/15	13/15	11/15

**Graphics**



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 11 of 12)  
 Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test Nautilus Environmental

Analysis ID: 00-3286-3945	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 20 Dec-17 14:59	Analysis: Parametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	11.7%	

**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 (20 µg)	-0.2127	1.943	0.099	6	0.5807	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0002347838	0.0002347838	1	0.04525	0.8386	Non-Significant Effect
Error	0.03113004	0.00518834	6			
Total	0.03136482		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	45.43	47.47	0.0107	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9713	0.6451	0.9084	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	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	0.0%
GH_FR1 (20 µg)	4	0.8323	0.672	0.9927	0.8363	0.724	0.9327	0.05038	12.11%	1.29%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	0.842	0.8647	0.8327	0.8333
GH_FR1 (20 µg)	0.902	0.7707	0.724	0.9327

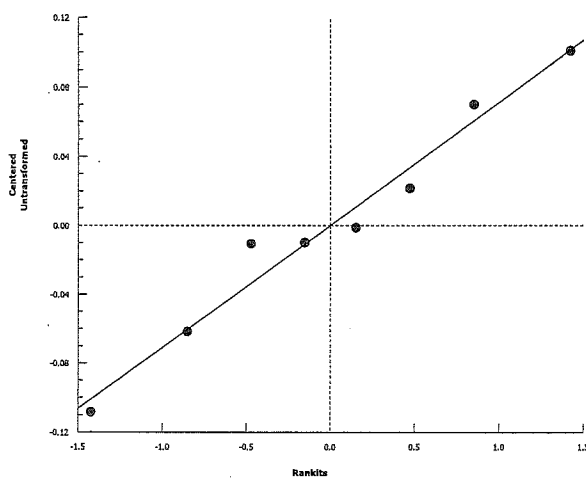
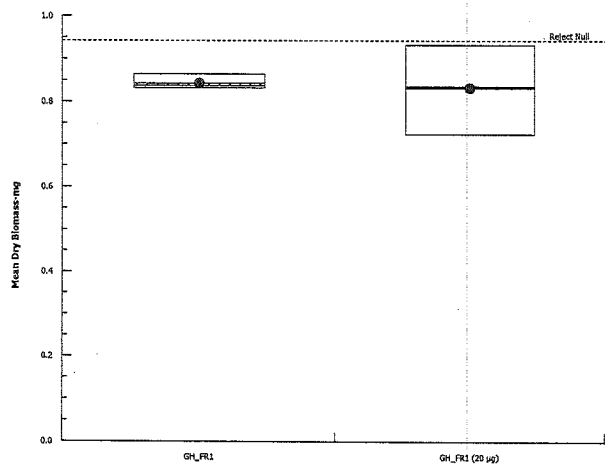
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-3286-3945      Endpoint: Mean Dry Biomass-mg  
Analyzed: 20 Dec-17 14:59      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 5 of 12)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 09-2652-6705	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 20 Dec-17 14:59	Analysis: Nonparametric-Two Sample	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	4.59%	

**Wilcoxon Rank Sum Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_FR1		GH_FR1 (20 µg)	15	NA	1	6	0.2429	Exact	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05948825	0.05948825	1	0.5109	0.5016	Non-Significant Effect
Error	0.6986041	0.116434	6			
Total	0.7580923		7			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.636	47.47	0.4471	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7531	0.6451	0.0088	Non-normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	0.0%
GH_FR1 (20 µg)	4	10.39	9.739	11.05	10.24	10.09	11	0.2054	3.95%	-1.69%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	10.1	10.09	10.6	10.09
GH_FR1 (20 µg)	11	10.23	10.25	10.09

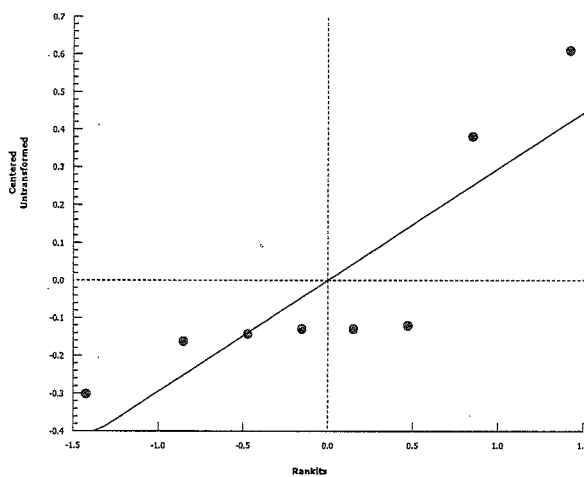
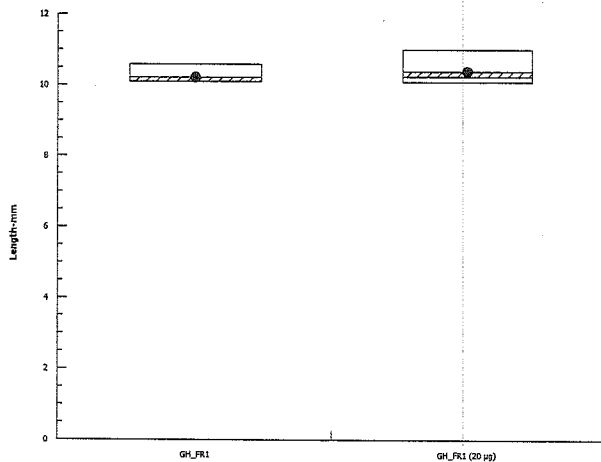
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-2652-6705      Endpoint: Length-mm  
Analyzed: 20 Dec-17 14:59      Analysis: Nonparametric-Two Sample

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 20 Dec-17 15:00 (p 3 of 6)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 17-1781-4888	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 20 Dec-17 14:59	Analysis: Single 2x2 Contingency Table	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)	Teck Coal	
GH_FR1 (20 µg)	03-8838-2614	02 Oct-17 13:05	04 Oct-17 12:20	75h		Teck Coal Q4

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_FR1 (20 µg)	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N (20		

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 (20 µg)	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_FR1	59	1	60	0.9833	0.01667	0.0%
GH_FR1 (20 µg)	55	5	60	0.9167	0.08333	6.78%

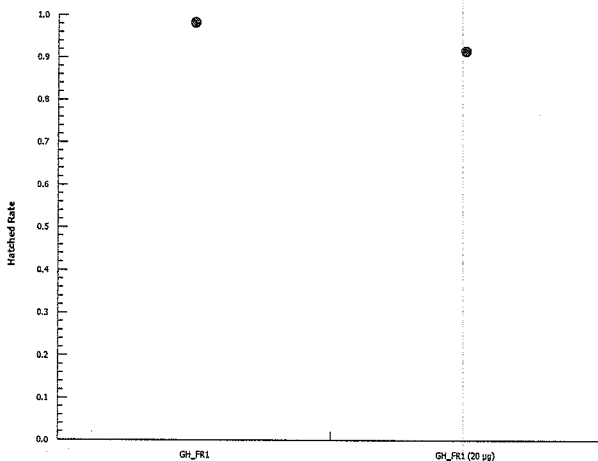
**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	1	0.9333	1	1
GH_FR1 (20 µg)	0.8667	1	0.9333	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_FR1	15/15	14/15	15/15	15/15
GH_FR1 (20 µg)	13/15	15/15	14/15	13/15

**Graphics**



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:53 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 09-5103-8433	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:52	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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_FRCP1	0	<0.0001	Exact	Significant Effect
GH_ER2		GH_FR1	0.1459	0.1459	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
GH_ER2 Negative Contr	48	12	60	0.8	0.2	0.0%
FR_FRCP1	10	50	60	0.1667	0.8333	79.17%
GH_FR1	42	18	60	0.7	0.3	12.5%
CM_MC2	11	49	60	0.1833	0.8167	77.08%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.8667	0.8	0.8667	0.6667
FR_FRCP1	0.2	0.06667	0.1333	0.2667
GH_FR1	0.6667	0.7333	0.6667	0.7333
CM_MC2	0	0.06667	0.1333	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	13/15	12/15	13/15	10/15
FR_FRCP1	3/15	1/15	2/15	4/15
GH_FR1	10/15	11/15	10/15	11/15
CM_MC2	0/15	1/15	2/15	8/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:53 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

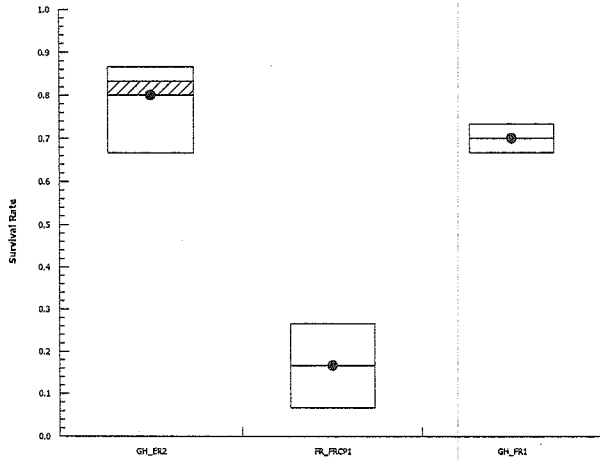
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 09-5103-8433      Endpoint: Survival Rate  
Analyzed: 18 Dec-17 15:52      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics





**CETIS Analytical Report**

Report Date: 18 Dec-17 15:53 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 00-4736-0541	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:52	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	32.8%	

**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	14	10	0	6	0.2626	Asymp	Non-Significant Effect
		GH_FR1	26	10	0	6	0.9996	Asymp	Non-Significant Effect
		CM_MC2	10	10	0	6	0.0276	Asymp	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.5630997	0.1876999	3	10.01	0.0014	Significant Effect
Error	0.2249354	0.01874461	12			
Total	0.788035		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	15.98	11.34	0.0011	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9027	0.8408	0.0889	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	4	0.676	0.6229	0.7291	0.6823	0.6353	0.704	0.0167	4.94%	0.0%
FR_FRCP1	4	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	24.24%
GH_FR1	4	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	-24.73%
CM_MC2	4	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	49.93%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	0.662	0.6353	0.704	0.7027
FR_FRCP1	0.7087	0.404	0.3873	0.5487
GH_FR1	0.842	0.8647	0.8327	0.8333
CM_MC2	0	0.438	0.44	0.476

# CETIS Analytical Report

Report Date: 18 Dec-17 15:53 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

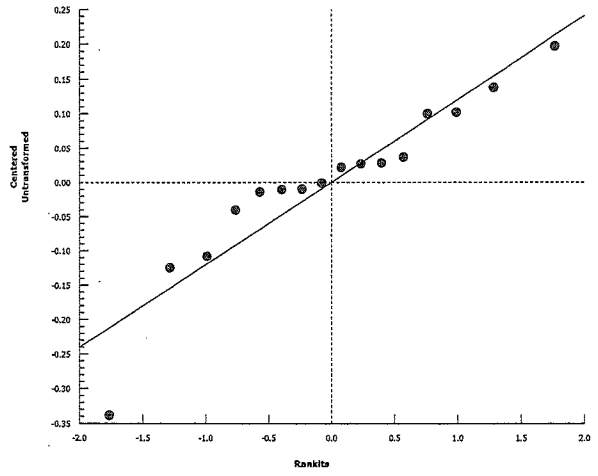
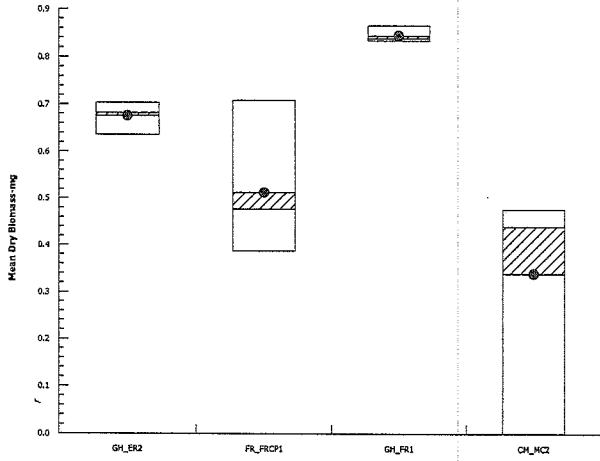
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 00-4736-0541      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Dec-17 15:52      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:53 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 02-5178-9503	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:53	<b>Analysis:</b> Nonparametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	23.0%	

**Wilcoxon Rank Sum Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_FRCP1	26	NA	0	6	1.0000	Exact	Non-Significant Effect
		GH_FR1	20	NA	0	6	0.7571	Exact	Non-Significant Effect
		CM_MC2	16	NA	0	5	0.9429	Exact	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	32.44625	10.81542	3	4.845	0.0219	Significant Effect
Error	24.55703	2.232458	11			
Total	57.00329		14			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.77	11.34	0.0020	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8821	0.8328	0.0511	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
GH_ER2	4	10	9.566	10.44	9.968	9.769	10.3	0.1367	2.73%	0.0%
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	-32.69%
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	-2.19%
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	-27.07%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	9.769	10.17	9.769	10.3
FR_FRCP1	13.33	16	12.5	11.25
GH_FR1	10.1	10.09	10.6	10.09
CM_MC2	15	13	10.13	

# CETIS Analytical Report

Report Date: 18 Dec-17 15:53 (p 2 of 4)  
Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-5178-9503

Endpoint: Length-mm

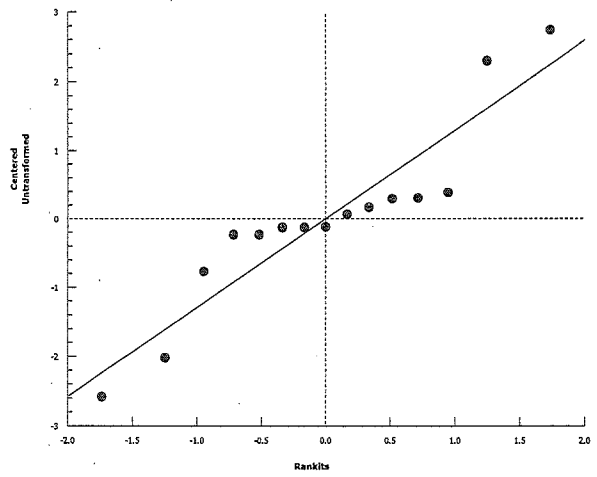
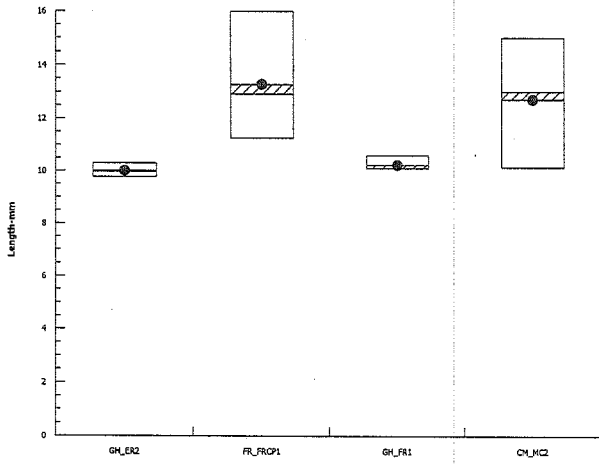
CETIS Version: CETISv1.8.7

Analyzed: 18 Dec-17 15:53

Analysis: Nonparametric-Two Sample

Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:53 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 16-9919-7263	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:52	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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_FRCP1	0.5	1.0000	Exact	Non-Significant Effect
GH_ER2		GH_FR1	0.7521	0.7521	Exact	Non-Significant Effect
GH_ER2		CM_MC2	0.3093	0.9279	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	58	2	60	0.9667	0.03333	1.7%
GH_FR1	59	1	60	0.9833	0.01667	0.0%
CM_MC2	57	3	60	0.95	0.05	3.39%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	1	1	1	0.9333
FR_FRCP1	0.9333	1	0.9333	1
GH_FR1	1	0.9333	1	1
CM_MC2	1	1	0.9333	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
GH_ER2	15/15	15/15	15/15	14/15
FR_FRCP1	14/15	15/15	14/15	15/15
GH_FR1	15/15	14/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	13/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:53 (p 2 of 4)  
Test Code: 171094-171095a | 01-3538-9344

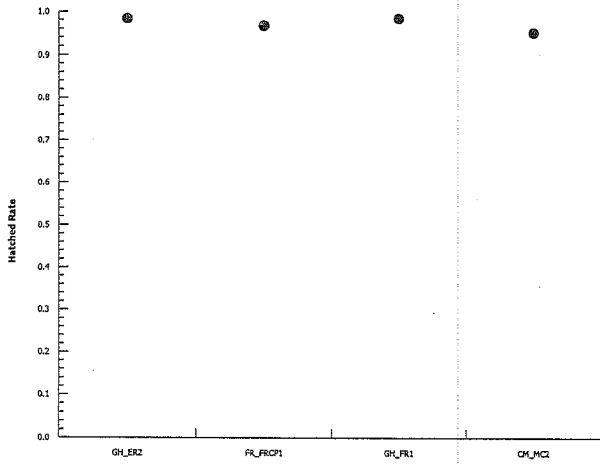
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-9919-7263      Endpoint: Hatched Rate  
Analyzed: 18 Dec-17 15:52      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:56 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 00-9173-1234	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:55	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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_FRCP1	0	<0.0001	Exact	Significant Effect
CM_MC1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	1.68E-07	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code		NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1	Negative Contr	39	21	60	0.65	0.35	0.0%
FR_FRCP1		10	50	60	0.1667	0.8333	74.36%
GH_FR1		42	18	60	0.7	0.3	-7.69%
CM_MC2		11	49	60	0.1833	0.8167	71.79%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.4	0.8667	0.8	0.5333
FR_FRCP1	0.2	0.06667	0.1333	0.2667
GH_FR1	0.6667	0.7333	0.6667	0.7333
CM_MC2	0	0.06667	0.1333	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	6/15	13/15	12/15	8/15
FR_FRCP1	3/15	1/15	2/15	4/15
GH_FR1	10/15	11/15	10/15	11/15
CM_MC2	0/15	1/15	2/15	8/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:56 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

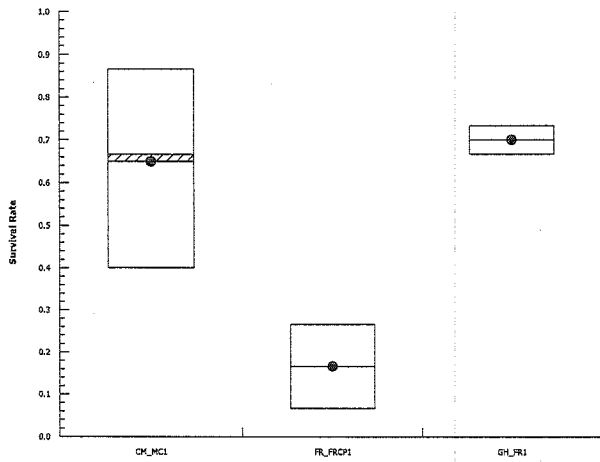
Nautilus Environmental

Analysis ID: 00-9173-1234  
Analyzed: 18 Dec-17 15:55

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics





**CETIS Analytical Report**

Report Date: 18 Dec-17 15:55 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 01-8399-4316	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:55	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	33.2%	

**Dunnett Multiple Comparison Test**

Sample Code vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1	FR_FRCP1	2.053	2.287	0.243	6	0.0742	CDF	Non-Significant Effect
	GH_FR1	-1.069	2.287	0.243	6	0.9662	CDF	Non-Significant Effect
	CM_MC2	3.691	2.287	0.243	6	0.0041	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.6077709	0.2025903	3	9.009	0.0021	Significant Effect
Error	0.2698476	0.0224873	12			
Total	0.8776186		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.87	11.34	0.0125	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9375	0.8408	0.3191	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	0.7298	0.528	0.9316	0.7297	0.576	0.884	0.06342	17.38%	0.0%
FR_FRCP1	4	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	29.82%
GH_FR1	4	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	-15.53%
CM_MC2	4	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	53.62%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.884	0.75	0.576	0.7093
FR_FRCP1	0.7087	0.404	0.3873	0.5487
GH_FR1	0.842	0.8647	0.8327	0.8333
CM_MC2	0	0.438	0.44	0.476

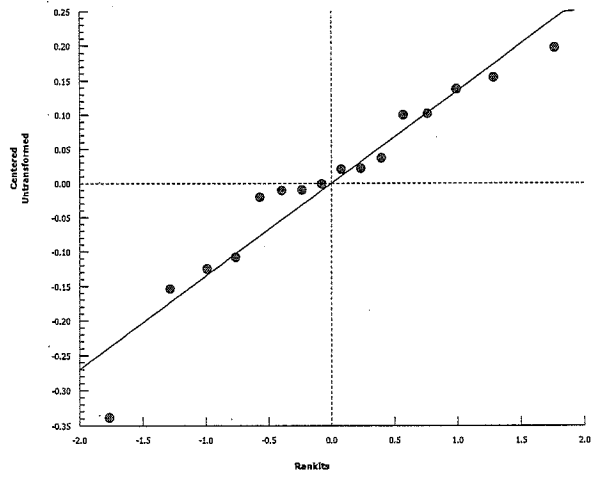
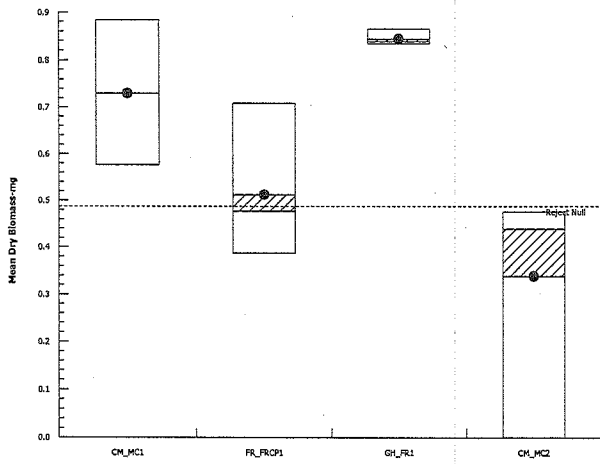
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 01-8399-4316      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Dec-17 15:55      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:55 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 12-3172-1744	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:55	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	25.8%	

**Dunnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1		FR_FRCP1	-2.5	2.318	2.522	6	0.9989	CDF	Non-Significant Effect
		GH_FR1	0.3033	2.318	2.522	6	0.6381	CDF	Non-Significant Effect
		CM_MC2	-1.836	2.318	2.724	5	0.9947	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	26.8648	8.954933	3	3.781	0.0437	Significant Effect
Error	26.0519	2.368355	11			
Total	52.9167		14			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.05	11.34	0.0182	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9281	0.8328	0.2554	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
CM_MC1	4	10.55	9.346	11.76	10.23	10.08	11.67	0.3785	7.18%	0.0%
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	-25.78%
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	3.13%
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	-20.45%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	11.67	10.08	10.08	10.38
FR_FRCP1	13.33	16	12.5	11.25
GH_FR1	10.1	10.09	10.6	10.09
CM_MC2	15	13	10.13	

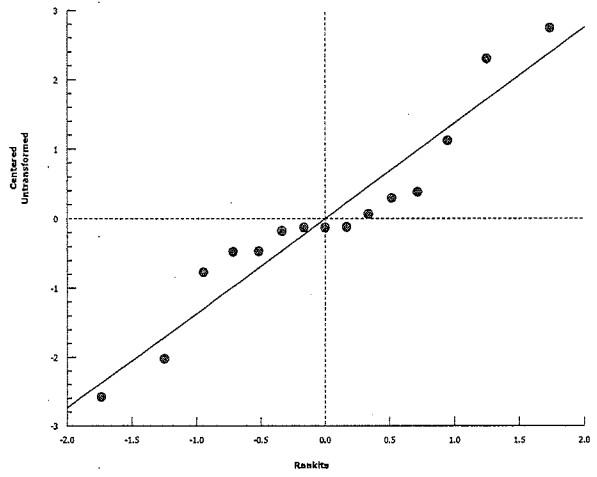
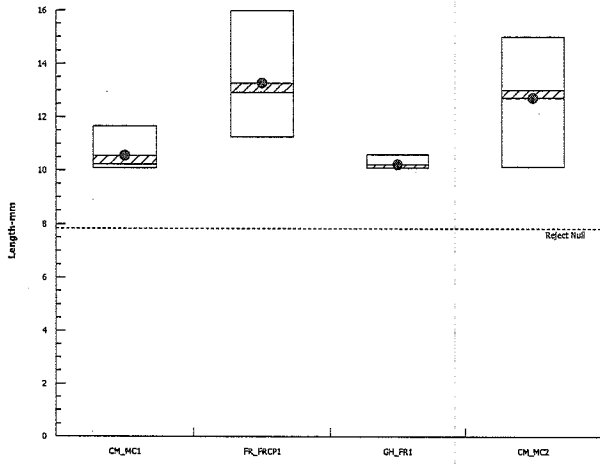
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 12-3172-1744      Endpoint: Length-mm  
Analyzed: 18 Dec-17 15:55      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:56 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 04-4325-4632	<b>Endpoint:</b> Hatched Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:55	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	71h (6 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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_FRCP1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		GH_FR1	1	1.0000	Exact	Non-Significant Effect
CM_MC1		CM_MC2	0.6603	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
CM_MC1 Negative Contr	57	3	60	0.95	0.05	0.0%
FR_FRCP1	58	2	60	0.9667	0.03333	-1.75%
GH_FR1	59	1	60	0.9833	0.01667	-3.51%
CM_MC2	57	3	60	0.95	0.05	0.0%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	0.9333	1	1	0.8667
FR_FRCP1	0.9333	1	0.9333	1
GH_FR1	1	0.9333	1	1
CM_MC2	1	1	0.9333	0.8667

**Hatched Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
CM_MC1	14/15	15/15	15/15	13/15
FR_FRCP1	14/15	15/15	14/15	15/15
GH_FR1	15/15	14/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	13/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:56 (p 2 of 4)  
Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

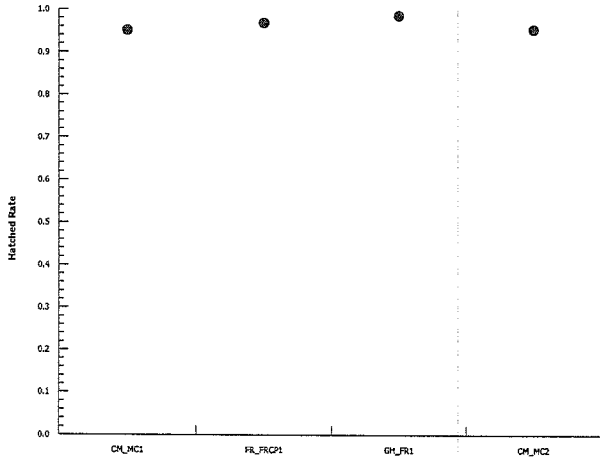
Nautilus Environmental

Analysis ID: 04-4325-4632  
Analyzed: 18 Dec-17 15:55

Endpoint: Hatched Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:46 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 16-8705-4849	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 18 Dec-17 15:45	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-8745-1376	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Emma Marus
<b>Start Date:</b> 05 Oct-17 16:30	<b>Protocol:</b> ASTM E1241-05 (2013)	<b>Diluent:</b>
<b>Ending Date:</b> 06 Nov-17 14:00	<b>Species:</b> Pimephales promelas	<b>Brine:</b>
<b>Duration:</b> 31d 22h	<b>Source:</b> Aquatox, AR	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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		FR_FRCP1	0	<0.0001	Exact	Significant Effect
FR_UFR1		GH_FR1	0.1001	0.1001	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Negative Contr	49	11	60	0.8167	0.1833	0.0%
FR_FRCP1	10	50	60	0.1667	0.8333	79.59%
GH_FR1	42	18	60	0.7	0.3	14.29%
CM_MC2	11	49	60	0.1833	0.8167	77.55%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.7333	0.8	0.7333	1
FR_FRCP1	0.2	0.06667	0.1333	0.2667
GH_FR1	0.6667	0.7333	0.6667	0.7333
CM_MC2	0	0.06667	0.1333	0.5333

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	11/15	12/15	11/15	15/15
FR_FRCP1	3/15	1/15	2/15	4/15
GH_FR1	10/15	11/15	10/15	11/15
CM_MC2	0/15	1/15	2/15	8/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:46 (p 4 of 4)  
Test Code: 171094-171095a | 01-3538-9344

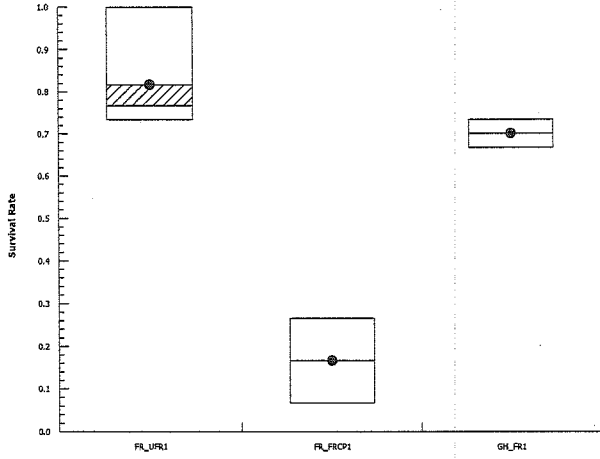
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 16-8705-4849      Endpoint: Survival Rate  
Analyzed: 18 Dec-17 15:45      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

## Graphics





**CETIS Analytical Report**

Report Date: 18 Dec-17 15:46 (p 3 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 02-2205-1842	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:45	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	28.6%	

**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	FR_FRCP1	10	10	0	6	0.0276	Asymp	Significant Effect
	GH_FR1	26	10	0	6	0.9996	Asymp	Non-Significant Effect
	CM_MC2	10	10	0	6	0.0276	Asymp	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat.	P-Value	Decision(α:5%)
Between	0.6618413	0.2206138	3	11.65	0.0007	Significant Effect
Error	0.2273233	0.01894361	12			
Total	0.8891646		15			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	14.67	11.34	0.0021	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9142	0.8408	0.1363	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	0.7775	0.7079	0.8471	0.7747	0.7333	0.8273	0.02186	5.62%	0.0%
FR_FRCP1	4	0.5122	0.274	0.7504	0.4763	0.3873	0.7087	0.07485	29.23%	34.13%
GH_FR1	4	0.8432	0.8194	0.867	0.8377	0.8327	0.8647	0.007475	1.77%	-8.45%
CM_MC2	4	0.3385	-0.02166	0.6987	0.439	0	0.476	0.1132	66.87%	56.46%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.7493	0.7333	0.8273	0.8
FR_FRCP1	0.7087	0.404	0.3873	0.5487
GH_FR1	0.842	0.8647	0.8327	0.8333
CM_MC2	0	0.438	0.44	0.476

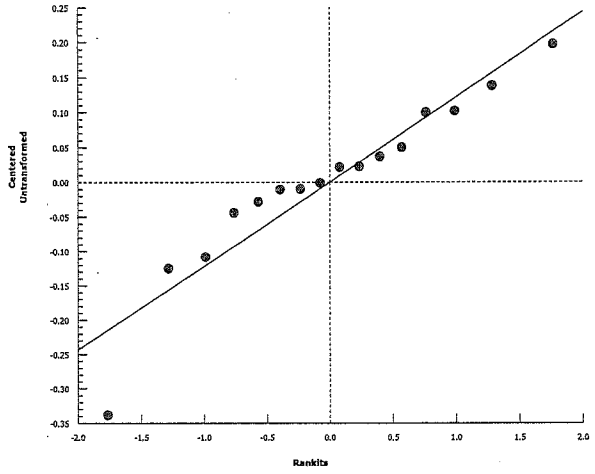
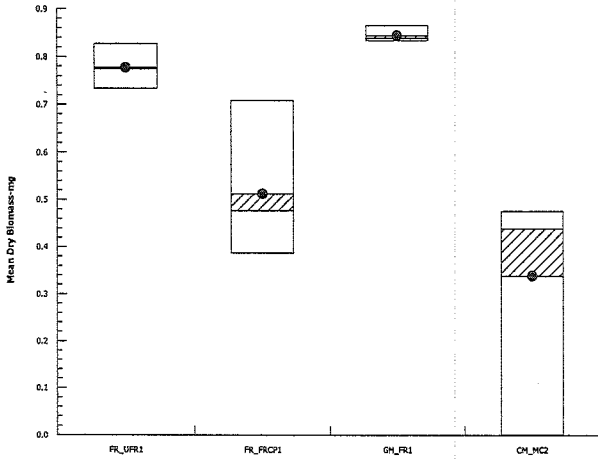
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 02-2205-1842      Endpoint: Mean Dry Biomass-mg  
Analyzed: 18 Dec-17 15:45      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:46 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

**Nautilus Environmental**

Analysis ID: 14-3845-4991	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:45	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		

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%)
FR_UFR1		FR_FRCP1	-3.034	2.318	2.443	6	0.9997	CDF	Non-Significant Effect
		GH_FR1	-0.1401	2.318	2.443	6	0.8034	CDF	Non-Significant Effect
		CM_MC2	-2.315	2.318	2.639	5	0.9983	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	31.62004	10.54001	3	4.742	0.0233	Significant Effect
Error	24.44875	2.222614	11			
Total	56.06879		14			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	16.44	11.34	0.0009	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8725	0.8328	0.0367	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	10.07	9.76	10.39	10.05	9.867	10.33	0.09832	1.95%	0.0%
FR_FRCP1	4	13.27	10.07	16.47	12.92	11.25	16	1.005	15.15%	-31.75%
GH_FR1	4	10.22	9.818	10.62	10.1	10.09	10.6	0.1265	2.48%	-1.47%
CM_MC2	3	12.71	6.621	18.8	13	10.13	15	1.415	19.28%	-26.17%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	10	10.33	10.09	9.867
FR_FRCP1	13.33	16	12.5	11.25
GH_FR1	10.1	10.09	10.6	10.09
CM_MC2	15	13	10.13	

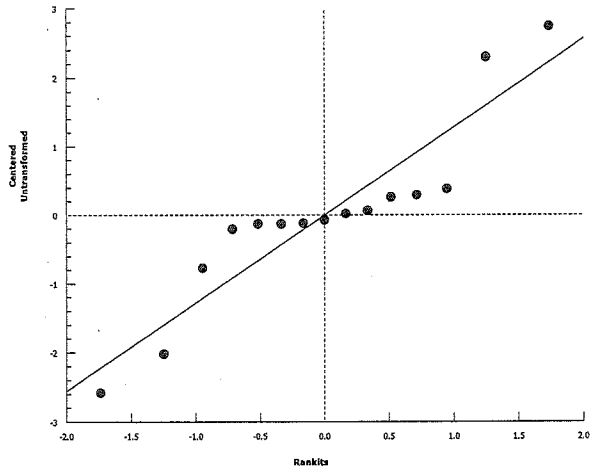
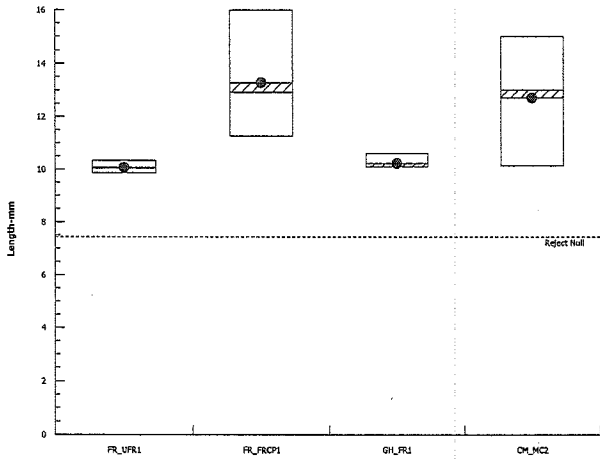
Fathead Minnow 32-d Survival and Growth Test

Nautilus Environmental

Analysis ID: 14-3845-4991      Endpoint: Length-mm  
Analyzed: 18 Dec-17 15:45      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 18 Dec-17 15:46 (p 1 of 4)  
 Test Code: 171094-171095a | 01-3538-9344

**Fathead Minnow 32-d Survival and Growth Test**

Nautilus Environmental

Analysis ID: 09-0718-4082	Endpoint: Hatched Rate	CETIS Version: CETISv1.8.7
Analyzed: 18 Dec-17 15:45	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 11-8745-1376	Test Type: Survival-Development-Growth	Analyst: Emma Marus
Start Date: 05 Oct-17 16:30	Protocol: ASTM E1241-05 (2013)	Diluent:
Ending Date: 06 Nov-17 14:00	Species: Pimephales promelas	Brine:
Duration: 31d 22h	Source: Aquatox, AR	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	75h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	75h (8.1 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	70h (5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_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		FR_FRCP1	0.2479	0.4958	Exact	Non-Significant Effect
FR_UFR1		GH_FR1	0.5	0.5000	Exact	Non-Significant Effect
FR_UFR1		CM_MC2	0.1218	0.3655	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1 Negative Contr	60	0	60	1	0	0.0%
FR_FRCP1	58	2	60	0.9667	0.03333	3.33%
GH_FR1	59	1	60	0.9833	0.01667	1.67%
CM_MC2	57	3	60	0.95	0.05	5.0%

**Hatched Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	1	1	1	1
FR_FRCP1	0.9333	1	0.9333	1
GH_FR1	1	0.9333	1	1
CM_MC2	1	1	0.9333	0.8667

**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	14/15	15/15	14/15	15/15
GH_FR1	15/15	14/15	15/15	15/15
CM_MC2	15/15	15/15	14/15	13/15

# CETIS Analytical Report

Report Date: 18 Dec-17 15:46 (p 2 of 4)  
Test Code: 171094-171095a | 01-3538-9344

Fathead Minnow 32-d Survival and Growth Test

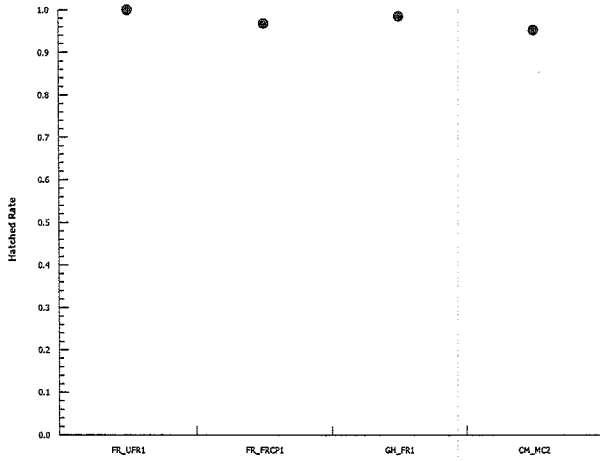
Nautilus Environmental

Analysis ID: 09-0718-4082  
Analyzed: 18 Dec-17 15:45

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**

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## Embryo-Alevin Test Summary Sheet

Client: Teck Test Date: October 5 - November 3, 2017  
 Work Order No.: 171092 Test Species: Oncorhynchus mykiss

**Sample Information:**

Sample ID: Various - see table below  
 Sample Date: October 2, 10, 17, 24 and 31, 2017  
 Date Received: October 3, 11, 18, 25 and November 1, 2017  
 Sample Volume: (2 - 11) x 20 L per refresh

**Dilution Water:**

Type: Dechlorinated Tap Water  
 Hardness (mg/L CaCO3): 8 - 12  
 Alkalinity (mg/L CaCO3): 10 - 12

**Test Organism Information:**

Batch No: 100517  
 Source: Vancouver Island Trout Hatchery, Duncan, BC Number male broodstock used: 3  
 Loading Density: 1.00 g/L → 9/L Number female broodstock used: 4

**SDS Reference Toxicant Results:**

Reference Toxicant ID: RTE98  
 Stock Solution ID: 17SO3 (1000 mg/L SDS)  
 Date Initiated: October 5, 2017  
 7-d EC50 (95% CL): 4.6 (4.1 - 5.3) mg/L SDS

Reference Toxicant Mean and Range: 4.2 (2.0 - 8.8) mg/L SDS  
 Reference Toxicant CV (%): 45

**Test Results:**

Sample ID	Survival (%) (Mean ± SD)	Viability (%) (Mean ± SD)	Length (mm) (Mean ± SD)	Wet weight (mg) (Mean ± SD)
Control	89.7 ± 8.3	83.8 ± 6.3	18.0 ± 0.3	71.9 ± 4.2
FR_UFR1	62.7 ± 41.8 *	61.9 ± 41.1 *	18.0 ± 0.3	<del>71.0 ± 8.0</del> 71.0 ± 7.4
GH_ER2	51.1 ± 36.2 *†	49.4 ± 35.6 *†	17.8 ± 0.7	70.6 ± 1.3
CM_MC1	31.7 ± 41.8 *†§	30.0 ± 41.9 *†§	17.7 ± 0.2	74.4 ± 5.1
FR_FRCP1	24.2 ± 46.1 *†§	24.2 ± 46.1 *†§	17.2 ± 1.1	75.7 ± 8.1
GH_FR1	20.7 ± 41.4 *†§	19.0 ± 37.9 *†§	16.5 ± 0.0	77.9 ± 0.0
GH_ERC	20.5 ± 34.0 *†§	18.8 ± 32.8 *†§	16.4 ± 0.5	69.0 ± 3.3
EV_HC1	30.8 ± 33.5 *†§	28.3 ± 31.1 *†§	16.2 ± 0.4	66.4 ± 7.8
EV_MC2	21.8 ± 41.4 *†§	19.4 ± 38.7 *†§	16.4 ± 1.2	73.1 ± 4.4
CM_MC2	20.7 ± 41.4 *†§	19.0 ± 37.9 *†§	20.3 ± 0.0	91.7 ± 0.0
LC_LCDSSLCC	36.4 ± 39.8 *†§	34.6 ± 36.8 *†§	19.5 ± 0.6	85.6 ± 3.4

\* Indicates results that were significantly lower relative to laboratory control  
 † Indicates results that were significantly lower relative to site control FR\_UFR1  
 § Indicates results that were significantly lower relative to site control GH\_ER2

Reviewed by: Jon Date reviewed: Nov. 17/17



## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: Oct 5 17:00 WSH  
 Stop Date & Time: Nov 3 09:00  
 Test Species: Oncorhynchus mykiss

% (v/v) Concentration Control	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	15.0	13.5	13.5	13.5	15.0	14.0	14.0	14.0	14.5	14.5	15.0	14.5
DO (mg/L)	10.0	10.1	10.2	10.2	10.2	10.0	10.1	10.1	9.9	10.0	10.0	9.5	9.6
pH	6.7	6.8	6.8	6.8	6.8	6.9	6.9	6.8	6.9	6.8	6.8	7.0	7.2
Cond. (µS/cm)	31	29		28		30		29		28		28	
Initials	K	K		EMM		K		K		K		K	

④ 15.0 temp(°C)

100 Concentration ① FRUFP1	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.1	10.3	10.2	10.2	10.2	10.2	10.1	10.2	9.9	9.9	9.9	9.8	9.6
pH	8.2	8.3	8.3	8.3	8.2	8.2	8.3	8.2	8.4	8.4	8.4	8.4	8.3
Cond. (µS/cm)	363	362		36		356		355		361		359	
Initials	K	K		EMM		K		K		K		K	

② 10.1 DO(mg/L)

100 Concentration ② GH-ER2	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.0	10.3	10.2	10.2	10.2	10.2	10.1	10.2	9.9	9.9	9.9	9.8	9.6
pH	8.2	8.3	8.3	8.3	8.2	8.2	8.3	8.1	8.4	8.3	8.4	8.3	8.3
Cond. (µS/cm)	305	307		308		301		300		305		306	
Initials	K	K		EMM		K		K		K		K	

100 Concentration ③ ON-MCI	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.0	10.3	10.2	10.1	10.1	10.2	10.2	10.3	9.9	9.9	9.9	9.8	9.6
pH	8.1	8.3	8.2	8.2	8.1	8.0	8.2	8.0	8.4	8.3	8.4	8.2	8.3
Cond. (µS/cm)	288	292		290		287		285		291		290	
Initials	K	K		EMM		K		K		K		K	

Thermometer: GER-9    DO meter: DO-2/3    pH meter: PH-3    Conductivity meter: CL/3

	Control	FRUFP1	GH-ER2	ON-MCI
Hardness*	11	192	160	156
Alkalinity*	10	146	148	144

\* mg/L as CaCO3

Analysts: EMM, K

Reviewed by: JOL

Date reviewed: Nov. 15/17

Sample Description: ①②③: clear, colorless, odourless, some particulates

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: H1092

Start Date & Time: Oct 5 (Tue) 17:00h  
 Stop Date & Time: Nov 3 (Tue) 09:00h  
 Test Species: Oncorhynchus mykiss

% (v/v) 100 Concentration ④ FR-FRCP1	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5	
DO (mg/L)	10.0	10.3	10.2	10.2	10.1	10.2	10.2	10.3	9.9	9.9	9.9	9.8	9.8	
pH	8.4	8.3	8.5	8.5	8.3	8.4	8.4	8.2	8.6	8.3	8.5	8.2	8.3	
Cond. (µS/cm)	1295	1304		1293		1271		1276		1295		1284		
Initials	K	K		EMM		K		K		K		K		

082

100 Concentration ⑤ GH-FR1	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5	
DO (mg/L)	10.0	10.3	10.1	10.2	10.1	10.3	10.2	10.3	10.0	9.9	9.9	9.8	9.6	
pH	8.3	8.3	8.5	8.5	8.2	8.3	8.4	8.2	8.6	8.4	8.6	8.4	8.4	
Cond. (µS/cm)	894	848		852		828		836		861		855		
Initials	K	K		EMM		K		K		K		K		

100 Concentration ⑥ GH-ERC	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5	
DO (mg/L)	10.1	10.3	10.1	10.2	10.1	10.1	10.2	10.3	10.0	10.0	10.0	9.9	9.6	
pH	8.1	8.4	8.4	8.1	8.2	8.1	8.3	8.0	8.5	8.3	8.5	8.2	8.3	
Cond. (µS/cm)	302	331		330		323		325		328		327		
Initials	K	K		EMM		K		K		K		K		

100 Concentration ⑦ EV-HCl	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5	
DO (mg/L)	10.0	10.3	10.1	10.2	10.1	10.3	10.2	10.3	10.0	10.0	9.9	9.9	9.6	
pH	8.2	8.3	8.4	8.2	8.4	8.3	8.4	8.2	8.5	8.4	8.5	8.3	8.4	
Cond. (µS/cm)	710	720		726		700		699		719		714		
Initials	K	K		EMM		K		K		K		K		

Thermometer: CER 9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C-2/3

	Control K	FR-FRCP1 K	GH-FR1 ER1 K	EV-HCl
Hardness*	810	550	184	540
Alkalinity*	252	202	152	190

Analysts: EMM, K  
 Reviewed by: JOB  
 Date reviewed: Nov-15/12

Sample Description: ④⑤⑥⑦: clear, colourless, odourless, some particulates.

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TRC  
 Sample ID: Various (see below)  
 Work Order #: A1092

Start Date & Time: Oct 5 12:00 PM  
 Stop Date & Time: Nov 3 12:00 PM  
 Test Species: Oncorhynchus mykiss

Concentration ⑧ EV-MC2	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.0	10.3	10.1	10.2	10.1	10.3	10.3	10.3	10.0	10.0	9.9	9.8	9.6
pH	8.1	8.4	8.4	8.3	8.4	8.1	8.3	8.0	8.5	8.4	8.5	8.3	8.4
Cond. (µS/cm)	653	631		630		608		607		622		618	
Initials	K	K		EMM		K		K		K		K	

⑩ 10.2  
er

Concentration ⑩ CM-MC2	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.0	10.3	10.1	10.2	10.1	10.3	10.3	10.3	10.0	9.9	9.9	9.8	9.6
pH	8.3	8.4	8.4	8.4	8.4	8.3	8.4	8.2	8.6	8.4	8.6	8.3	8.4
Cond. (µS/cm)	1030	1033		1029		1018		1017		1034		1029	
Initials	K	K		EMM		K		K		K		K	

Concentration ⑪ LC-SS-LLC	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	13.5	14.5	13.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5
DO (mg/L)	10.1	10.3	10.1	10.2	10.1	10.3	10.3	10.3	10.0	9.9	9.9	9.8	9.6
pH	8.2	8.4	8.4	8.4	8.4	8.2	8.4	8.2	8.6	8.4	8.6	8.3	8.4
Cond. (µS/cm)	910	905		909		884		879		904		898	
Initials	K	K		EMM		K		K		K		K	

Concentration	Days												
	init.	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)													
DO (mg/L)													
pH													
Cond. (µS/cm)													
Initials													

Thermometer: CE9 DO meter: DO-2/3 pH meter: pH-3 Conductivity meter: C-2/3

	Control	EV-MC2	CM-MC2	LC-SS-LLC
Hardness*		326	690	660
Alkalinity*		194	208	208

Analysts: EMM, K

Reviewed by: JGU

Date reviewed: Nov. 15/17

Sample Description:

⑧ ⑨ ⑩: Clear, colourless, odourless, some particulates

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TRC  
 Sample ID: various (see below)  
 Work Order #: 171092

Start Date & Time: 04/5/12 1705h  
 Stop Date & Time: 04/30/12 0900h  
 Test Species: Oncorhynchus mykiss

Concentration Control	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	15.0	14.5	15.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.5	14.5
DO (mg/L)	10.1	9.9	9.9	9.8	9.8	9.6	9.8	9.8	9.8	9.9	9.8	9.5	9.8	9.6
pH	6.7	6.7	6.8	6.9	6.9	7.0	6.8	7.0	7.1	6.9	7.1	6.9	7.1	6.9
Cond. (µS/cm)	28		27		27		27		27		26		27	
Initials	K		K		MM		A		K		AWZ/KL		K	

Concentration ① FRUPE1	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	14.5	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	9.9	9.8	9.7	9.5	9.7	9.9	9.9	9.9	9.6	9.5	9.8	9.5
pH	8.5	8.4	8.4	8.5	8.2	8.1	8.1	8.2	8.1	8.2	8.2	8.1	8.2	8.1
Cond. (µS/cm)	365		362		361		364		362		363		366	
Initials	K		K		MM		A		K		AWZ/KL		K	

Concentration ② AH ERL	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	14.5	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	10.1	9.8	9.7	9.3	9.8	9.9	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.4	8.4	8.4	8.4	8.1	8.1	8.2	8.3	8.1	8.1	8.1	8.1	8.2	8.1
Cond. (µS/cm)	308		302		302		304		302		303		305	
Initials	K		K		MM		A		K		AWZ/KL		K	

Concentration ③ CM MCI	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	14.5	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	10.2	9.8	9.9	9.3	9.8	9.8	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.3	8.4	8.2	8.5	8.0	8.1	8.2	8.3	8.0	8.1	8.1	8.1	8.0	8.2
Cond. (µS/cm)	295		292		292		293		292		291		293	
Initials	K		K		MM		A		K		AWZ/KL		K	

Thermometer: CER-9    DO meter: DO-2/3    pH meter: PH-3    Conductivity meter: C-2/3

	Control	FRUPE1	AH ERL	CM MCI
Hardness*	8	150/192	166	154
Alkalinity*	11	192/150	144	146

Analysts: AWZ, YPL, AWZ, KL

Reviewed by: JCB  
 Date reviewed: Nov-15/12

\* mg/L as CaCO3

Sample Description: ②③: clear, colourless, odourless, some particulates

Comments:

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Tek  
 Sample ID: Various (see below)  
 Work Order #: 171097

Start Date & Time: 04/5/14 14:05h  
 Stop Date & Time: Nov 3/14 09:00h  
 Test Species: Oncorhynchus mykiss

Concentration ④ FR-FRCP1	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.8	14.5	15.2	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	10.2	9.8	9.7	9.7	9.8	9.8	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.5	8.6	8.3	8.6	8.1	8.2	8.2	8.3	7.9	8.3	8.0	8.3	8.0	8.2
Cond. (µS/cm)	1366		1280		1283		1272		1290		1272		1277	
Initials	K		K		MM		A		K		K/A/ME		K	

Concentration ⑤ CH-CH-FR1	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	10.2	9.8	9.6	9.7	9.5	9.8	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.5	8.6	8.5	8.6	8.2	8.2	8.2	8.2	8.1	8.2	8.3	8.3	8.3	8.3
Cond. (µS/cm)	1004		1074		902		988		953		984		988	
Initials	K		K		MM		A		K		K/A/ME		K	

Concentration ⑥ CH-ERC	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.9	10.2	9.8	9.8	9.6	9.8	9.8	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.3	8.5	8.3	8.5	8.1	8.1	8.1	8.3	8.0	8.2	8.1	8.2	8.1	8.2
Cond. (µS/cm)	327		323		324		328		323		323		326	
Initials	K		K		MM		A		K		K/A/ME		K	

Concentration ⑦ EV-HCl	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.6	9.8	10.2	9.8	9.9	9.7	9.9	9.7	9.9	9.9	9.5	9.5	9.8	9.5
pH	8.5	8.6	8.5	8.6	8.2	8.2	8.1	8.2	8.1	8.2	8.3	8.2	8.3	8.3
Cond. (µS/cm)	708		708		703		708		710		708		713	
Initials	K		K		MM		A		K		K/A/ME		K	

Thermometer: CER-9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C-2/3

	Control	CH-FR1	CH-ERC	EV-HCl
Hardness*	800	570	178	540
Alkalinity*	230	200	158	190

Analysts: AND, YML, AAR, K  
 Reviewed by: JBL  
 Date reviewed: Nov 15/17

\* mg/L as CaCO3

Sample Description: (④)(⑤)(⑦): clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: OCT 5 / A-E 1705h  
 Stop Date & Time: NOV 3 / A-E 0900h  
 Test Species: Oncorhynchus mykiss

⑧ % (w/v) 100 Concentration EV-MCL	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.7	9.8	10.2	9.9	9.6	9.7	9.9	9.8	9.9	9.9	9.6	9.4	9.8	9.6
pH	8.5	8.5	8.5	8.5	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.3	8.2	8.3
Cond. (µS/cm)	586		585		581		583		587		587		589	
Initials	K		K		MML		A		K		AWZ/K		K	

⑨ 100 Concentration CM-MCL	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.7	9.8	10.2	9.9	9.7	9.8	9.9	9.8	9.9	9.9	9.5	9.4	9.8	9.6
pH	8.5	8.6	8.5	8.6	8.2	8.2	8.2	8.2	8.1	8.3	8.2	8.3	8.2	8.3
Cond. (µS/cm)	1016		1006		1006		1007		1002		1002		1005	
Initials	K		K		MML		A		K		AWZ/K		K	

⑩ 100 Concentration LL-LCDSSLC	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	14.5	14.0	14.0	15.0	14.0	15.0	14.0	15.0	14.5	15.0	15.0	14.0	14.5
DO (mg/L)	9.7	9.8	10.2	9.9	9.7	9.7	9.8	9.7	9.9	9.9	9.5	9.5	9.8	9.7
pH	8.5	8.6	8.5	8.6	8.2	8.2	8.2	8.3	8.1	8.3	8.3	8.3	8.2	8.3
Cond. (µS/cm)	918		907		910		923		908		904		911	
Initials	K		K		MML		A		K		AWZ/K		K	

Concentration	Days													
	7		8		9		10		11		12		13	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: CER-9 DO meter: DO-2 B pH meter: PH-3 Conductivity meter: C-2/B

	Control	EV-MCL	CM-MCL	LL-LCDSSLC
Hardness*		380	600	630
Alkalinity*		192	214	202

Analysts: AWZ, MML, AWZ, K  
 Reviewed by: JGK  
 Date reviewed: Nov. 15/17

\* mg/L as CaCO3

Sample Description: ⑧ ⑨ ⑩: clear, odourless, colourless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: A1092

Start Date & Time: 06/5/12 1705h  
 Stop Date & Time: 10/3/12 0900h  
 Test Species: Oncorhynchus mykiss

Concentration (Control)	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	14.5	14.5	14.5	14.0	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0
DO (mg/L)	10.2	9.5	9.8	9.9	9.4	9.2	9.9	9.7	10.0	9.8	9.6	9.2	9.9	9.8
pH	7.0	7.1	7.0	7.0	7.0	7.0	7.2	7.2	6.9	6.9	6.9	7.1	7.1	7.1
Cond. (µS/cm)	27		29		33		31		30		32		34	
Initials	k		k		k		ML		k		k		k	

Concentration ① FRUPP1	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	14.8	14.0	13.5	14.0	14.0	14.0
DO (mg/L)	9.7	9.5	9.8	9.8	9.2	9.2	9.4	9.8	9.8	9.7	9.1	9.3	9.8	9.8
pH	8.3	8.2	8.1	8.1	8.2	8.1	8.3	8.2	8.3	8.3	8.3	8.3	8.3	8.3
Cond. (µS/cm)	361		360		338		362		362		362		362	
Initials	k		k		k		ML		k		k		k	

Concentration ② CHLER2	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)	9.8	9.5	9.8	9.8	9.2	9.2	9.5	9.7	9.7	9.7	9.0	9.1	9.8	9.8
pH	8.3	8.3	8.0	8.1	8.1	8.1	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
Cond. (µS/cm)	305		303		306		306		307		305		305	
Initials	k		k		k		ML		k		k		k	

Concentration ③ CHMCI1	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)	9.8	9.5	9.9	9.8	9.2	9.2	9.6	9.7	9.7	9.7	9.0	9.1	9.8	9.8
pH	8.1	8.3	7.9	8.1	8.0	8.1	8.2	8.3	8.1	8.3	8.2	8.3	8.4	8.2
Cond. (µS/cm)	292		292		292		293		294		292		291	
Initials	k		k		k		ML		k		k		k	

Thermometer: CER9    DO meter: DO-213    pH meter: PH-3    Conductivity meter: C-213

	Control	FRUPP1	CHLER2	CHMCI1
Hardness*	11	184	158	148
Alkalinity*	10	154	148	146

Analysts: ML, k

Reviewed by: JG  
 Date reviewed: Nov. 15/12

Sample Description: (2)(3) = clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 17002

Start Date & Time: Oct 5 17:00 DOST  
 Stop Date & Time: Nov 3 17:00 0900h  
 Test Species: Oncorhynchus mykiss

Concentration (14) FR-FRCP1	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)	9.8	9.5	10.0	9.9	9.2	9.2	9.7	9.6	9.7	9.7	9.0	9.0	9.8	9.8
pH	8.2	8.3	8.0	8.2	8.0	8.3	8.2	8.3	8.1	8.4	8.1	8.4	8.2	8.4
Cond. (µS/cm)	1371		1373		1375		1372		1368		1363		1345	
Initials	K		K		K		K		K		K		K	

Concentration (5) WH-FR1	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)	9.8	9.5	10.0	9.9	9.2	9.2	9.6	9.8	9.7	9.7	9.0	9.0	9.8	9.8
pH	8.3	8.4	8.1	8.2	8.2	8.2	8.3	8.4	8.3	8.4	8.3	8.4	8.4	8.4
Cond. (µS/cm)	919		915		925		924		924		923		917	
Initials	K		K		K		K		K		K		K	

Concentration (6) WH-ERC	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)	9.8	9.5	10.0	10.0	9.2	9.2	9.7	9.7	9.8	9.7	9.0	9.0	9.8	9.8
pH	8.1	8.3	8.0	8.1	8.0	8.1	8.2	8.3	8.2	8.3	8.3	8.3	8.2	8.3
Cond. (µS/cm)	326		325		318		326		329		323		326	
Initials	K		K		K		K		K		K		K	

Concentration (7) EV-HL1	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)	9.8	9.5	10.0	10.0	9.2	9.2	9.7	9.7	9.7	9.7	9.0	9.0	9.7	9.8
pH	8.2	8.4	8.1	8.2	8.2	8.2	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4
Cond. (µS/cm)	716		717		710		720		722		716		717	
Initials	K		K		K		K		K		K		K	

Thermometer: CER 9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C-2/3

	Control	WH-FR1	WH-ERC	EV-HL1
Hardness*	930	850	178	380
Alkalinity*	222	206	156	202

Analysts: YML, K  
 Reviewed by: JBL  
 Date reviewed: Nov. 15/17

\* mg/L as CaCO3

Sample Description: (4)(6)(7): clear, colourless, odourless, some particulates; (5) clear, slightly yellow, odourless, some particulates

Comments: \_\_\_\_\_



## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 17092

Start Date & Time: Oct 5 / Apr 10:30h  
 Stop Date & Time: Nov 3 / A C 0900h  
 Test Species: Oncorhynchus mykiss

⑧ % (w/v) 100 Concentration EV-MC2	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)	9.7	9.5	10.0	10.0	9.2	9.2	9.6	9.4	9.2	9.7	9.0	9.0	9.8	9.8
pH	8.2	8.3	8.0	8.2	8.1	8.2	8.2	8.3	8.3	8.4	8.3	8.4	8.3	8.4
Cond. (µS/cm)	626		625		622		627		627		626		621	
Initials	K		K		K		MLL		K		K		K	

⑨ WO Concentration CM-MC2	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)	9.7	9.5	10.0	9.9	9.2	9.2	9.4	9.7	9.7	9.7	9.0	9.0	9.7	9.8
pH	8.3	8.4	8.1	8.2	8.1	8.2	8.2	8.3	8.2	8.3	8.2	8.3	8.4	8.4
Cond. (µS/cm)	992		995		1002		991		987		979		985	
Initials	K		K		K		MLL		K		K		K	

⑩ WO Concentration LL-COSSL	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)	9.7	9.5	10.0	9.9	9.2	9.2	9.5	9.6	9.7	9.7	9.0	9.0	9.7	9.8
pH	8.3	8.4	8.1	8.2	8.1	8.3	8.2	8.2	8.3	8.4	8.3	8.4	8.3	8.3
Cond. (µS/cm)	926		925		922		927		928		928		919	
Initials	K		K		K		MLL		K		K		K	

Concentration	Days													
	14		15		16		17		18		19		20	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: CEP 9    DO meter: DO-2/3    pH meter: PH-3    Conductivity meter: C-2/3

	Control <sup>K</sup>	EV-MC2	CM-MC2	LL-COSSL
Hardness*	/	300	580	430
Alkalinity*	/	200	198	198

Analysts: MLL, K

Reviewed by: JGB

Date reviewed: Nov. 15/12

Sample Description: ⑧⑨⑩: clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 17-092

Start Date & Time: Oct 5 / A.E. 1705h  
 Stop Date & Time: Nov 3 / A.E. 0900h  
 Test Species: Oncorhynchus mykiss

% (v/v) Concentration Control	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	10.1	9.6	9.8	9.8	9.8	9.9	9.9	9.9	9.7	9.6	9.8	9.9	10.1	10.0
pH	7.1	7.2	6.8	6.8	7.0	7.1	7.0	7.2	6.6	6.6	7.0	6.7	6.5	6.5
Cond. (µS/cm)	34		34		34		34		36		36		36	
Initials	k		k		A		A		k		k		k	

100 Concentration ① FR-UFPI	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.9	9.6	10.1	9.8	9.9	9.8	9.8	9.8	9.7	9.4	9.9	9.7	9.8	9.9
pH	8.4	8.3	8.2	8.2	8.2	8.1	8.2	8.1	8.3	8.1	8.3	8.2	8.3	8.1
Cond. (µS/cm)	349	322	350		351		350		362		353		354	
Initials	k		k		A		A		k		k		k	

100 Concentration ② ALEPZ	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.9	9.6	10.0	9.8	9.9	9.7	9.8	9.7	9.6	9.3	9.9	9.7	9.8	9.9
pH	8.4	8.3	8.2	8.2	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.2
Cond. (µS/cm)	300	296	301		300		301		304		307		302	
Initials	k		k		A		A		k		k		k	

100 Concentration ③ CM-MCI	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.9	9.6	10.0	9.8	9.9	9.9	9.8	9.6	9.5	9.3	9.9	9.7	9.8	9.9
pH	8.2	8.3	8.2	8.2	8.3	8.2	8.2	8.3	8.1	8.1	8.1	8.4	8.0	8.2
Cond. (µS/cm)	273	243	274		271		280		278		275		275	
Initials	k		k		A		A		k		k		k	

Thermometer: LEP-9    DO meter: DO-2/B    pH meter: PH-3    Conductivity meter: C-1/B

	Control	FR-UFPI	ALEPZ	CM-MCI
Hardness*	12	200	168	148
Alkalinity*	10	148	150	142

Analysts: AJD, HCL

Reviewed by: Joh

Date reviewed: Nov-15/17

\* mg/L as CaCO3

Sample Description: ①②③ = clear, colourless, odourless, some particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: Oct 5 AM 1705h  
 Stop Date & Time: Nov 3/17 0900h  
 Test Species: Oncorhynchus mykiss

Concentration ④ FR-FRCP1	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.9	9.6	10.0	9.8	9.9	9.8	9.9	9.7	9.5	9.3	9.9	9.7	9.8	9.9
pH	8.2	8.4	8.3	8.3	8.3	8.2	8.3	8.3	8.1	8.3	8.1	8.4	8.0	8.3
Cond. (µS/cm)	1245	<del>2730</del>	<del>123</del> 1243		1248		1240		1241		1228		1244	1245 <sup>m</sup>
Initials	K		K		A		A		K		K		K	

Concentration ⑤ GH-FP1	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.9	9.6	10.0	9.8	9.8	9.7	9.9	9.7	9.4	9.3	9.9	9.7	9.8	9.9
pH	8.3	8.4	8.3	8.3	8.3	8.2	8.2	8.3	8.4	8.4	8.4	8.4	8.4	8.3
Cond. (µS/cm)	896	<del>300</del>	897		890		891		897		896		897	<del>1245</del> 882
Initials	K		K		A		A		K		K		K	

Concentration ⑥ GH-ERC	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.8	9.6	10.1	9.8	9.9	9.7	9.8	9.7	9.4	9.3	9.9	9.7	9.8	9.9
pH	8.2	8.4	8.2	8.2	8.3	8.3	8.2	8.3	8.2	8.3	8.3	8.4	8.2	8.1
Cond. (µS/cm)	323	<del>344</del>	323		322		323		326		326		325	
Initials	K		K		A		A		K		K		K	

Concentration ⑦ GH-HCE	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.8	9.7	10.0	9.8	9.8	9.7	9.9	9.7	9.4	9.3	9.8	9.7	9.8	9.9
pH	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.3	8.3
Cond. (µS/cm)		712		715		730		731		724		723		736 733 <sup>m</sup>
Initials	K		K		A		A		K		K		K	

Thermometer: CEP-9 DO meter: DO-213 pH meter: PH-3 Conductivity meter: CL/3

	Control	GH-FP1	GH-ERC	GH-HCE
Hardness*	850	490	188	490
Alkalinity*	206	212	158	202

Analysts: AWD, JL  
 Reviewed by: JL  
 Date reviewed: Nov 15/17

\* mg/L as CaCO3

Sample Description: ④⑤⑥⑦: clear, colorless, odorless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TECK  
 Sample ID: Various (see below)  
 Work Order #: 1710012

Start Date & Time: Oct 5 11:21 1705h  
 Stop Date & Time: Nov 9 11:21 1700h  
 Test Species: Oncorhynchus mykiss

⑧ 200 Concentration EV-MCZ	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.8	9.7	10.0	9.8	9.8	9.7	9.7	9.7	9.4	9.3	9.8	9.7	9.9	9.9	
pH	8.2	8.4	8.3 <sup>10.0</sup>	8.1	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.2 <sup>10.0</sup>	8.3
Cond. (µS/cm)	514		520		525		526		531		530		544 529 <sup>2</sup>		
Initials	K		K		A		A		K		K		K		

⑨ 100 Concentration CM-MCZ	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5	
DO (mg/L)	9.8	9.7	9.8 <sup>10.0</sup>	9.8	9.9	9.8	9.8	9.8	9.5	9.3	9.8	9.7	9.9	9.9	
pH	8.3	8.4	8.2 <sup>10.0</sup>	8.2	8.2	8.4	8.4	8.2	8.4	8.3	8.3	8.3	8.4	8.2	8.3
Cond. (µS/cm)	887		879		882		884		886		881		1039 886 <sup>2</sup>		
Initials	K		K		A		A		K		K		K		

⑩ 100 Concentration LL-COSSICE	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	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.5	15.0	14.5	14.5
DO (mg/L)	9.8	9.8	10.0	9.8	9.9	9.8	9.9	9.7	9.4	9.3	9.8	9.7	9.9	9.9
pH	8.3	8.5	8.2	8.2	8.2	8.3	8.2	8.4	8.3	8.4	8.3	8.4	8.3 <sup>10.0</sup>	8.3
Cond. (µS/cm)	916		918		913		918		919		916		929 916 <sup>2</sup>	
Initials	K		K		A		A		K		K		K	

Concentration	Days													
	21		22		23		24		25		26		27	
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials	K		K		A		A		K		K		K	

Thermometer: CER9    DO meter: DO-2/3    pH meter: PH-3    Conductivity meter: C-2/3

	Control K	EV-MCZ	CM-MCZ	LL-COSSICE
Hardness*	2 <sup>2</sup>	270	590	480
Alkalinity*		174	198	216

Analysts: A.D.M.

Reviewed by: Jon

Date reviewed: Nov. 15/17

\* mg/L as CaCO3

Sample Description: ⑧⑨⑩: clear, colourless, odourless, some particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various Various (see below)  
 Work Order #: 1710912

Start Date & Time: Oct 5/13 07:17 AM  
 Stop Date & Time: Nov 3/13 09:00 AM  
 Test Species: Oncorhynchus mykiss

Concentration Control	Days													
	28		29 Final		30									
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.6	9.8	/	10.2										
pH	6.7	6.6	/	6.9										
Cond. (µS/cm)	36		38											
Initials	u		k											

100 Concentration ① PRUFPI	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.2										
pH	8.3	8.3	/	8.0										
Cond. (µS/cm)	352		359											
Initials	u		u											

100 Concentration ② WHERZ	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.3	/	8.1										
Cond. (µS/cm)	305		310											
Initials	u		u											

100 Concentration ③ CM_MCI	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.1	8.2	/	8.1										
Cond. (µS/cm)	284		287											
Initials	u		u											

Thermometer: CER-9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C2/3

	Control	PRUFPI	WHERZ	CM_MCI
Hardness*	12	180	170	150
Alkalinity*	12	154	152	144

Analysts: u

Reviewed by: John

Date reviewed: Nov. 14/13

\* mg/L as CaCO3

Sample Description: ①②③: clear, colorless, odorless, some particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: TALX  
 Sample ID: Various (See below)  
 Work Order #: 17092

Start Date & Time: outside 1705h  
 Stop Date & Time: Nov 3 11 C 0900h  
 Test Species: Oncorhynchus mykiss

% (v/v) 100 Concentration ④ FR-FRCP1	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.2	/	8.2										
Cond. (µS/cm)	1315		1285											
Initials	K		K											

100 Concentration ⑤ GH-FR1	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.4	/	8.3										
Cond. (µS/cm)	884		892											
Initials	K		K											

100 Concentration ⑥ GH-ERC	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.4	/	8.2										
Cond. (µS/cm)	326		330											
Initials	K		K											

100 Concentration ⑦ EV-HCL	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.0										
pH	8.3	8.4	/	8.4										
Cond. (µS/cm)	735		739											
Initials	K		K											

Thermometer: CER-9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C-2/3

	FR-FRCP1	GH-FR1	GH-ERC	EV-HCL
Hardness*	760	570	200	520
Alkalinity*	226	206	156	208

Analysts: K

Reviewed by: JGK

Date reviewed: Nov. 15/17

\* mg/L as CaCO3

Sample Description: ④⑤⑥⑦: clear, colourless, odourless, some particulates

Comments: \_\_\_\_\_

## Embryo-Alevin Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 11092

Start Date & Time: Oct 5/19 2:00h  
 Stop Date & Time: Nov 3/19 0900h  
 Test Species: Oncorhynchus mykiss

⑧ (LW) 100 Concentration EV-MC2	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.1	8.4	/	8.2										
Cond. (µS/cm)	543		548											
Initials	K		K											

⑨ 100 Concentration CM-MC2	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.3	/	8.2										
Cond. (µS/cm)	K 252-1024		1022											
Initials	K		K											

⑩ 100 Concentration CC-LOSSLCC	Days													
	28		29 Final											
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)	14.0	14.5	/	14.5										
DO (mg/L)	9.8	9.8	/	10.1										
pH	8.2	8.4	/	8.2										
Cond. (µS/cm)	927		936											
Initials	K		K											

Concentration	Days													
	new	old	new	old	new	old	new	old	new	old	new	old	new	old
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Thermometer: DER9 DO meter: DO-2/3 pH meter: PH-3 Conductivity meter: C-2/B

	Control	EV-MC2	CM-MC2	CC-LOSSLCC
Hardness*	/	360	660	610
Alkalinity*	/	180	212	218

Analysts: K  
 Reviewed by: JGH  
 Date reviewed: Nov. 15/19

\* mg/L as CaCO3

Sample Description: ⑧⑨⑩: Clear, colourless, odourless, some particulates.

Comments: \_\_\_\_\_

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tetra  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: Oct 5 (Ae Hosh)  
 Stop Date & Time: Nov 3/17 Oaon  
 Test Species: Oncorhynchus mykiss

Concentration % (w/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	1	0
	3								0	0		0	1	0
	4								0	0		0	1	0
FR-FRPS 100	1								1	1	0	1	1	23
	2								1	1	0	1	1	4
	3								1	0	0	0	0	1
	4								0	0	1	0	2	8
GH-FRPS 100	1				1		1	1	0	0	0	0	0	3
	2				0		1	0	0	0	0	0	1	2
	3				0		1	0	0	0	0	1	2	4
	4				1	0	1	0	1	3	3	5	7	25
GH-MCS 100	1			0	0	0		0	0	0	0	0	0	0
	2			0	0			1	1	0	3	3	0	8
	3			1	1			2	0	1	0	1	1	7
	4			2	0			3	3	3	3	2	1	17
FR-FRPS 100	1			0				0	0	0	0	0	0	0
	2			2				1	1	2	1	0	11	24
	3			1				0	4	5	2	7	10	30
	4			0				0	1	0	2	1	8	12
GH-FRPS 100	1			0				0	0	0	0	0	0	0
	2			0	1			1	2	3	4	2	9	26
	3			0	0			0	0	0	0	1	6	7
	4			1	0			0	0	1	10	2	11	24 15
GH-ERC 100	1			0	0			0	0	0	0	0	0	0
	2			0	1	1		1	0	2	0	1	1	8
	3			0	0	0		0	0	0	2	0	1	4
	4			2	1	1		0	1	0	2	0	4	7
EV-HCS 100	1			0	0	0		0	0	0	0	0	0	0
	2			2	0	1		0	2	0	1	3	1	9
	3			0	0			0	1	1	0	0	0	2
	4			0	0			0	0	1	1	2	6	3
Tech Initials														

Comments: 1/8 at eyed stage

Reviewed by: JGU Date reviewed: Nov-16/17



## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tech  
 Sample ID: Various (see below)  
 Work Order #: 17092

Start Date & Time: Oct 5 12:12 PM  
 Stop Date & Time: Nov 12 09:00 AM  
 Test Species: Oncorhynchus mykiss

Concentration <i>(µM)</i>	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		1	2	3	4	5	6	7	8	9	10	11 <sup>0</sup>	12	
EUM2 100	1	0	0	0	0	3	0	0	1	0	0	0	0	4
	2			1	0	0	1	0	1	0	2	0	5	10
	3			1	1	3	8	8	29					30
	4			6	2	0	1	2	2	1	5	3	1	23
UM2 100	1			2	0	2	0	0	0	0	0	0	0	4
	2			3	1	0	1	0	6	3	4	8	1	27
	3			3	0	1	0	2	6	2	8	7		29
	4			4	1	0	0	1	10	5	4	5	1	30
L-LOSSUE 100	1			0		0		0	0	0	0	0	0	0
	2			3		2		0	0	0	0	0	6	11
	3			0		0		0	0	0	0	0	2	3
	4	↓	↓	1	↓	1	↓	1	1	2	4	9	11	2030
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
Tech Initials		K	EM	K	K	K	K	K	K	MM	A	K	K	K

Comments: Out eyed stage

Reviewed by: Jon Date reviewed: Nov-16/17  
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tecel  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: Oct 5 / A.C. 1705h  
 Stop Date & Time: Nov 3 / A.E. 0900h  
 Test Species: Oncorhynchus mykiss

Concentration % (v/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		13	14	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
	2	0	0	0	0	1	0	1	0	1	3	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	2	0	0	1	0	1	0
PRUFES 100	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	1	0	1	0	3	0	1	1	0	0	0
	3	0	0	0	0	1	0	0	0	0	0	0	0	0
	4	4	13	1	0	2	0	0	0	0	0	0	0	0
ALERC 100	1	0	0	0	0	0	0	0	1	0	0	0	0	0
	2	0	0	2	0	1	0	3	1	3	0	0	0	0
	3	1	0	0	0	1	0	0	1	2	0	0	0	0
	4	4	1	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	1	2	1	5	0	10	0	1	0	0	0	0	0
	3	3	3	8	10	0	0	10	0	0	0	0	0	0
	4	3	2	0	2	1	4	0	0	0	0	1	0	0
PRUFES 100	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	1	2	0	1	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	4	4	4	4	0	0	0	0	0	0	0	0	0
ALERC 100	1	0	0	0	0	0	1	0	0	0	0	0	1	0
	2	3	1	0	0	0	0	0	0	0	0	0	0	0
	3	4	1	3	3	5	6	10	0	0	0	0	0	0
	4	7	4	5	0	0	0	0	0	0	0	0	0	0
ALERC 100	1	0	0	0	0	1	2	0	4	1	0	0	0	0
	2	2	3	2	4	0	3	1	0	1	0	0	0	0
	3	2	0	1	4	1	1	13	5	0	1	0	0	0
	4	2	4	4	2	0	0	0	0	0	0	0	0	0
EXHCE 100	1	0	0	0	0	0	0	0	0	2	0	0	2	0
	2	1	9	1	3	1	2	0	0	0	0	0	0	0
	3	0	0	1	1	1	1	0	0	0	0	0	0	0
	4	6	4	2	2	2	0	0	0	0	0	0	0	0
Tech Initials		K	K	K	K	MLL	K	K	K	K	K	K	K	K

Comments: Start 40 hatch (2) 75% hatched

Reviewed by: JCM

Date reviewed: Nov. 16/17

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Tech  
 Sample ID: Vambus (see below)  
 Work Order #: 171092

Start Date & Time: Oct 5 11:20 1705h  
 Stop Date & Time: Nov 17 09:00h  
 Test Species: Oncorhynchus mykiss

Concentration % (w/v)	Rep	Day of Test - No. of Mortalities												Total Dead Eggs/Embryos/ Alevins
		13	14	15	16	17	18	19	20	21	22	23	24	
EV.MCZ 100	1	0	0	0	0	0	0	0	0	00	10	0	0	1
	2	4	1	6	7	1	0	0	0	0	000	0	0	4+18=19
	3													0
	4	5	0	1	0	0	1							7
AM.MCZ 100	1	0	0	0	0	0	0	0	1	00	00	0	0	1
	2	1	0	0	1									2
	3													0
	4													0
LLC.DSS.MCZ 100	1	0	0	0	0	0	0	0	30	00	0	0	0	3
	2	6	4	0	1	0	00	40	00	0	1	0	0	16
	3	2	1	1	1	2	0	1	200	10	2	0	0	13
	4	2	0	0	0	1								3
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
	1													
	2													
	3													
	4													
Tech Initials		h	h	h	h	h	h	h	h	h	h	h	h	h

Comments: 0 start to hatch @ >50% hatched

Reviewed by: Jon Date reviewed: Nov. 16/17  
 Version 1.1 Issued October 6, 2015 Nautilus Environmental Company Inc.

## Embryo-Alevin Toxicity Test Daily Mortality

Client: Teck  
 Sample ID: Various (see below)  
 Work Order #: 171092

Start Date & Time: 06:15/17e 1705h  
 Stop Date & Time: Nov 17e 17 0900h  
 Test Species: Oncorhynchus mykiss

Concentration % (v/v)	Rep	Day of Test - No. of Mortalities					Total Dead Embryos/Alevins	Total Undeveloped/Unhatched (abnormal)	Total No. Alevins (normal)	Total Exposed Eggs
		25	26	27	28	29				
Control	1	1	0	0	0	0	1	5	24	30
	2	0	0	0	0	0	6	0	24	30
	3	0	0	0	0	0	1	1	27	29
	4	0	0	0	0	0	4	1	23	28
PR FPE1 100	1	0	0	0	0	0	3	1	28	32
	2	0	0	0	0	0	4	0	19	30
	3	0	0	0	0	0	2	0	28	30
	4	0	0	0	0	0	28	0	1	29
GH FPE2 100	1	0	1	0	0	0	5	0	25	30
	2	1	0	1	0	0	14	1	15	30
	3	0	0	0	0	0	9	1	18	28
	4	0	0	0	0	0	30	0	0	30
CM MCI 100	1	0	0	1	0	0	3	0	28	31
	2	0	0	0	0	1	20	2	8	30
	3	0	0	0	0	0	32	0	0	32
	4	0	0	0	0	0	30	0	1	31
PR FPE1 100	1	0	0	0	1	0	2	0	28	30
	2	0	0	0	0	0	28	0	0	28
	3	0	0	0	0	0	30	0	0	30
	4	0	0	0	0	0	28	0	1	29
GH FPE1 100	1	1	1	1	0	0	5	2	22	29
	2	0	0	0	0	0	30	0	0	30
	3	0	0	0	0	0	30	0	0	30
	4	0	0	0	0	0	31	0	0	31
GH FPE2 100	1	0	0	0	0	0	9	1	21	31
	2	0	0	0	0	0	24	1	2	27
	3	0	0	0	0	0	32	0	0	32
	4	0	0	0	0	0	30	0	0	30
GH FPE1 100	1	0	0	0	0	0	7	2	21	30
	2	0	0	0	0	0	26	1	3	30
	3	1	0	0	0	0	20	0	10	30
	4	0	0	0	0	0	28	0	0	28
Tech Initials		K	K	K	K	K	K	K	K	K

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by: Jon

Date reviewed: Nov. 16/17

### Embryo-Alevin Toxicity Test Daily Mortality

Client: TEK  
Sample ID: Various (see below)  
Work Order #: 171092

Start Date & Time: Oct 5/17 @ 11:00h  
Stop Date & Time: Nov 3/17 @ 09:00h  
Test Species: Oncorhynchus mykiss

Concentration % (v/v)	Rep	Day of Test - No. of Mortalities						Total Dead Embryos/ Alevins	Total Undeveloped/ Unhatched (abnormal)	Total No. Alevins (normal)	Total Exposed Eggs
		25	26	27	28	29					
<u>EL-MC2</u> <u>100</u>	1	0	0	0	0	0	5	2	24	31	
	2	0	0	0	0	0	29	1	0	30	
	3	<del>_____</del>						<del>30</del> 29	0	0	30
	4	<del>_____</del>						30	0	0	30
<u>CM-MC2</u> <u>100</u>	1	0	0	0	0	0	5	2	22	29	
	2	<del>_____</del>						29	0	0	29
	3	<del>_____</del>						29	0	0	29
	4	<del>_____</del>						30	0	0	30
<u>CS-LOSSICE</u> <u>100</u>	1	0	0	0	0	0	3	2	24	29	
	2	0	0	0	0	0	27	0	4	31	
	3	0	0	0	0	0	16	0	12	28	
	4	<del>_____</del>						33	0	0	33
	1										
	2										
	3										
	4										
	1										
	2										
	3										
	4										
	1										
	2										
	3										
	4										
	1										
	2										
	3										
	4										
Tech Initials		<u>W</u>	<u>W</u>	<u>W</u>	<u>W</u>	<u>W</u>		<u>W</u>	<u>W</u>	<u>W</u>	<u>W</u>

Comments: \_\_\_\_\_  
\_\_\_\_\_

Reviewed by: Joh

Date reviewed: Nov-16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
November 3

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control A	1	18.0	/			
	2	19.0	/			
	3	19.5	/			
	4	19.0	/			
	5	18.5	/			
	6	18.5	/			
	7	19.5	/			
	8	19.0	/			
	9	19.0	/			
	10	18.0	/			
	11	19.5	/			
	12	19.0	/			
	13	18.5	/			
	14	18.5	/			
	15	18.0	/			
	16	19.0	/			
	17	15.5	/			
	18	19.0	/			
	19	20.0	/			
	20	18.5	/			
	21	18.5	/			
	22	18.5	/			
	23	19.5	/			
	24	19.0	/			
	25	18.0			/	deformed jaw
	26	17.5			/	
	27	18.0			/	
	28	17.0			/	
	29	14.0			/	deformed jaw and yolk sac edema
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.25 g  
 Number of survivors: 29  
 Number of deformed/have difficulty swimming: 5/0  
 Initials: MMK  
 Reviewed by: JLW

Date Reviewed: Nov 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control B	1	17.5	/			
	2	18.5	/			
	3	18.0	/			
	4	18.0	/			
	5	17.0	/			
	6	18.0	/			
	7	17.0	/			
	8	19.5	/			
	9	19.0	/			
	10	18.0	/			
	11	19.5	/			
	12	18.5	/			
	13	19.0	/			
	14	17.5	/			
	15	17.5	/			
	16	18.5	/			
	17	17.0	/			
	18	18.0	/			
	19	17.5	/			
	20	18.0	/			
	21	17.5	/			
	22	18.0	/			
	23	18.0	/			
	24	19.0	/			
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.63 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 0/0  
 Initials: ML/K  
 Reviewed by: JGK

Date Reviewed: Nov-16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: Control  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
Control C	1	17.5	/		
	2	17.5	/		
	3	16.5	/		
	4	18.5	/		
	5	17.5	/		
	6	17.5	/		
	7	18.5	/		
	8	18.0	/		
	9	18.0	/		
	10	18.0	/		
	11	18.0	/		
	12	17.0	/		
	13	17.5	/		
	14	17.5	/		
	15	18.5	/		
	16	18.0	/		
	17	16.5	/		
	18	17.0	/		
	19	18.0	/		
	20	17.0	/		
	21	18.0	/		
	22	18.0	/		
	23	18.0	/		
	24	18.5	/		
	25	19.0	/		
	26	18.0	/		
	27	17.5	/		
	28	15.0			/
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.95 g  
 Number of survivors: 28  
 Number of deformed/have difficulty swimming: 1/1  
 Initials: YML, VE  
 Reviewed by: JGH

Date Reviewed: Nov-16/17



### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: Control  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
Control D	1	17.5	/			
	2	18.0	/			
	3	17.0	/			
	4	17.0	/			
	5	17.5	/			
	6	18.0	/			
	7	17.0	/			
	8	18.0	/			
	9	18.0	/			
	10	18.0	/			
	11	17.0	/			
	12	17.5	/			
	13	18.0	/			
	14	18.5	/			
	15	18.0	/			
	16	19.0	/			
	17	18.5	/			
	18	17.5	/			
	19	17.5	/			
	20	17.0	/			
	21	19.0	/			
	22	18.0	/			
	23	18.0	/			
	24	15.0			/	yolk sac edema, jaw deformity, pale and shortened body
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.74 g  
Number of survivors: 24  
Number of deformed/have difficulty swimming: 1/1  
Initials: MLK  
Reviewed by: JGw

Date Reviewed: Nov-16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
 Sample ID: FR\_UFR1  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 A	1	18.5	/		
	2	18.5	/		
	3	17.5	/		
	4	18.5	/		
	5	20.0	/		
	6	18.0	/		
	7	18.5	/		
	8	19.0	/		
	9	17.5	/		
	10	18.0	/		
	11	17.0	/		
	12	19.0	/		
	13	19.5	/		
	14	18.0	/		
	15	17.5	/		
	16	18.5	/		
	17	18.0	/		
	18	17.5	/		
	19	17.5	/		
	20	18.0	/		
	21	17.0	/		
	22	18.5	/		
	23	19.0	/		
	24	19.0	/		
	25	19.0	/		
	26	18.5	/		
	27	18.0	/		
	28	18.0	/		
	29	17.0	X	/	jaw deformity
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.10 g  
 Number of survivors: 29  
 Number of deformed/have difficulty swimming: 1/0  
 Initials: YML, XL

Reviewed by: JCW

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: FR\_UFR1  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 B	1	16.0	/		
	2	18.0	/		
	3	17.5	/		
	4	17.0	/		
	5	18.5	/		
	6	19.0	/		
	7	16.5	/		
	8	19.0	/		
	9	17.0	/		
	10	18.0	/		
	11	17.0	/		
	12	18.5	/		
	13	18.0	/		
	14	18.0	/		
	15	17.5	/		
	16	17.0	/		
	17	17.0	/		
	18	18.0	/		
	19	17.5	/		
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.18 g  
Number of survivors: 19  
Number of deformed/have difficulty swimming: 0/0  
Initials: YML, K  
Reviewed by: JOU

Date Reviewed: Nov. 16/17

Alevin Test Data Sheet  
Deformities

Client: Teck

Start Date: October 5, 2017

Sample ID: FR\_UFR1

Termination Date: October 3, 2017  
November

Work Order No.: 171092

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 C	1	18.0	/		
	2	18.0	/		
	3	18.5	/		
	4	18.0	/		
	5	18.0	/		
	6	19.0	/		
	7	18.0	/		
	8	18.5	/		
	9	19.5	/		
	10	18.0	/		
	11	18.5	/		
	12	18.5	/		
	13	18.5	/		
	14	19.0	/		
	15	18.5	/		
	16	18.0	/		
	17	19.0	/		
	18	17.0	/		
	19	18.0	/		
	20	19.0	/		
	21	18.0	/		
	22	17.0	/		
	23	18.0	/		
	24	17.5	/		
	25	19.5	/		
	26	19.0	/		
	27	19.5	/		
	28	18.5	/		
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.94 g

Number of survivors: 28

Number of deformed/have difficulty swimming: 0/0

Initials: YU, LL

Reviewed by: JGK

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: FR\_UFR1  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_UFR1 0	1	10.0	/		
	2				
	3				
	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): 0.080 g  
Number of survivors: 1  
Number of deformed/have difficulty swimming: 0/0  
Initials: MLW  
Reviewed by: Joh

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: GH\_ER2  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
GH_ER2 A	1	17.5	/		
	2	19.0	/		
	3	18.2	/		
	4	17.0	/		
	5	18.5	/		
	6	18.5	/		
	7	17.5	/		
	8	18.0	/		
	9	19.5	/		
	10	17.5	/		
	11	18.0	/		
	12	18.0	/		
	13	18.5	/		
	14	18.0	/		
	15	16.0	/		
	16	19.0	/		
	17	19.0	/		
	18	18.0	/		
	19	17.5	/		
	20	19.0	/		
	21	18.5	/		
	22	16.0	/		
	23	18.0	/		
	24	16.0	/		
	25	19.0	/		
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Total Weight (pooled): 1.80 g

Number of survivors: 25

Number of deformed/have difficulty swimming: 0/0

Initials: YHL, VL

Reviewed by: Joh

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: October 5, 2017

Sample ID: GH\_ER2

Termination Date: NOVEMBER 3, 2017

Work Order No.: 171092

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 B	1	20.0	/			
	2	18.0	/			
	3	15.0	/			
	4	15.5	/			
	5	17.0	/			
	6	17.0	/			
	7	19.5	/			
	8	17.5	/			
	9	18.0	/			
	10	17.0	/			
	11	16.0	/			
	12	17.0	/			
	13	18.5	/			
	14	17.0	/			
	15	19.0	/			
	16	12.0			✓	missing tail
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.11 g

Number of survivors: 16

Number of deformed/have difficulty swimming: 1/1

Initials: YH, K

Reviewed by: JGU

Date Reviewed: Nov. 16/17

Alevin Test Data Sheet  
Deformities

Client: Teck  
Sample ID: GH\_ER2  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ER2 C	1	19.0	/			
	2	18.5	/			
	3	17.5	/			
	4	19.0	/			
	5	19.0	/			
	6	18.0	/			
	7	19.0	/			
	8	18.5	/			
	9	18.5	/			
	10	18.0	/			
	11	18.5	/			
	12	20.0	/			
	13	18.5	/			
	14	19.0	/			
	15	17.5	/			
	16	19.0	/			
	17	18.5	/			
	18	19.0	/			
	19	16.0			✓	twisted tail.
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.34 g  
Number of survivors: 19  
Number of deformed/have difficulty swimming: 1/1  
Initials: YH/KU  
Reviewed by: John

Date Reviewed: Nov. 16/17



**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: CM\_MC1  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC1 A	1	17.5	/			
	2	18.5	/			
	3	18.5	/			
	4	16.5	/			
	5	18.5	/			
	6	18.0	/			
	7	18.0	/			
	8	16.5	/			
	9	19.0	/			
	10	17.0	/			
	11	18.0	/			
	12	18.5	/			
	13	17.5	/			
	14	17.0	/			
	15	17.5	/			
	16	16.5	/			
	17	18.2	/			
	18	19.0	/			
	19	18.2	/			
	20	17.5	/			
	21	18.0	/			
	22	17.0	/			
	23	17.0	/			
	24	18.5	/			
	25	18.5	/			
	26	18.0	/			
	27	18.0	/			
	28	17.5	/			
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.05 g  
 Number of survivors: 28  
 Number of deformed/have difficulty swimming: 0/0  
 Initials: YH, M  
 Reviewed by: JGH

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: CM\_MC1  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
CM_MC1 B	1	16.5	—		
	2	17.5	—		
	3	19.0	—		
	4	16.5	—		
	5	19.0	—		
	6	18.0	—		
	7	18.0	—		
	8	17.5	—		
	9	18.0		✓	twisted tail
	10	18.0		✓	kyphosis.
	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): 0.70 g  
 Number of survivors: 10  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: MLK  
 Reviewed by: JGK

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: October 5, 2017

Sample ID: CM\_MC1

Termination Date: October 3, 2017

Work Order No.: 171092

*ASD/MS/CC*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
CM_MC1 D	1	17.5	✓	* Y/L	
	2				
	3				
	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): 0.00 g

Number of survivors: 1

Number of deformed/have difficulty swimming: 0/0

Initials: MLK

Reviewed by: JGH

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: FR\_FRCP1  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
FR_FRCP1 A	1	17.5	/			
	2	18.0	/			
	3	18.0	/			
	4	18.0	/			
	5	18.5	/			
	6	17.0	/			
	7	19.0	/			
	8	17.5	/			
	9	18.5	/			
	10	19.0	/			
	11	19.0	/			
	12	17.0	/			
	13	18.0	/			
	14	18.0	/			
	15	17.0	/			
	16	20.0	/			
	17	17.5	/			
	18	16.5	/			
	19	19.0	/			
	20	17.5	/			
	21	17.5	/			
	22	18.0	/			
	23	18.0	/			
	24	18.0	/			
	25	18.0	/			
	26	18.5	/			
	27	18.0	/			
	28	17.5	/			
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 228 g  
 Number of survivors: 28  
 Number of deformed/have difficulty swimming: 0/0  
 Initials: MLW  
 Reviewed by: JOU

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: FR\_FRCP1  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
FR_FRCP1 0	1	16.5	✓		
	2				
	3				
	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): 0.07 g

Number of survivors: 1

Number of deformed/have difficulty swimming: 0/0

Initials: YUL, W

Reviewed by: JOU

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
 Sample ID: GH\_FR1  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_FR1 A	1	15.5	/			
	2	16.0	/			
	3	16.0	/			
	4	17.0	/			
	5	17.5	/			
	6	17.0	/			
	7	17.0	/			
	8	16.5	/			
	9	16.5	/			
	10	16.0	/			
	11	17.5	/			
	12	16.5	/			
	13	17.0	/			
	14	17.5	/			
	15	15.5	/			
	16	16.0	/			
	17	17.0	/			
	18	16.5	/			
	19	17.5	/			
	20	17.0	/			
	21	16.5	/			
	22	18.0	/			
	23	15.0			✓	yolk sac edema, jaw deformity, pale and shortened body
	24	14.5			✓	
	25					↓ ↓ ↓ ↓ ↓
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.97 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: YH, K  
 Reviewed by: JCh

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: GH\_ERC  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC A	1	16.0	/			
	2	15.5	/			
	3	18.0	/			
	4	17.5	/			
	5	17.7	/			
	6	17.5	/			
	7	18.2	/			
	8	15.5	/			
	9	15.5	/			
	10	17.5	/			
	11	15.0	/			
	12	17.5	/			
	13	16.0	/			
	14	17.0	/			
	15	16.5	/			
	16	15.5	/			
	17	17.0	/			
	18	16.5	/			
	19	16.5	/			
	20	18.0	/			
	21	17.0	/			
	22	17.5			✓	Yolk sac edema
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.57 g  
 Number of survivors: 22  
 Number of deformed/have difficulty swimming: 1/0  
 Initials: YGL/LL  
 Reviewed by: JGK

Date Reviewed: Nov. 16/17

Alevin Test Data Sheet  
Deformities

Client: Teck  
Sample ID: GH\_ERC  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
GH_ERC B	1	16.5	✓			
	2	15.5	✓			
	3	16.0		✓	slight 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): 0.20 g

Number of survivors: 3

Number of deformed/have difficulty swimming: 1/1

Initials: MLK

JOA

Reviewed by: \_\_\_\_\_

Date Reviewed: Nov. 16/17



### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: EV\_HC1  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 A	1	15.5	/			
	2	16.0	/			
	3	16.0	/			
	4	16.0	/			
	5	15.0	/			
	6	16.0	/			
	7	16.0	/			
	8	15.5	/			
	9	16.5	/			
	10	16.0	/			
	11	16.0	/			
	12	16.5	/			
	13	17.0	/			
	14	16.0	/			
	15	16.5	/			
	16	15.0	/			
	17	17.0	/			
	18	17.0	/			
	19	15.0	/			
	20	16.5	/			
	21	14.5	/			
	22	14.0			✓	twisted tail
	23	14.0			✓	spinales
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 1.65 g  
Number of survivors: 23  
Number of deformed/have difficulty swimming: 2/2  
Initials: KL, YL  
Reviewed by: Joh

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: EV\_HC1  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
~~NOVEMBER~~

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_HC1 B	1	17.0	✓			
	2	16.5	✓			
	3	16.0	✓			
	4	15.5		✓	Kyphosis at tail	
	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): 0.23 g

Number of survivors: 4

Number of deformed/have difficulty swimming: 1/1

Initials: KL, YML

Reviewed by: Jbu

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: October 5, 2017

Sample ID: EV\_HC1

Termination Date: October 3, 2017

Work Order No.: 171092

November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
EV_HC1 C	1	165	/		
	2	160	/		
	3	170	/		
	4	160	/		
	5	170	/		
	6	170	/		
	7	180.5	/		
	8	17.0	/		
	9	16.0	/		
	10	175	/		
	11	180			
	12	170			
	13	17.5			
	14	165			
	15	175			
	16	180 w			
	17	180			
	18	190			
	19	180			
	20	170			
	21	160			
	22	175			
	23	180			
	24	175			
	25	170			
	26	160			
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.70 g

Number of survivors: 10

Number of deformed/have difficulty swimming: 0/0

Initials: YML, M

Reviewed by: JOU

Date Reviewed: Nov-16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: EV\_MC2  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
EV_MC2 A	1	180	/			
	2	170	/			
	3	17.5	/			
	4	16.5	/			
	5	17.5	/			
	6	180	/			
	7	180	/			
	8	190	/			
	9	180	/			
	10	180	/			
	11	170	/			
	12	160	/			
	13	17.5	/			
	14	180	/			
	15	17.5	/			
	16	170	/			
	17	160	/			
	18	17.5	/			
	19	15.8	/			
	20	180	/			
	21	17.5	/			
	22	17.0	/			
	23	16.5	/			
	24	18.0	/			
	25	16.5			✓	yolk sac edema, <del>also</del> abnormal jaw
	26	14.5			✓	kyphosis, yolk sac edema
27						
28						
29						
30						
31						
32						
33						
34						
35						

Total Weight (pooled): 198 g  
 Number of survivors: 26  
 Number of deformed/have difficulty swimming: 2/2  
 Initials: YHL, KC  
 Reviewed by: JOK

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck

Start Date: October 5, 2017

Sample ID: EV\_MC2

Termination Date: October 3, 2017

Work Order No.: 171092

*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
EV_MC2 B	1	15.5		✓	jaw deformity
	2				
	3				
	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): 0.07  
0.70 g

Number of survivors: 1

Number of deformed/have difficulty swimming: 1/0

Initials: YML, u

Reviewed by: JON

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: CM\_MC2  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
 NOVEMBER

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
CM_MC2 A	1	20.0	/			
	2	20.0	/			
	3	22.0	/			
	4	21.0	/			
	5	21.5	/			
	6	20.0	/			
	7	19.5	/			
	8	21.0	/			
	9	21.0	/			
	10	20.0	/			
	11	21.0	/			
	12	18.5	/			
	13	20.5	/			
	14	21.0	/			
	15	21.0	/			
	16	21.0	/			
	17	21.0	/			
	18	20.0	/			
	19	20.5	/			
	20	21.5	/			
	21	22.5	/			
	22	21.0	/			
	23	18.0			✓	yolk sac edema and jaw deformity ↓ ↓
	24	16.0			✓	
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					

Total Weight (pooled): 2.20 g  
 Number of survivors: 24  
 Number of deformed/have difficulty swimming: 2/0  
 Initials: YHL, KL  
 Reviewed by: Joh

Date Reviewed: Nov. 16/17

**Alevin Test Data Sheet**  
Deformities

Client: Teck  
 Sample ID: LC\_LCDSSLCC  
 Work Order No.: 171092

Start Date: October 5, 2017  
 Termination Date: October 3, 2017  
*November*

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments
LC_LCDSSLCC A	1	195	/		
	2	190	/		
	3	21.0	/		
	4	205	/		
	5	200	/		
	6	200	/		
	7	180	/		
	8	195	/		
	9	190	/		
	10	185	/		
	11	205	/		
	12	220	/		
	13	200	/		
	14	210	/		
	15	200	/		
	16	195	/		
	17	205	/		
	18	210	/		
	19	210	/		
	20	210	/		
	21	205	/		
	22	210	/		
	23	215	/		
	24	190	/		
	25	170			✓ yolk sac edema
	26	150			✓ 2-headed; one of them had facial deformity.
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				

Total Weight (pooled): 2.32 g

Number of survivors: 26

Number of deformed/have difficulty swimming: 2/1

Initials: ML, LL

Reviewed by: JOU

Date Reviewed: Nov. 16/17

### Alevin Test Data Sheet Deformities

Client: Teck  
Sample ID: LC\_LCDSSLCC  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: October 3, 2017  
November

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC B	1	20.5	✓			
	2	20.5	✓			
	3	20.5	✓			
	4	18.0	✓			
	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): 0.34 g

Number of survivors: 4

Number of deformed/have difficulty swimming: 0%

Initials: MM, K

Reviewed by: Jlu

Date Reviewed: Nov. 16/17



Alevin Test Data Sheet  
Deformities

Client: Teck  
Sample ID: LC\_LCDSSLCC  
Work Order No.: 171092

Start Date: October 5, 2017  
Termination Date: November 3, 2017

Treatment and Replicate	Fish	Length (mm)	Normal	Abnormal	Comments	
LC_LCDSSLCC C	1	190	/			
	2	185	/			
	3	180	/			
	4	195	/			
	5	180	/			
	6	185	/			
	7	195	/			
	8	185	/			
	9	190	/			
	10	200	/			
	11	200	/			
	12	175	/			
	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): 0.99 g

Number of survivors: 12

Number of deformed/have difficulty swimming: 0/0

Initials: YGL/K

Reviewed by: JOK

Date Reviewed: Nov. 16/17

**CETIS Summary Report**

Report Date: 07 Nov-17 19:01 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Batch ID: 18-3391-0204      Test Type: Survival-Development      Analyst: Kania Lywe  
 Start Date: 05 Oct-17 17:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 03 Nov-17 09:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 28d 16h      Source: Vancouver Island Trout Hatchery      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-7028-1525	05 Oct-17	05 Oct-17	17h	Teck Coal	
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C) ✓		
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C) ✓		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C) ✓		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C) ✓		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C) ✓		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C) ✓		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C) ✓		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C) ✓		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C) ✓		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C) ✓		

① FR\_UFR1 and GH\_ER2 and CM\_MC1 are site controls reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

**Proportion Normal Summary (table)**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	4	0.8381	0.7382	0.938	0.8	0.931	0.03138	0.06276	7.49%	0.0%
① FR_UFR1	4	0.619	0	1	0.03448	0.9333	0.2054	0.4108	66.36%	26.14%
① GH_ER2	4	0.494	0	1	0	0.8333	0.1783	0.3565	72.17%	41.05%
① CM_MC1	4	0.3005	0	0.9673	0	0.9032	0.2095	0.419	139.4%	64.14%
FR_FRCP1	4	0.242	0	0.9758	0	0.9333	0.2306	0.4612	190.6%	71.13%
GH_FR1	4	0.1897	0	0.7932	0	0.7586	0.1897	0.3793	200.0%	77.37%
GH_ERC	4	0.1879	0	0.7102	0	0.6774	0.1641	0.3282	174.7%	77.58%
EV_HC1	4	0.2833	0	0.7781	0	0.7	0.1555	0.3109	109.7%	66.19%
EV_MC2	4	0.1935	0	0.8095	0	0.7742	0.1935	0.3871	200.0%	76.91%
CM_MC2	4	0.1897	0	0.7932	0	0.7586	0.1897	0.3793	200.0%	77.37%
LC_LCDSSLCC	4	0.3463	0	0.9313	0	0.8276	0.1838	0.3677	106.2%	58.68%

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	4	0.8973	0.7656	1	0.8	0.9667	0.04138	0.08276	9.22%	0.0%
① FR_UFR1	4	0.6268	0	1	0.03448	0.9333	0.2088	0.4175	66.6%	30.14%
① GH_ER2	4	0.5113	0	1	0	0.8333	0.1811	0.3622	70.84%	43.02%
① CM_MC1	4	0.3172	0	0.9832	0	0.9032	0.2093	0.4185	131.9%	64.65%
FR_FRCP1	4	0.242	0	0.9758	0	0.9333	0.2306	0.4612	190.6%	73.04%
GH_FR1	4	0.2069	0	0.8653	0	0.8276	0.2069	0.4138	200.0%	76.94%
GH_ERC	4	0.2052	0	0.7468	0	0.7097	0.1702	0.3404	165.9%	77.13%
EV_HC1	4	0.3083	0	0.8412	0	0.7667	0.1674	0.3349	108.6%	65.64%
EV_MC2	4	0.218	0	0.8769	0	0.8387	0.207	0.4141	189.9%	75.7%
CM_MC2	4	0.2069	0	0.8653	0	0.8276	0.2069	0.4138	200.0%	76.94%
LC_LCDSSLCC	4	0.3635	0	0.997	0	0.8966	0.1991	0.3981	109.5%	59.49%

**CETIS Summary Report**

Report Date: 07 Nov-17 19:01 (p 2 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

**Proportion Normal Detail (Viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.8	0.8	0.931	0.8214
① FR_UFR1	0.875	0.6333	0.9333	0.03448
① GH_ER2	0.8333	0.5	0.6429	0
① CM_MC1	0.9032	0.2667	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.7586	0	0	0
GH_ERC	0.6774	0.07407	0	0
EV_HC1	0.7	0.1	0.3333	0
EV_MC2	0.7742	0	0	0
CM_MC2	0.7586	0	0	0
LC_LCDSSLCC	0.8276	0.129	0.4286	0

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.9667	0.8	0.9655	0.8571
① FR_UFR1	0.9063	0.6333	0.9333	0.03448
① GH_ER2	0.8333	0.5333	0.6786	0
① CM_MC1	0.9032	0.3333	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.8276	0	0	0
GH_ERC	0.7097	0.1111	0	0
EV_HC1	0.7667	0.1333	0.3333	0
EV_MC2	0.8387	0.03333	0	0
CM_MC2	0.8276	0	0	0
LC_LCDSSLCC	0.8966	0.129	0.4286	0

① FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites

**Proportion Normal Binomials (Viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	24/30	24/30	27/29	23/28
① FR_UFR1	28/32	19/30	28/30	1/29
① GH_ER2	25/30	15/30	18/28	0/30
① CM_MC1	28/31	8/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	22/29	0/30	0/30	0/31
GH_ERC	21/31	2/27	0/32	0/30
EV_HC1	21/30	3/30	10/30	0/28
EV_MC2	24/31	0/30	0/30	0/30
CM_MC2	22/29	0/29	0/29	0/30
LC_LCDSSLCC	24/29	4/31	12/28	0/33

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	29/30	24/30	28/29	24/28
① FR_UFR1	29/32	19/30	28/30	1/29
① GH_ER2	25/30	16/30	19/28	0/30
① CM_MC1	28/31	10/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	24/29	0/30	0/30	0/31
GH_ERC	22/31	3/27	0/32	0/30
EV_HC1	23/30	4/30	10/30	0/28
EV_MC2	26/31	1/30	0/30	0/30
CM_MC2	24/29	0/29	0/29	0/30
LC_LCDSSLCC	26/29	4/31	12/28	0/33

**CETIS Summary Report**

Report Date: 09 Nov-17 17:09 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Batch ID: 04-5732-8336      Test Type: Survival-Development-Growth      Analyst: Kania Lywe  
 Start Date: 05 Oct-17 17:05      Protocol: EC/EPS 1/RM/28      Diluent: Dechlorinated Tap Water  
 Ending Date: 03 Nov-17 09:00      Species: Oncorhynchus mykiss      Brine:  
 Duration: 28d 16h      Source: Vancouver Island Trout Hatchery      Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-7028-1525	05 Oct-17	05 Oct-17	17h	Teck Coal	
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	4	17.96	17.45	18.47	17.69	18.33	0.1598	0.3195	1.78%	0.0%
FR_UFR1	4	18.05	17.54	18.57	17.63	18.38	0.1616	0.3232	1.79%	-0.52%
GH_ER2	3	17.82	16.05	19.59	17.06	18.47	0.4112	0.7122	4.0%	0.77%
CM_MC1	3	17.68	17.28	18.08	17.5	17.8	0.0928	0.1607	0.91%	1.55%
FR_FRCP1	2	17.25	7.72	26.78	16.5	18	0.75	1.061	6.15%	3.97%
GH_FR1	1	16.54			16.54	16.54	0	0	0.0%	7.92%
GH_ERC	2	16.38	11.61	21.14	16	16.75	0.375	0.5303	3.24%	8.84%
EV_HC1	3	16.2	15.26	17.14	15.8	16.55	0.2179	0.3775	2.33%	9.81%
EV_MC2	2	16.35	5.491	27.22	15.5	17.21	0.855	1.209	7.39%	8.95%
CM_MC2	1	20.31			20.31	20.31	0	0	0.0%	-13.07%
LC_LCDSSLCC	3	19.51	18.04	20.98	18.83	19.88	0.342	0.5923	3.04%	-8.63%

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control	4	71.91	65.18	78.64	67.92	77.59	2.115	4.229	5.88%	0.0%
FR_UFR1	4	70.95	59.15	82.75	62.11	80	3.709	7.417	10.45%	1.34%
GH_ER2	3	70.63	67.37	73.9	69.38	72	0.7597	1.316	1.86%	1.78%
CM_MC1	3	74.4	61.72	87.09	70	80	2.947	5.105	6.86%	-3.47%
FR_FRCP1	2	75.71	3.107	148.3	70	81.43	5.714	8.081	10.67%	-5.29%
GH_FR1	1	77.92			77.92	77.92	0	0	0.0%	-8.35%
GH_ERC	2	69.02	39.17	98.86	66.67	71.36	2.348	3.321	4.81%	4.03%
EV_HC1	3	66.41	47.12	85.71	57.5	71.74	4.485	7.768	11.7%	7.65%
EV_MC2	2	73.08	33.98	112.2	70	76.15	3.077	4.351	5.96%	-1.62%
CM_MC2	1	91.67			91.67	91.67	0	0	0.0%	-27.47%
LC_LCDSSLCC	3	85.58	77.13	94.03	82.5	89.23	1.964	3.402	3.98%	-19.0%

**CETIS Summary Report**

Report Date: 09 Nov-17 17:09 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

**Length-mm Detail**

Sample Code	Rep 1	② Rep 2	① Rep 3	① Rep 4
Control	18.33	18.13	17.7	17.69
① FR_UFR1	18.21	17.63	18.38	18
① GH_ER2	17.94	17.06	18.47	
① CM_MC1	17.75	17.8	17.5	
FR_FRCP1	18	16.5		
GH_FR1	16.54			
GH_ERC	16.75	16		
EV_HC1	15.8	16.25	16.55	
EV_MC2	17.21	15.5		
CM_MC2	20.31			
LC_LCDSSLCC	19.83	19.88	18.83	

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	② Rep 2	② Rep 3	② Rep 4
Control	77.59	67.92	69.64	72.5
① FR_UFR1	72.41	62.11	69.29	80
① GH_ER2	72	69.38	70.53	
① CM_MC1	73.21	70	80	
FR_FRCP1	81.43	70		
GH_FR1	77.92			
GH_ERC	71.36	66.67		
EV_HC1	71.74	57.5	70	
EV_MC2	76.15	70		
CM_MC2	91.67			
LC_LCDSSLCC	89.23	85	82.5	

② Empty data fields implies imply data is omitted from analysis as there is no survival.

**CETIS Analytical Report**

Report Date: 07 Nov-17 19:01 (p 1 of 3)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 08-4502-8951	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 07 Nov-17 18:57	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-3391-0204	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-7028-1525	05 Oct-17	05 Oct-17	17h	Teck Coal	
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① If FR\_UFR1, GH\_ER2, CM\_MC1 are site controls reference

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1.314E-06	<0.0001	Exact	Significant Effect
Control	① GH_ER2	0	<0.0001	Exact	Significant Effect
Control	① CM_MC1	0	<0.0001	Exact	Significant Effect
Control	FR_FRCP1	0	<0.0001	Exact	Significant Effect
Control	GH_FR1	0	<0.0001	Exact	Significant Effect
Control	GH_ERC	0	<0.0001	Exact	Significant Effect
Control	EV_HC1	0	<0.0001	Exact	Significant Effect
Control	EV_MC2	0	<0.0001	Exact	Significant Effect
Control	CM_MC2	0	<0.0001	Exact	Significant Effect
Control	LC_LCDSSLCC	0	<0.0001	Exact	Significant Effect

**CETIS Analytical Report**

Report Date: 07 Nov-17 19:01 (p 2 of 3)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 08-4502-8951      Endpoint: Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 07 Nov-17 18:57      Analysis: STP 2x2 Contingency Tables      Official Results: Yes

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	105	12	117	0.8974	0.1026	0.0%
FR_UFR1	77	44	121	0.6364	0.3636	29.09%
GH_ER2	60	58	118	0.5085	0.4915	43.34%
CM_MC1	39	85	124	0.3145	0.6855	64.95%
FR_FRCP1	29	88	117	0.2479	0.7521	72.38%
GH_FR1	24	96	120	0.2	0.8	77.71%
GH_ERC	25	95	120	0.2083	0.7917	76.79%
EV_HC1	37	81	118	0.3136	0.6864	65.06%
EV_MC2	27	94	121	0.2231	0.7769	75.14%
CM_MC2	24	93	117	0.2051	0.7949	77.14%
LC_LCDSSLCC	42	79	121	0.3471	0.6529	61.32%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.9667	0.8	0.9655	0.8571
FR_UFR1	0.9063	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5333	0.6786	0
CM_MC1	0.9032	0.3333	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.8276	0	0	0
GH_ERC	0.7097	0.1111	0	0
EV_HC1	0.7667	0.1333	0.3333	0
EV_MC2	0.8387	0.03333	0	0
CM_MC2	0.8276	0	0	0
LC_LCDSSLCC	0.8966	0.129	0.4286	0

*FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites*

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	29/30	24/30	28/29	24/28
FR_UFR1	29/32	19/30	28/30	1/29
GH_ER2	25/30	16/30	19/28	0/30
CM_MC1	28/31	10/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	24/29	0/30	0/30	0/31
GH_ERC	22/31	3/27	0/32	0/30
EV_HC1	23/30	4/30	10/30	0/28
EV_MC2	26/31	1/30	0/30	0/30
CM_MC2	24/29	0/29	0/29	0/30
LC_LCDSSLCC	26/29	4/31	12/28	0/33

Salmonid Embryo-Alevin Survival and Development Test

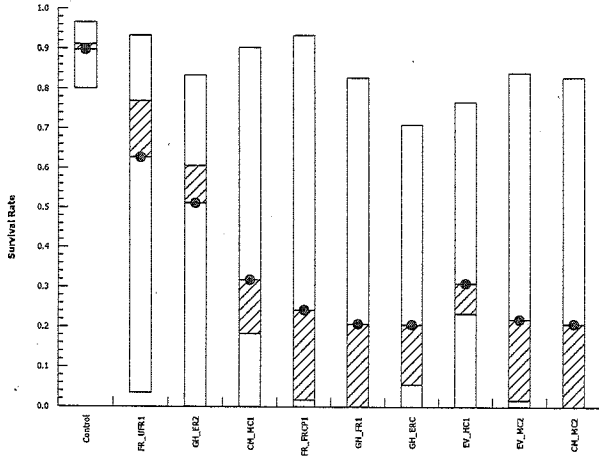
Nautilus Environmental

Analysis ID: 08-4502-8951  
Analyzed: 07 Nov-17 18:57

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics





**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test** Nautilus Environmental

<b>Analysis ID:</b> 09-8795-3492	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 07 Nov-17 18:58	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-3391-0204	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*①FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	0.03079	0.0308	Exact	Significant Effect
FR_UFR1		① CM_MC1	3.59E-07	<0.0001	Exact	Significant Effect
FR_UFR1		FR_FRCP1	0	<0.0001	Exact	Significant Effect
FR_UFR1		GH_FR1	0	<0.0001	Exact	Significant Effect
FR_UFR1		GH_ERC	0	<0.0001	Exact	Significant Effect
FR_UFR1		EV_HC1	4.631E-07	<0.0001	Exact	Significant Effect
FR_UFR1		EV_MC2	0	<0.0001	Exact	Significant Effect
FR_UFR1		CM_MC2	0	<0.0001	Exact	Significant Effect
FR_UFR1		LC_LCDSSLCC	5.416E-06	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	77	44	121	0.6364	0.3636	0.0%
① GH_ER2	60	58	118	0.5085	0.4915	20.1%
① CM_MC1	39	85	124	0.3145	0.6855	50.58%
FR_FRCP1	29	88	117	0.2479	0.7521	61.05%
GH_FR1	24	96	120	0.2	0.8	68.57%
GH_ERC	25	95	120	0.2083	0.7917	67.26%
EV_HC1	37	81	118	0.3136	0.6864	50.73%
EV_MC2	27	94	121	0.2231	0.7769	64.94%
CM_MC2	24	93	117	0.2051	0.7949	67.77%
LC_LCDSSLCC	42	79	121	0.3471	0.6529	45.45%

**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 2 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 09-8795-3492      Endpoint: Survival Rate  
 Analyzed: 07 Nov-17 18:58      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Survival Rate Detail**

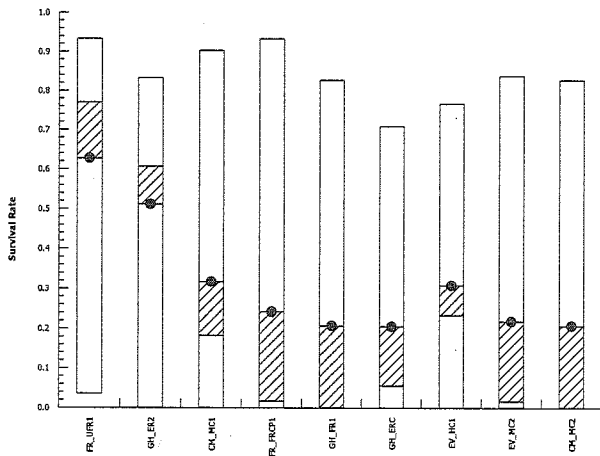
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9063	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5333	0.6786	0
CM_MC1	0.9032	0.3333	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.8276	0	0	0
GH_ERC	0.7097	0.1111	0	0
EV_HC1	0.7667	0.1333	0.3333	0
EV_MC2	0.8387	0.03333	0	0
CM_MC2	0.8276	0	0	0
LC_LCDSSLCC	0.8966	0.129	0.4286	0

*FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites.*

**Survival Rate Binomials**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	29/32	19/30	28/30	1/29
GH_ER2	25/30	16/30	19/28	0/30
CM_MC1	28/31	10/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	24/29	0/30	0/30	0/31
GH_ERC	22/31	3/27	0/32	0/30
EV_HC1	23/30	4/30	10/30	0/28
EV_MC2	26/31	1/30	0/30	0/30
CM_MC2	24/29	0/29	0/29	0/30
LC_LCDSSLCC	26/29	4/31	12/28	0/33

**Graphics**



**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 17-6602-8616	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 07 Nov-17 19:01	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-3391-0204	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1	1.0000	Exact	Non-Significant Effect
GH_ER2	① CM_MC1	0.00162	0.0065	Exact	Significant Effect
GH_ER2	FR_FRCP1	3.017E-05	0.0002	Exact	Significant Effect
GH_ER2	GH_FR1	4.881E-07	<0.0001	Exact	Significant Effect
GH_ER2	GH_ERC	1.051E-06	<0.0001	Exact	Significant Effect
GH_ER2	EV_HC1	0.001753	0.0053	Exact	Significant Effect
GH_ER2	EV_MC2	3.623E-06	<0.0001	Exact	Significant Effect
GH_ER2	CM_MC2	9.316E-07	<0.0001	Exact	Significant Effect
GH_ER2	LC_LCDSSLCC	0.008315	0.0166	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1	77	44	121	0.6364	0.3636	-25.15%
① GH_ER2	Receiving Wate 60	58	118	0.5085	0.4915	0.0%
① CM_MC1	39	85	124	0.3145	0.6855	38.15%
FR_FRCP1	29	88	117	0.2479	0.7521	51.25%
GH_FR1	24	96	120	0.2	0.8	60.67%
GH_ERC	25	95	120	0.2083	0.7917	59.03%
EV_HC1	37	81	118	0.3136	0.6864	38.33%
EV_MC2	27	94	121	0.2231	0.7769	56.12%
CM_MC2	24	93	117	0.2051	0.7949	59.66%
LC_LCDSSLCC	42	79	121	0.3471	0.6529	31.74%

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 17-6602-8616  
Analyzed: 07 Nov-17 19:01

Endpoint: Survival Rate  
Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Survival Rate Detail

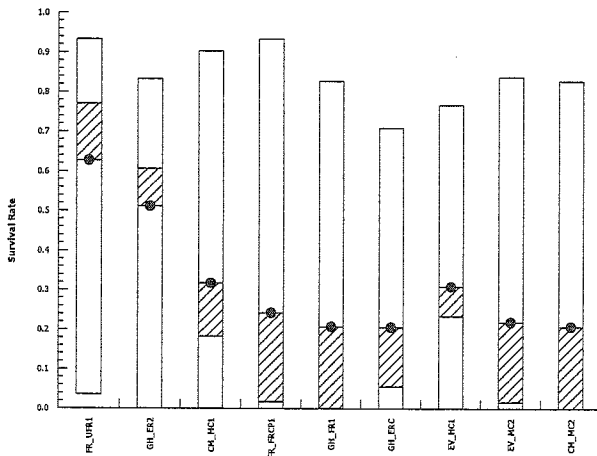
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.9063	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5333	0.6786	0
CM_MC1	0.9032	0.3333	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.8276	0	0	0
GH_ERC	0.7097	0.1111	0	0
EV_HC1	0.7667	0.1333	0.3333	0
EV_MC2	0.8387	0.03333	0	0
CM_MC2	0.8276	0	0	0
LC_LCDSSLCC	0.8966	0.129	0.4286	0

FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites.

Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	29/32	19/30	28/30	1/29
GH_ER2	25/30	16/30	19/28	0/30
CM_MC1	28/31	10/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	24/29	0/30	0/30	0/31
GH_ERC	22/31	3/27	0/32	0/30
EV_HC1	23/30	4/30	10/30	0/28
EV_MC2	26/31	1/30	0/30	0/30
CM_MC2	24/29	0/29	0/29	0/30
LC_LCDSSLCC	26/29	4/31	12/28	0/33

Graphics



**CETIS Analytical Report**

Report Date: 10 Nov-17 11:29 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 02-4494-2582	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 10 Nov-17 11:22	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-3391-0204	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites.

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1	1.0000	Exact	Non-Significant Effect
CM_MC1	GH_ER2	1	1.0000	Exact	Non-Significant Effect
CM_MC1	FR_FRCP1	0.1572	0.7862	Exact	Non-Significant Effect
CM_MC1	GH_FR1	0.02859	0.2573	Exact	Non-Significant Effect
CM_MC1	GH_ERC	0.04068	0.2847	Exact	Non-Significant Effect
CM_MC1	EV_HC1	0.5489	1.0000	Exact	Non-Significant Effect
CM_MC1	EV_MC2	0.07088	0.4253	Exact	Non-Significant Effect
CM_MC1	CM_MC2	0.03678	0.2942	Exact	Non-Significant Effect
CM_MC1	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	77	44	121	0.6364	0.3636	-102.3%
GH_ER2	60	58	118	0.5085	0.4915	-61.67%
CM_MC1 Site Control	39	85	124	0.3145	0.6855	0.0%
FR_FRCP1	29	88	117	0.2479	0.7521	21.19%
GH_FR1	24	96	120	0.2	0.8	36.41%
GH_ERC	25	95	120	0.2083	0.7917	33.76%
EV_HC1	37	81	118	0.3136	0.6864	0.3%
EV_MC2	27	94	121	0.2231	0.7769	29.05%
CM_MC2	24	93	117	0.2051	0.7949	34.78%
LC_LCDSSLCC	42	79	121	0.3471	0.6529	-10.36%



**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 1 of 3)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

Nautilus Environmental

Analysis ID: 07-2608-9845	Endpoint: Proportion Normal (viability)	CETIS Version: CETISv1.8.7
Analyzed: 07 Nov-17 18:57	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 18-3391-0204	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-7028-1525	05 Oct-17	05 Oct-17	17h	Teck Coal	
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1, GH\_ER2, CM\_MC1 are site sam reference

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	0.0002055	0.0002	Exact	Significant Effect
Control	① GH_ER2	0	<0.0001	Exact	Significant Effect
Control	① CM_MC1	0	<0.0001	Exact	Significant Effect
Control	FR_FRCP1	0	<0.0001	Exact	Significant Effect
Control	GH_FR1	0	<0.0001	Exact	Significant Effect
Control	GH_ERC	0	<0.0001	Exact	Significant Effect
Control	EV_HC1	0	<0.0001	Exact	Significant Effect
Control	EV_MC2	0	<0.0001	Exact	Significant Effect
Control	CM_MC2	0	<0.0001	Exact	Significant Effect
Control	LC_LCDSSLCC	0	<0.0001	Exact	Significant Effect

**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 2 of 3)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 07-2608-9845      Endpoint: Proportion Normal (viability)  
 Analyzed: 07 Nov-17 18:57      Analysis: STP 2x2 Contingency Tables      CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Negative Contr	98	19	117	0.8376	0.1624	0.0%
① FR_UFR1	76	45	121	0.6281	0.3719	25.01%
① GH_ER2	58	60	118	0.4915	0.5085	41.32%
① CM_MC1	37	87	124	0.2984	0.7016	64.38%
FR_FRCP1	29	88	117	0.2479	0.7521	70.41%
GH_FR1	22	98	120	0.1833	0.8167	78.11%
GH_ERC	23	97	120	0.1917	0.8083	77.12%
EV_HC1	34	84	118	0.2881	0.7119	65.6%
EV_MC2	24	97	121	0.1983	0.8017	76.32%
CM_MC2	22	95	117	0.188	0.812	77.55%
LC_LCDSSLCC	40	81	121	0.3306	0.6694	60.53%

① FR\_UFR1, and GH\_ER2, CM\_MC1 are reference sites

**Proportion Normal Detail (viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	0.8	0.8	0.931	0.8214
① FR_UFR1	0.875	0.6333	0.9333	0.03448
① GH_ER2	0.8333	0.5	0.6429	0
① CM_MC1	0.9032	0.2667	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.7586	0	0	0
GH_ERC	0.6774	0.07407	0	0
EV_HC1	0.7	0.1	0.3333	0
EV_MC2	0.7742	0	0	0
CM_MC2	0.7586	0	0	0
LC_LCDSSLCC	0.8276	0.129	0.4286	0

**Proportion Normal Binomials (viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
Control	24/30	24/30	27/29	23/28
① FR_UFR1	28/32	19/30	28/30	1/29
① GH_ER2	25/30	15/30	18/28	0/30
① CM_MC1	28/31	8/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	22/29	0/30	0/30	0/31
GH_ERC	21/31	2/27	0/32	0/30
EV_HC1	21/30	3/30	10/30	0/28
EV_MC2	24/31	0/30	0/30	0/30
CM_MC2	22/29	0/29	0/29	0/30
LC_LCDSSLCC	24/29	4/31	12/28	0/33



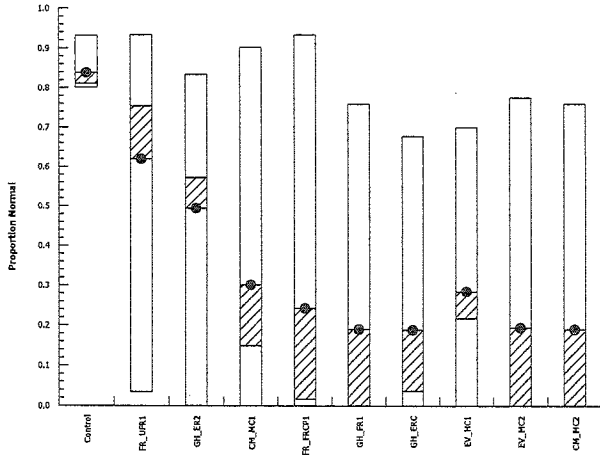
Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 07-2608-9845      Endpoint: Proportion Normal (Weakly)  
Analyzed: 07 Nov-17 18:57      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 21-0952-7243      Endpoint: Proportion Normal (Viability)  
 Analyzed: 07 Nov-17 18:58      Analysis: STP 2x2 Contingency Tables      CETIS Version: CETISv1.8.7  
 Batch ID: 18-3391-0204      Test Type: Survival-Development      Official Results: Yes  
 Start Date: 05 Oct-17 17:05      Protocol: EC/EPS 1/RM/28      Analyst: Kania Lywe  
 Ending Date: 03 Nov-17 09:00      Species: Oncorhynchus mykiss      Diluent: Dechlorinated Tap Water  
 Duration: 28d 16h      Source: Vancouver Island Trout Hatchery      Brine:  
 Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
① GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
① CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1 and GH\_ER2, CM\_MC1 are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
① GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
① CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	0.02283	0.0228	Exact	Significant Effect
FR_UFR1	① CM_MC1	1.776E-07	<0.0001	Exact	Significant Effect
FR_UFR1	FR_FRCP1	0	<0.0001	Exact	Significant Effect
FR_UFR1	GH_FR1	0	<0.0001	Exact	Significant Effect
FR_UFR1	GH_ERC	0	<0.0001	Exact	Significant Effect
FR_UFR1	EV_HC1	0	<0.0001	Exact	Significant Effect
FR_UFR1	EV_MC2	0	<0.0001	Exact	Significant Effect
FR_UFR1	CM_MC2	0	<0.0001	Exact	Significant Effect
FR_UFR1	LC_LCDSSLCC	2.885E-06	<0.0001	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
① FR_UFR1      Upstream Contr	76	45	121	0.6281	0.3719	0.0%
① GH_ER2	58	60	118	0.4915	0.5085	21.74%
① CM_MC1	37	87	124	0.2984	0.7016	52.49%
FR_FRCP1	29	88	117	0.2479	0.7521	60.54%
GH_FR1	22	98	120	0.1833	0.8167	70.81%
GH_ERC	23	97	120	0.1917	0.8083	69.48%
EV_HC1	34	84	118	0.2881	0.7119	54.13%
EV_MC2	24	97	121	0.1983	0.8017	68.42%
CM_MC2	22	95	117	0.188	0.812	70.06%
LC_LCDSSLCC	40	81	121	0.3306	0.6694	47.37%

Salmonid Embryo-Alevin Survival and Development Test

Nautilus Environmental

Analysis ID: 21-0952-7243 Endpoint: Proportion Normal (viability)  
 Analyzed: 07 Nov-17 18:58 Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

Proportion Normal Detail (viability)

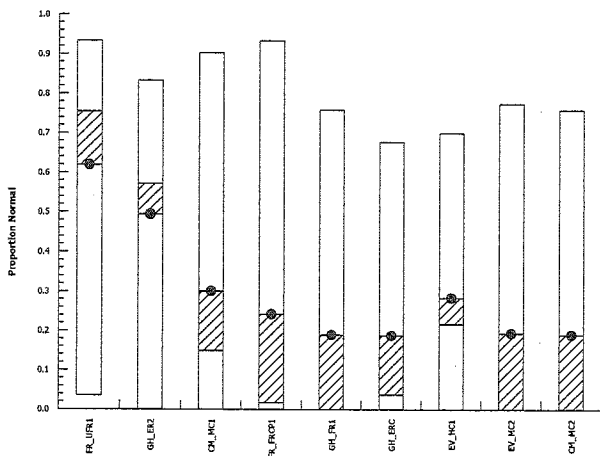
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.875	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5	0.6429	0
CM_MC1	0.9032	0.2667	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.7586	0	0	0
GH_ERC	0.6774	0.07407	0	0
EV_HC1	0.7	0.1	0.3333	0
EV_MC2	0.7742	0	0	0
CM_MC2	0.7586	0	0	0
LC_LCDSSLCC	0.8276	0.129	0.4286	0

FR\_UFR1, GH\_ERC, CM\_MC1 are reference sites

Proportion Normal Binomials (viability)

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/32	19/30	28/30	1/29
GH_ER2	25/30	15/30	18/28	0/30
CM_MC1	28/31	8/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	22/29	0/30	0/30	0/31
GH_ERC	21/31	2/27	0/32	0/30
EV_HC1	21/30	3/30	10/30	0/28
EV_MC2	24/31	0/30	0/30	0/30
CM_MC2	22/29	0/29	0/29	0/30
LC_LCDSSLCC	24/29	4/31	12/28	0/33

Graphics



**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

<b>Analysis ID:</b> 10-9049-0294	<b>Endpoint:</b> Proportion Normal (w/abn)	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 07 Nov-17 19:01	<b>Analysis:</b> STP 2x2 Contingency Tables	<b>Official Results:</b> Yes
<b>Batch ID:</b> 18-3391-0204	<b>Test Type:</b> Survival-Development	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		① FR_UFR1, and GH_ER2, on MCL are reference sites
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	0.001582	0.0047	Exact	Significant Effect
GH_ER2	FR_FRCP1	8.626E-05	0.0004	Exact	Significant Effect
GH_ER2	GH_FR1	3.629E-07	<0.0001	Exact	Significant Effect
GH_ER2	GH_ERC	8.052E-07	<0.0001	Exact	Significant Effect
GH_ER2	EV_HC1	0.001032	0.0041	Exact	Significant Effect
GH_ER2	EV_MC2	1.411E-06	<0.0001	Exact	Significant Effect
GH_ER2	CM_MC2	6.819E-07	<0.0001	Exact	Significant Effect
GH_ER2	LC_LCDSSLCC	0.008158	0.0163	Exact	Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	76	45	121	0.6281	0.3719	-27.79%
GH_ER2	58	60	118	0.4915	0.5085	0.0%
CM_MC1	37	87	124	0.2984	0.7016	39.29%
FR_FRCP1	29	88	117	0.2479	0.7521	49.57%
GH_FR1	22	98	120	0.1833	0.8167	62.7%
GH_ERC	23	97	120	0.1917	0.8083	61.01%
EV_HC1	34	84	118	0.2881	0.7119	41.38%
EV_MC2	24	97	121	0.1983	0.8017	59.65%
CM_MC2	22	95	117	0.188	0.812	61.74%
LC_LCDSSLCC	40	81	121	0.3306	0.6694	32.74%

**CETIS Analytical Report**

Report Date: 07 Nov-17 19:02 (p 2 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 10-9049-0294      Endpoint: Proportion Normal (viability)  
 Analyzed: 07 Nov-17 19:01      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Proportion Normal Detail (viability)**

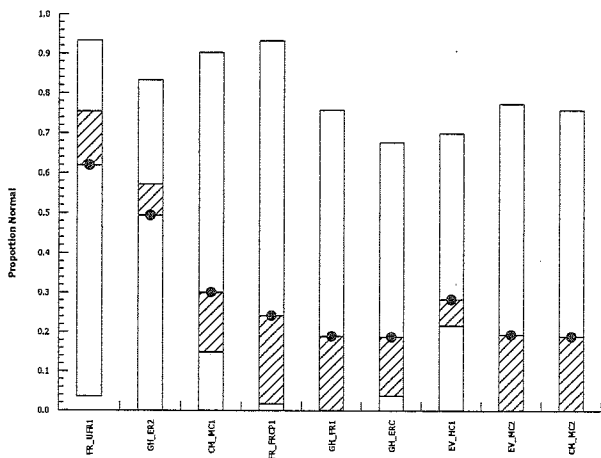
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.875	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5	0.6429	0
CM_MC1	0.9032	0.2667	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.7586	0	0	0
GH_ERC	0.6774	0.07407	0	0
EV_HC1	0.7	0.1	0.3333	0
EV_MC2	0.7742	0	0	0
CM_MC2	0.7586	0	0	0
LC_LCDSSLCC	0.8276	0.129	0.4286	0

FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites

**Proportion Normal Binomials (viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/32	19/30	28/30	1/29
GH_ER2	25/30	15/30	18/28	0/30
CM_MC1	28/31	8/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	22/29	0/30	0/30	0/31
GH_ERC	21/31	2/27	0/32	0/30
EV_HC1	21/30	3/30	10/30	0/28
EV_MC2	24/31	0/30	0/30	0/30
CM_MC2	22/29	0/29	0/29	0/30
LC_LCDSSLCC	24/29	4/31	12/28	0/33

**Graphics**



**CETIS Analytical Report**

Report Date: 10 Nov-17 11:29 (p 1 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 09-5103-7248	Endpoint: Proportion Normal (Waikiki)	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 11:22	Analysis: STP 2x2 Contingency Tables	Official Results: Yes
Batch ID: 18-3391-0204	Test Type: Survival-Development	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

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	1	1.0000	Exact	Non-Significant Effect
CM_MC1	GH_ER2	1	1.0000	Exact	Non-Significant Effect
CM_MC1	FR_FRCP1	0.2315	1.0000	Exact	Non-Significant Effect
CM_MC1	GH_FR1	0.02531	0.2278	Exact	Non-Significant Effect
CM_MC1	GH_ERC	0.03666	0.2566	Exact	Non-Significant Effect
CM_MC1	EV_HC1	0.4867	1.0000	Exact	Non-Significant Effect
CM_MC1	EV_MC2	0.0479	0.2874	Exact	Non-Significant Effect
CM_MC1	CM_MC2	0.03238	0.2590	Exact	Non-Significant Effect
CM_MC1	LC_LCDSSLCC	1	1.0000	Exact	Non-Significant Effect

**Data Summary**

Sample Code	NR	R	NR + R	Prop NR	Prop R	%Effect
FR_UFR1	76	45	121	0.6281	0.3719	-110.5%
GH_ER2	58	60	118	0.4915	0.5085	-64.73%
CM_MC1 Site Control	37	87	124	0.2984	0.7016	0.0%
FR_FRCP1	29	88	117	0.2479	0.7521	16.93%
GH_FR1	22	98	120	0.1833	0.8167	38.56%
GH_ERC	23	97	120	0.1917	0.8083	35.77%
EV_HC1	34	84	118	0.2881	0.7119	3.44%
EV_MC2	24	97	121	0.1983	0.8017	33.53%
CM_MC2	22	95	117	0.188	0.812	36.98%
LC_LCDSSLCC	40	81	121	0.3306	0.6694	-10.79%

**CETIS Analytical Report**

Report Date: 10 Nov-17 11:29 (p 2 of 2)  
 Test Code: 171092a | 12-7381-2559

**Salmonid Embryo-Alevin Survival and Development Test**

**Nautilus Environmental**

Analysis ID: 09-5103-7248      Endpoint: Proportion Normal (viability)  
 Analyzed: 10 Nov-17 11:22      Analysis: STP 2x2 Contingency Tables

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Proportion Normal Detail (viability)**

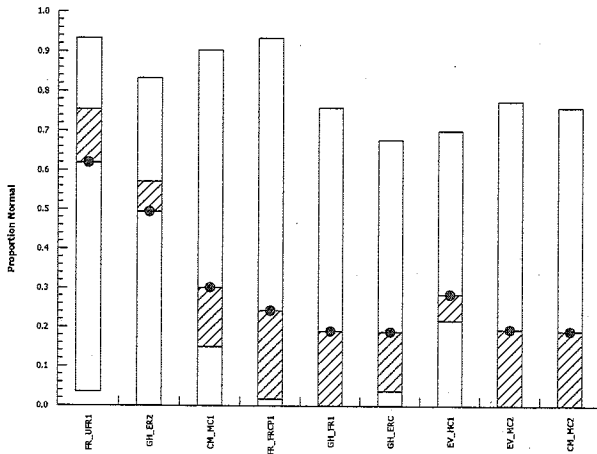
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	0.875	0.6333	0.9333	0.03448
GH_ER2	0.8333	0.5	0.6429	0
CM_MC1	0.9032	0.2667	0	0.03226
FR_FRCP1	0.9333	0	0	0.03448
GH_FR1	0.7586	0	0	0
GH_ERC	0.6774	0.07407	0	0
EV_HC1	0.7	0.1	0.3333	0
EV_MC2	0.7742	0	0	0
CM_MC2	0.7586	0	0	0
LC_LCDSSLCC	0.8276	0.129	0.4286	0

FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites.

**Proportion Normal Binomials (viability)**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	28/32	19/30	28/30	1/29
GH_ER2	25/30	15/30	18/28	0/30
CM_MC1	28/31	8/30	0/32	1/31
FR_FRCP1	28/30	0/28	0/30	1/29
GH_FR1	22/29	0/30	0/30	0/31
GH_ERC	21/31	2/27	0/32	0/30
EV_HC1	21/30	3/30	10/30	0/28
EV_MC2	24/31	0/30	0/30	0/30
CM_MC2	22/29	0/29	0/29	0/30
LC_LCDSSLCC	24/29	4/31	12/28	0/33

**Graphics**



CETIS Analytical Report

Report Date: 09 Nov-17 17:09 (p 1 of 3)
Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 03-0079-6437 Endpoint: Length-mm CETIS Version: CETISv1.8.7
Analyzed: 09 Nov-17 17:03 Analysis: Nonparametric-Control vs Treatments Official Results: Yes
Batch ID: 04-5732-8336 Test Type: Survival-Development-Growth Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05 Protocol: EC/EPS 1/RM/28 Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00 Species: Oncorhynchus mykiss Brine:
Duration: 28d 16h Source: Vancouver Island Trout Hatchery Age:

Table with 7 columns: Sample Code, Sample ID, Sample Date, Receive Date, Sample Age, Client Name, Project. Rows include Control, FR\_UFR1, GH\_ER2, CM\_MC1, FR\_FRCP1, GH\_FR1, GH\_ERC, EV\_HC1, EV\_MC2, CM\_MC2, LC\_LCDSSLCC.

Handwritten note: FR\_UFR1 and GH\_ER2, CM\_MC1 are reference sites

Table with 6 columns: Sample Code, Material Type, Sample Source, Station Location, Latitude, Longitude. Rows include Control, FR\_UFR1, GH\_ER2, CM\_MC1, FR\_FRCP1, GH\_FR1, GH\_ERC, EV\_HC1, EV\_MC2, CM\_MC2, LC\_LCDSSLCC.

Table with 6 columns: Data Transform, Zeta, Alt Hyp, Trials, Seed, Test Result. Row: Untransformed, NA, C > T, NA, NA.

Dunn/Bonferroni-Holm Test

Table with 10 columns: Sample Code vs, Sample Code, Test Stat, Critical, MSD, DF, P-Value, P-Type, Decision(alpha:5%). Rows compare Control to FR\_UFR1, GH\_ER2, CM\_MC1, FR\_FRCP1, GH\_FR1, GH\_ERC, EV\_HC1, EV\_MC2, CM\_MC2, LC\_LCDSSLCC.



**CETIS Analytical Report**

Report Date: 09 Nov-17 17:09 (p 2 of 3)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 03-0079-6437      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 09 Nov-17 17:03      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	33.09259	3.309259	10	10.15	<0.0001	Significant Effect
Error	5.540671	0.3259218	17			
Total	38.63326		27			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	4.899	3.593	0.0021	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9686	0.8975	0.5438	Normal Distribution

**Length-mm Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control	4	17.96	17.45	18.47	17.92	17.69	18.33	0.1598	1.78%	0.0%
① FR_UFR1	4	18.05	17.54	18.57	18.1	17.63	18.38	0.1616	1.79%	-0.52%
① GH_ER2	3	17.82	16.05	19.59	17.94	17.06	18.47	0.4112	4.0%	0.77%
① CM_MC1	3	17.68	17.28	18.08	17.75	17.5	17.8	0.09279	0.91%	1.55%
FR_FRCP1	2	17.25	7.72	26.78	17.25	16.5	18	0.75	6.15%	3.97%
GH_FR1	1	16.54			16.54	16.54	16.54	0	0.0%	7.92%
GH_ERC	2	16.38	11.61	21.14	16.38	16	16.75	0.375	3.24%	8.84%
EV_HC1	3	16.2	15.26	17.14	16.25	15.8	16.55	0.2179	2.33%	9.81%
EV_MC2	2	16.35	5.491	27.22	16.35	15.5	17.21	0.855	7.39%	8.95%
CM_MC2	1	20.31			20.31	20.31	20.31	0	0.0%	-13.07%
LC_LCDSSLCC	3	19.51	18.04	20.98	19.83	18.83	19.88	0.342	3.04%	-8.63%

**Length-mm Detail**

Sample Code	Rep 1	② Rep 2	② Rep 3	② Rep 4
Control	18.33	18.13	17.7	17.69
① FR_UFR1	18.21	17.63	18.38	18
① GH_ER2	17.94	17.06	18.47	
① CM_MC1	17.75	17.8	17.5	
FR_FRCP1	18	16.5		
GH_FR1	16.54			
GH_ERC	16.75	16		
EV_HC1	15.8	16.25	16.55	
EV_MC2	17.21	15.5		
CM_MC2	20.31			
LC_LCDSSLCC	19.83	19.88	18.83	

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites

② Empty data fields imply data is omitted from analysis as there is no survival.

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

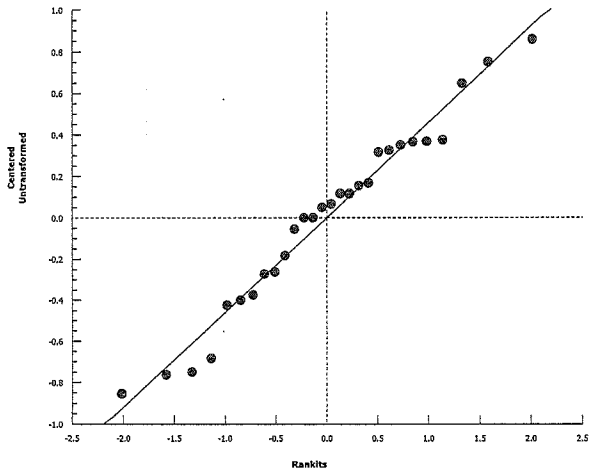
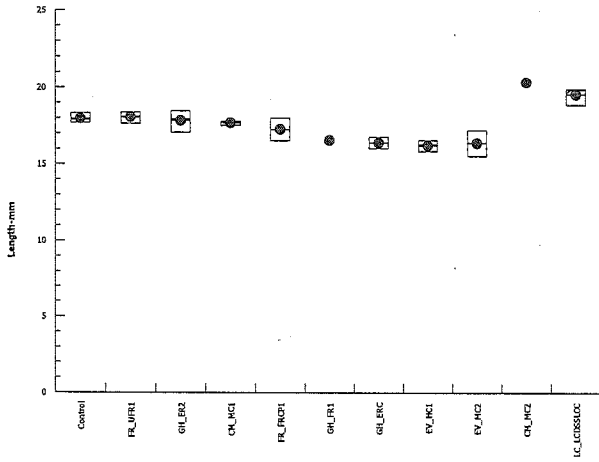
Nautilus Environmental

Analysis ID: 03-0079-6437  
Analyzed: 09 Nov-17 17:03

Endpoint: Length-mm  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 09 Nov-17 17:09 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 14-7491-4455	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 09 Nov-17 17:04	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 04-5732-8336	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

**Dunn/Bonferroni-Holm Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
FR_UFR1		GH_ER2	0.2238	2.539		5	1.0000	Asymp	Non-Significant Effect
		CM_MC1	0.5942	2.539		5	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	0.8371	2.539		4	1.0000	Asymp	Non-Significant Effect
		GH_FR1	1.249	2.539		3	0.6346	Asymp	Non-Significant Effect
		GH_ERC	1.695	2.539		4	0.3606	Asymp	Non-Significant Effect
		EV_HC1	2.138	2.539		5	0.1465	Asymp	Non-Significant Effect
		EV_MC2	1.695	2.539		4	0.3606	Asymp	Non-Significant Effect
		CM_MC2	-1.028	2.539		3	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	-1.134	2.539		5	0.8717	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	32.67159	3.630177	9	9.709	0.0001	Significant Effect
Error	5.234397	0.3738855	14			
Total	37.90599		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	4.544	4.03	0.0059	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9599	0.884	0.4361	Normal Distribution

**CETIS Analytical Report**

Report Date: 09 Nov-17 17:09 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 14-7491-4455      Endpoint: Length-mm  
 Analyzed: 09 Nov-17 17:04      Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Length-mm Summary**

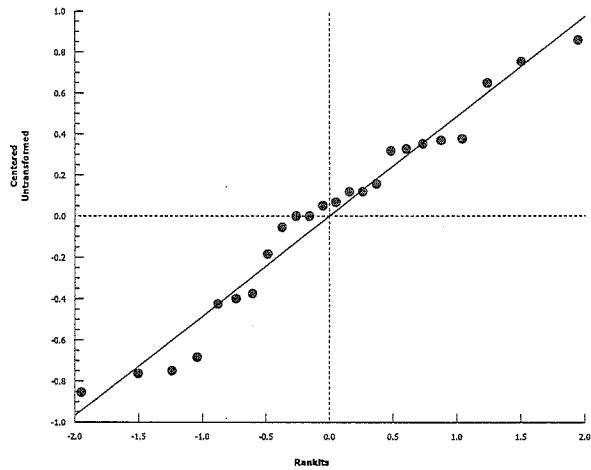
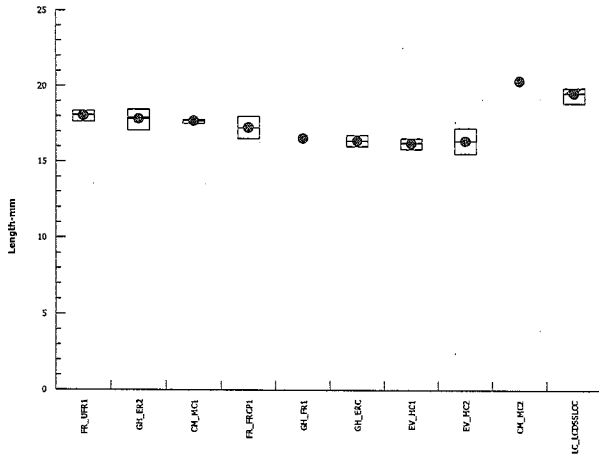
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	18.05	17.54	18.57	18.1	17.63	18.38	0.1616	1.79%	0.0%
GH_ER2	3	17.82	16.05	19.59	17.94	17.06	18.47	0.4112	4.0%	1.28%
CM_MC1	3	17.68	17.28	18.08	17.75	17.5	17.8	0.09279	0.91%	2.06%
FR_FRCP1	2	17.25	7.72	26.78	17.25	16.5	18	0.75	6.15%	4.46%
GH_FR1	1	16.54			16.54	16.54	16.54	0	0.0%	8.39%
GH_ERC	2	16.38	11.61	21.14	16.38	16	16.75	0.375	3.24%	9.31%
EV_HC1	3	16.2	15.26	17.14	16.25	15.8	16.55	0.2179	2.33%	10.27%
EV_MC2	2	16.35	5.491	27.22	16.35	15.5	17.21	0.855	7.39%	9.42%
CM_MC2	1	20.31			20.31	20.31	20.31	0	0.0%	-12.49%
LC_LCDSSLCC	3	19.51	18.04	20.98	19.83	18.83	19.88	0.342	3.04%	-8.08%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	18.21	17.63	18.38	18
GH_ER2	17.94	17.06	18.47	
CM_MC1	17.75	17.8	17.5	
FR_FRCP1	18	16.5		
GH_FR1	16.54			
GH_ERC	16.75	16		
EV_HC1	15.8	16.25	16.55	
EV_MC2	17.21	15.5		
CM_MC2	20.31			
LC_LCDSSLCC	19.83	19.88	18.83	

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites  
 ② Empty data fields imply data is omitted from analysis as there is no survival.

**Graphics**



**CETIS Analytical Report**

Report Date: 09 Nov-17 17:09 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

<b>Analysis ID:</b> 11-2454-4233	<b>Endpoint:</b> Length-mm	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 09 Nov-17 17:08	<b>Analysis:</b> Nonparametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 04-5732-8336	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*OFF UFR1, GH\_ER2, CM\_MC1  
are reference sites.*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

**Dunn/Bonferroni-Holm Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2		FR_UFR1	-0.409	2.539		5	1.0000	Asymp	Non-Significant Effect
		CM_MC1	0.2599	2.539		4	1.0000	Asymp	Non-Significant Effect
		FR_FRCP1	0.5294	2.539		3	1.0000	Asymp	Non-Significant Effect
		GH_FR1	1	2.539		2	0.9513	Asymp	Non-Significant Effect
		GH_ERC	1.343	2.539		3	0.7172	Asymp	Non-Significant Effect
		EV_HC1	1.704	2.539		4	0.3981	Asymp	Non-Significant Effect
		EV_MC2	1.343	2.539		3	0.7172	Asymp	Non-Significant Effect
		CM_MC2	-1.205	2.539		2	1.0000	Asymp	Non-Significant Effect
		LC_LCDSSLCC	-1.357	2.539		4	0.9126	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	32.67159	3.630177	9	9.709	0.0001	Significant Effect
Error	5.234397	0.3738855	14			
Total	37.90599		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	4.544	4.03	0.0059	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9599	0.884	0.4361	Normal Distribution

**CETIS Analytical Report**

Report Date: 09 Nov-17 17:09 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test** Nautilus Environmental

Analysis ID: 11-2454-4233      Endpoint: Length-mm      CETIS Version: CETISv1.8.7  
 Analyzed: 09 Nov-17 17:08      Analysis: Nonparametric-Control vs Treatments      Official Results: Yes

**Length-mm Summary**

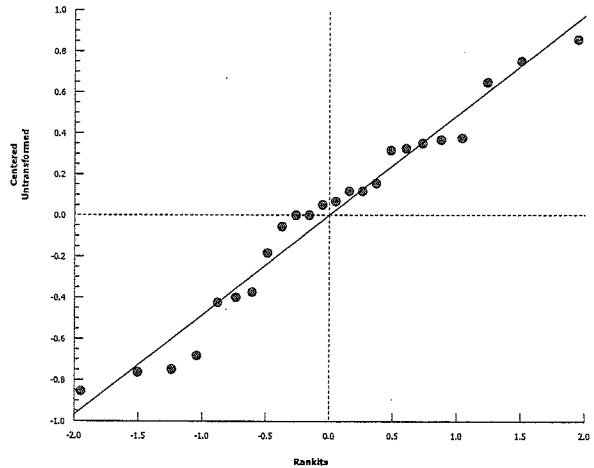
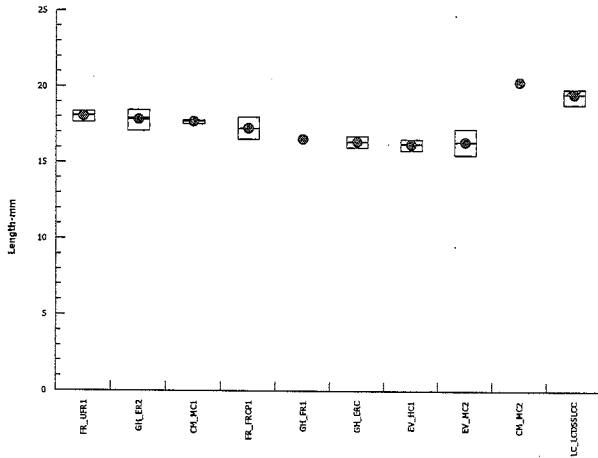
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	18.05	17.54	18.57	18.1	17.63	18.38	0.1616	1.79%	0.0%
GH_ER2	3	17.82	16.05	19.59	17.94	17.06	18.47	0.4112	4.0%	1.28%
CM_MC1	3	17.68	17.28	18.08	17.75	17.5	17.8	0.09279	0.91%	2.06%
FR_FRCP1	2	17.25	7.72	26.78	17.25	16.5	18	0.75	6.15%	4.46%
GH_FR1	1	16.54			16.54	16.54	16.54	0	0.0%	8.39%
GH_ERC	2	16.38	11.61	21.14	16.38	16	16.75	0.375	3.24%	9.31%
EV_HC1	3	16.2	15.26	17.14	16.25	15.8	16.55	0.2179	2.33%	10.27%
EV_MC2	2	16.35	5.491	27.22	16.35	15.5	17.21	0.855	7.39%	9.42%
CM_MC2	1	20.31			20.31	20.31	20.31	0	0.0%	-12.49%
LC_LCDSSLCC	3	19.51	18.04	20.98	19.83	18.83	19.88	0.342	3.04%	-8.08%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	18.21	17.63	18.38	18
GH_ER2	17.94	17.06	18.47	
CM_MC1	17.75	17.8	17.5	
FR_FRCP1	18	16.5		
GH_FR1	16.54			
GH_ERC	16.75	16		
EV_HC1	15.8	16.25	16.55	
EV_MC2	17.21	15.5		
CM_MC2	20.31			
LC_LCDSSLCC	19.83	19.88	18.83	

① FR\_UFR1, CM\_MC1, GH\_ER2 are reference sites  
 ② Empty data fields imply data is omitted from analysis as there is no survival

**Graphics**



**CETIS Analytical Report**

Report Date: 10 Nov-17 11:35 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fly Survival Development and Growth Test Nautilus Environmental

Analysis ID: 03-1181-6056	Endpoint: Length-mm	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 11:24	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 04-5732-8336	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

① FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed	NA	C > T	NA	NA	

**Dunn/Bonferroni-Holm Test**

Sample Code	vs Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1	FR_UFR1	-0.7794	2.539		5	1.0000	Asymp	Non-Significant Effect
	GH_ER2	-0.4331	2.539		4	1.0000	Asymp	Non-Significant Effect
	FR_FRCP1	0.2195	2.539		3	1.0000	Asymp	Non-Significant Effect
	GH_FR1	0.7554	2.539		2	1.0000	Asymp	Non-Significant Effect
	GH_ERC	1.033	2.539		3	1.0000	Asymp	Non-Significant Effect
	EV_HC1	1.357	2.539		4	0.7864	Asymp	Non-Significant Effect
	EV_MC2	1.033	2.539		3	1.0000	Asymp	Non-Significant Effect
	CM_MC2	-1.45	2.539		2	1.0000	Asymp	Non-Significant Effect
	LC_LCDSSLCC	-1.704	2.539		4	0.9558	Asymp	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	32.67159	3.630177	9	9.709	0.0001	Significant Effect
Error	5.234397	0.3738855	14			
Total	37.90599		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	4.544	4.03	0.0059	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9599	0.884	0.4361	Normal Distribution

**CETIS Analytical Report**

Report Date: 10 Nov-17 11:35 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 03-1181-6056 Endpoint: Length-mm  
 Analyzed: 10 Nov-17 11:24 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Length-mm Summary**

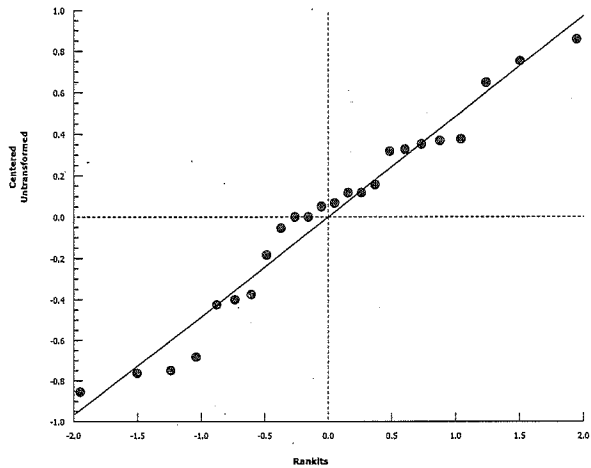
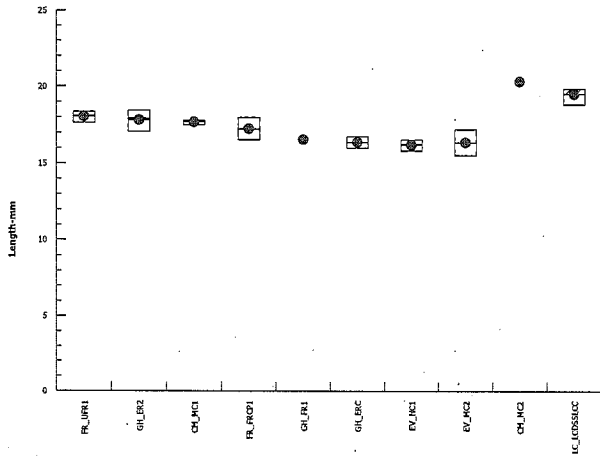
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	18.05	17.54	18.57	18.1	17.63	18.38	0.1616	1.79%	0.0%
GH_ER2	3	17.82	16.05	19.59	17.94	17.06	18.47	0.4112	4.0%	1.28%
CM_MC1	3	17.68	17.28	18.08	17.75	17.5	17.8	0.09279	0.91%	2.06%
FR_FRCP1	2	17.25	7.72	26.78	17.25	16.5	18	0.75	6.15%	4.46%
GH_FR1	1	16.54			16.54	16.54	16.54	0	0.0%	8.39%
GH_ERC	2	16.38	11.61	21.14	16.38	16	16.75	0.375	3.24%	9.31%
EV_HC1	3	16.2	15.26	17.14	16.25	15.8	16.55	0.2179	2.33%	10.27%
EV_MC2	2	16.35	5.491	27.22	16.35	15.5	17.21	0.855	7.39%	9.42%
CM_MC2	1	20.31			20.31	20.31	20.31	0	0.0%	-12.49%
LC_LCDSSLCC	3	19.51	18.04	20.98	19.83	18.83	19.88	0.342	3.04%	-8.08%

**Length-mm Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	18.21	17.63	18.38	18
GH_ER2	17.94	17.06	18.47	
CM_MC1	17.75	17.8	17.5	
FR_FRCP1	18	16.5		
GH_FR1	16.54			
GH_ERC	16.75	16		
EV_HC1	15.8	16.25	16.55	
EV_MC2	17.21	15.5		
CM_MC2	20.31			
LC_LCDSSLCC	19.83	19.88	18.83	

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites  
 ② Empty data fields imply that dot is omitted from analysis as there is no survival

**Graphics**





**CETIS Analytical Report**

Report Date: 09 Nov-17 17:10 (p 1 of 3)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test** **Nautilus Environmental**

<b>Analysis ID:</b> 04-6572-4323	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.8.7
<b>Analyzed:</b> 09 Nov-17 17:03	<b>Analysis:</b> Parametric-Control vs Treatments	<b>Official Results:</b> Yes
<b>Batch ID:</b> 04-5732-8336	<b>Test Type:</b> Survival-Development-Growth	<b>Analyst:</b> Kania Lywe
<b>Start Date:</b> 05 Oct-17 17:05	<b>Protocol:</b> EC/EPS 1/RM/28	<b>Diluent:</b> Dechlorinated Tap Water
<b>Ending Date:</b> 03 Nov-17 09:00	<b>Species:</b> Oncorhynchus mykiss	<b>Brine:</b>
<b>Duration:</b> 28d 16h	<b>Source:</b> Vancouver Island Trout Hatchery	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control	09-7028-1525	05 Oct-17	05 Oct-17	17h	Teck Coal	
① FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)		
② GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
③ CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control	control	Teck Coal	Control		
① FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
② GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
③ CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.1%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Control	①	FR_UFR1	0.2471	2.75	10.69	6	0.9088	CDF	Non-Significant Effect
	②	GH_ER2	0.3044	2.75	11.54	5	0.8952	CDF	Non-Significant Effect
	③	CM_MC1	-0.5941	2.75	11.54	5	0.9934	CDF	Non-Significant Effect
		FR_FRCP1	-0.7991	2.75	13.09	4	0.9969	CDF	Non-Significant Effect
		GH_FR1	-0.9774	2.75	16.9	3	0.9985	CDF	Non-Significant Effect
		GH_ERC	0.6086	2.75	13.09	4	0.7988	CDF	Non-Significant Effect
		EV_HC1	1.31	2.75	11.54	5	0.4677	CDF	Non-Significant Effect
		EV_MC2	-0.2449	2.75	13.09	4	0.9778	CDF	Non-Significant Effect
		CM_MC2	-3.215	2.75	16.9	3	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-3.256	2.75	11.54	5	1.0000	CDF	Non-Significant Effect

① FR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites

CETIS Analytical Report

Report Date: 09 Nov-17 17:10 (p 2 of 3)
Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 04-6572-4323 Endpoint: Mean Dry Weight-mg
Analyzed: 09 Nov-17 17:03 Analysis: Parametric-Control vs Treatments
CETIS Version: CETISv1.8.7
Official Results: Yes

ANOVA Table

Table with 7 columns: Source, Sum Squares, Mean Square, DF, F Stat, P-Value, Decision(alpha:5%). Rows include Between, Error, and Total.

Distributional Tests

Table with 6 columns: Attribute, Test, Test Stat, Critical, P-Value, Decision(alpha:1%). Rows include Variances and Distribution.

Mean Dry Weight-mg Summary

Table with 11 columns: Sample Code, Count, Mean, 95% LCL, 95% UCL, Median, Min, Max, Std Err, CV%, %Effect. Lists various sample codes and their corresponding statistics.

Mean Dry Weight-mg Detail

Table with 5 columns: Sample Code, Rep 1, Rep 2, Rep 3, Rep 4. Shows individual replicate data for each sample code.

Handwritten note: FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites

Handwritten note: Empty data fields imply that data is shifted from analysis as there is no survival

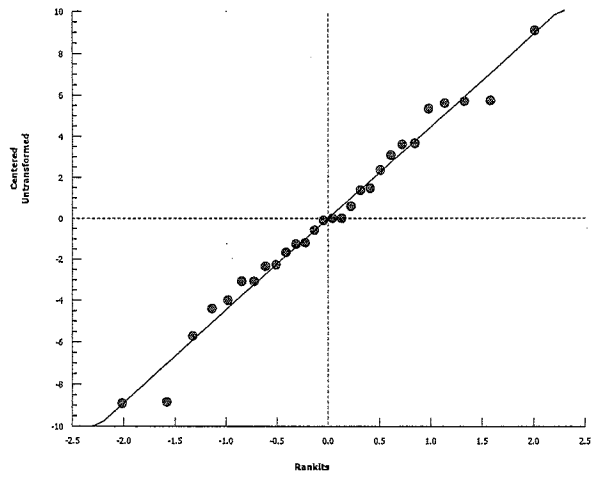
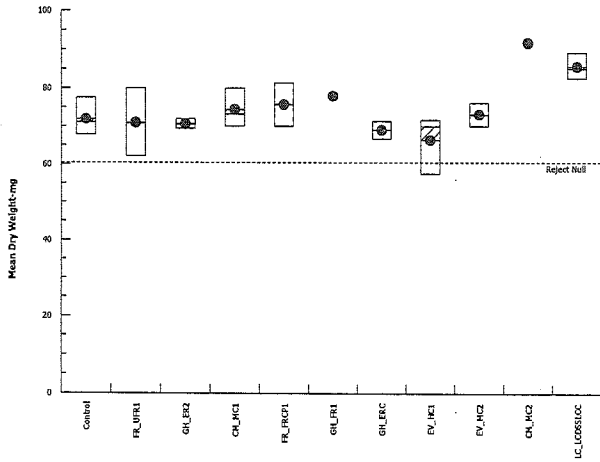
Salmonid Embryo-Alevin-Fry Survival Development and Growth Test

Nautilus Environmental

Analysis ID: 04-6572-4323 Endpoint: Mean Dry Weight-mg  
Analyzed: 09 Nov-17 17:03 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



**CETIS Analytical Report**

Report Date: 09 Nov-17 17:11 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 15-5375-7937	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 09 Nov-17 17:05	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 04-5732-8336	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*FR\_UFR1, GH\_ER2 and CM\_MC1 are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.1%	

**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	0.07253	2.771	12.13	5	0.9373	CDF	Non-Significant Effect
		CM_MC1	-0.7891	2.771	12.13	5	0.9962	CDF	Non-Significant Effect
		FR_FRCP1	-0.9598	2.771	13.75	4	0.9980	CDF	Non-Significant Effect
		GH_FR1	-1.087	2.771	17.76	3	0.9988	CDF	Non-Significant Effect
		GH_ERC	0.3901	2.771	13.75	4	0.8632	CDF	Non-Significant Effect
		EV_HC1	1.037	2.771	12.13	5	0.5908	CDF	Non-Significant Effect
		EV_MC2	-0.4283	2.771	13.75	4	0.9865	CDF	Non-Significant Effect
		CM_MC2	-3.233	2.771	17.76	3	1.0000	CDF	Non-Significant Effect
		LC_LCDSSLCC	-3.342	2.771	12.13	5	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1030.463	114.4958	9	3.487	0.0181	Significant Effect
Error	459.7314	32.83796	14			
Total	1490.194		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	1.647	4.03	0.1941	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9803	0.884	0.9015	Normal Distribution

**CETIS Analytical Report**

Report Date: 09 Nov-17 17:11 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

Nautilus Environmental

Analysis ID: 15-5375-7937      Endpoint: Mean Dry Weight-mg  
 Analyzed: 09 Nov-17 17:05      Analysis: Parametric-Control vs Treatments  
 CETIS Version: CETISv1.8.7  
 Official Results: Yes

**Mean Dry Weight-mg Summary**

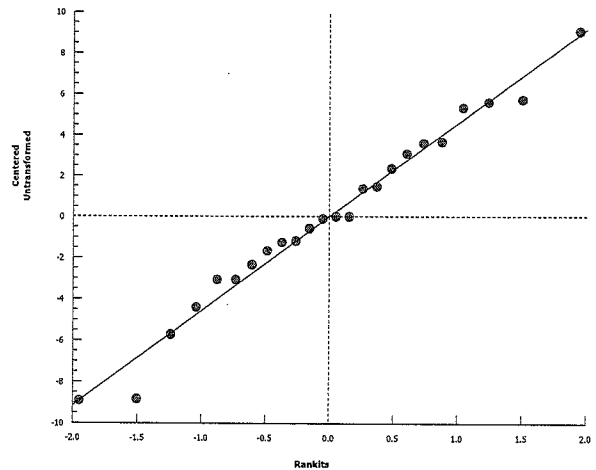
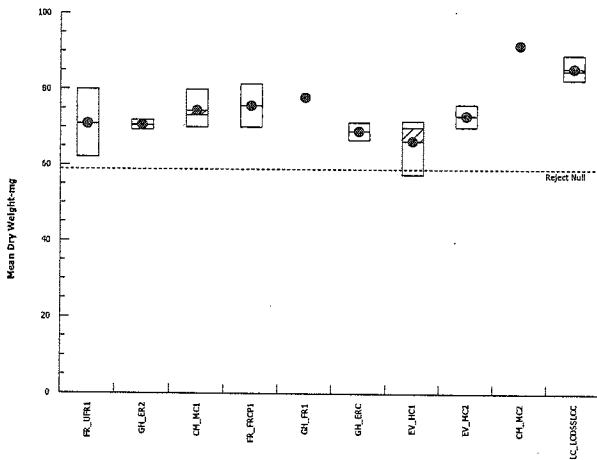
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
FR_UFR1	4	70.95	59.15	82.75	70.85	62.11	80	3.709	10.45%	0.0%
GH_ER2	3	70.63	67.37	73.9	70.53	69.38	72	0.7597	1.86%	0.45%
CM_MC1	3	74.4	61.72	87.09	73.21	70	80	2.947	6.86%	-4.87%
FR_FRCP1	2	75.71	3.107	148.3	75.71	70	81.43	5.714	10.67%	-6.71%
GH_FR1	1	77.92			77.92	77.92	77.92	0	0.0%	-9.82%
GH_ERC	2	69.02	39.17	98.86	69.02	66.67	71.36	2.349	4.81%	2.73%
EV_HC1	3	66.41	47.12	85.71	70	57.5	71.74	4.485	11.7%	6.4%
EV_MC2	2	73.08	33.98	112.2	73.08	70	76.15	3.077	5.96%	-3.0%
CM_MC2	1	91.67			91.67	91.67	91.67	0	0.0%	-29.2%
LC_LCDSSLCC	3	85.58	77.13	94.03	85	82.5	89.23	1.964	3.98%	-20.61%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	72.41	62.11	69.29	80
GH_ER2	72	69.38	70.53	
CM_MC1	73.21	70	80	
FR_FRCP1	81.43	70		
GH_FR1	77.92			
GH_ERC	71.36	66.67		
EV_HC1	71.74	57.5	70	
EV_MC2	76.15	70		
CM_MC2	91.67			
LC_LCDSSLCC	89.23	85	82.5	

① FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites  
 ② Empty data fields imply that data is omitted from analysis as there is no survival

**Graphics**



**CETIS Analytical Report**

Report Date: 09 Nov-17 17:11 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test** Nautilus Environmental

Analysis ID: 13-1743-3744	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 09 Nov-17 17:08	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 04-5732-8336	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*FR\_UFR1, GH\_ER2, CM\_MC1 are reference sites.*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	18.1%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
GH_ER2	FR_UFR1	-0.07253	2.735	11.97	5	0.9419	CDF	Non-Significant Effect
	CM_MC1	-0.806	2.735	12.8	4	0.9936	CDF	Non-Significant Effect
	FR_FRCP1	-0.9712	2.735	14.31	3	0.9963	CDF	Non-Significant Effect
	GH_FR1	-1.101	2.735	18.1	2	0.9977	CDF	Non-Significant Effect
	GH_ERC	0.3094	2.735	14.31	3	0.8580	CDF	Non-Significant Effect
	EV_HC1	0.9021	2.735	12.8	4	0.6211	CDF	Non-Significant Effect
	EV_MC2	-0.467	2.735	14.31	3	0.9810	CDF	Non-Significant Effect
	CM_MC2	-3.179	2.735	18.1	2	1.0000	CDF	Non-Significant Effect
	LC_LCDSSLCC	-3.194	2.735	12.8	4	1.0000	CDF	Non-Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1030.463	114.4958	9	3.487	0.0181	Significant Effect
Error	459.7314	32.83796	14			
Total	1490.194		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	1.647	4.03	0.1941	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9803	0.884	0.9015	Normal Distribution

**CETIS Analytical Report**

Report Date: 09 Nov-17 17:11 (p 2 of 2)  
 Test Code: 171092b | 19-6705-1734

**Salmonid Embryo-Alevin-Fry Survival Development and Growth Test**

**Nautilus Environmental**

Analysis ID: 13-1743-3744      Endpoint: Mean Dry Weight-mg      CETIS Version: CETISv1.8.7  
 Analyzed: 09 Nov-17 17:08      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	4	70.95	59.15	82.75	70.85	62.11	80	3.709	10.45%	0.0%
GH_ER2	3	70.63	67.37	73.9	70.53	69.38	72	0.7597	1.86%	0.45%
CM_MC1	3	74.4	61.72	87.09	73.21	70	80	2.947	6.86%	-4.87%
FR_FRCP1	2	75.71	3.107	148.3	75.71	70	81.43	5.714	10.67%	-6.71%
GH_FR1	1	77.92			77.92	77.92	77.92	0	0.0%	-9.82%
GH_ERC	2	69.02	39.17	98.86	69.02	66.67	71.36	2.349	4.81%	2.73%
EV_HC1	3	66.41	47.12	85.71	70	57.5	71.74	4.485	11.7%	6.4%
EV_MC2	2	73.08	33.98	112.2	73.08	70	76.15	3.077	5.96%	-3.0%
CM_MC2	1	91.67			91.67	91.67	91.67	0	0.0%	-29.2%
LC_LCDSSLCC	3	85.58	77.13	94.03	85	82.5	89.23	1.964	3.98%	-20.61%

**Mean Dry Weight-mg Detail**

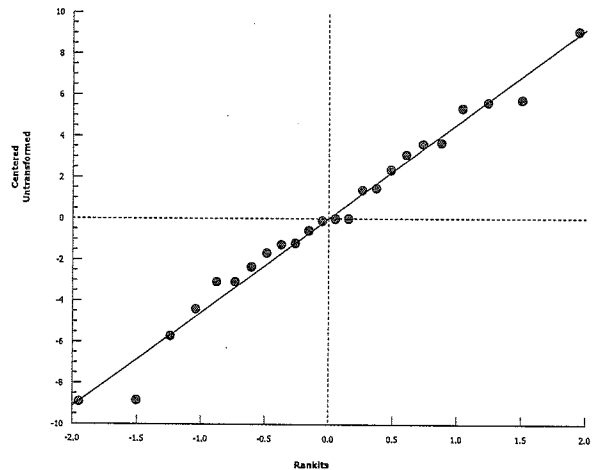
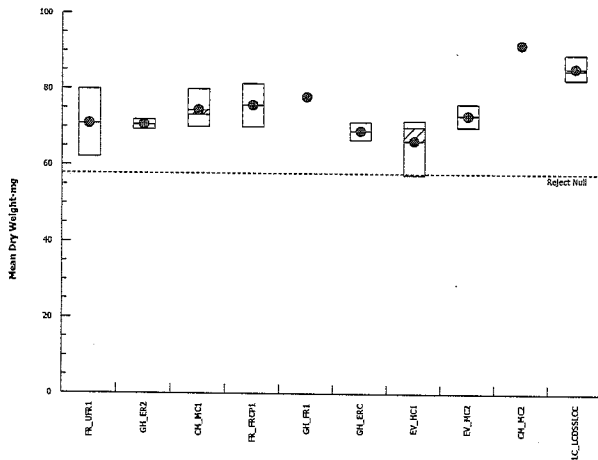
Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
FR_UFR1	72.41	62.11	69.29	80
GH_ER2	72	69.38	70.53	
CM_MC1	73.21	70	80	
FR_FRCP1	81.43	70		
GH_FR1	77.92			
GH_ERC	71.36	66.67		
EV_HC1	71.74	57.5	70	
EV_MC2	76.15	70		
CM_MC2	91.67			
LC_LCDSSLCC	89.23	85	82.5	

① FR\_UFR1, GH\_ER2, CM\_MC1

live reference sites.

② Empty data fields imply that data is omitted from analysis as there is no survival

**Graphics**



**CETIS Analytical Report**

Report Date: 10 Nov-17 11:29 (p 1 of 2)  
 Test Code: 171092b | 19-6705-1734

Salmonid Embryo-Alevin-Fry Survival Development and Growth Test Nautilus Environmental

Analysis ID: 18-7929-7572	Endpoint: Mean Dry Weight-mg	CETIS Version: CETISv1.8.7
Analyzed: 10 Nov-17 11:25	Analysis: Parametric-Control vs Treatments	Official Results: Yes
Batch ID: 04-5732-8336	Test Type: Survival-Development-Growth	Analyst: Kania Lywe
Start Date: 05 Oct-17 17:05	Protocol: EC/EPS 1/RM/28	Diluent: Dechlorinated Tap Water
Ending Date: 03 Nov-17 09:00	Species: Oncorhynchus mykiss	Brine:
Duration: 28d 16h	Source: Vancouver Island Trout Hatchery	Age:

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
FR_UFR1	18-2543-6397	02 Oct-17 11:42	03 Oct-17 12:20	77h (9 °C)	Teck Coal	
GH_ER2	10-5395-0543	02 Oct-17 10:40	03 Oct-17 12:20	78h (8.1 °C)		
CM_MC1	10-7518-3876	02 Oct-17 17:28	03 Oct-17 12:20	72h (6 °C)		
FR_FRCP1	21-3583-2933	02 Oct-17 13:17	03 Oct-17 12:20	76h (9 °C)		
GH_FR1	11-2690-6696	02 Oct-17 13:05	03 Oct-17 12:20	76h (8.1 °C)		
GH_ERC	14-2896-5795	02 Oct-17 12:05	03 Oct-17 12:20	77h (8.1 °C)		
EV_HC1	16-9251-9166	02 Oct-17 09:40	03 Oct-17 12:20	79h (5.8 °C)		
EV_MC2	02-1009-5265	02 Oct-17 11:00	03 Oct-17 12:20	78h (6 °C)		
CM_MC2	17-6706-2671	02 Oct-17 18:26	03 Oct-17 12:20	71h (5 °C)		
LC_LCDSSLCC	13-9376-8325	02 Oct-17 09:14	03 Oct-17 12:20	80h (8.2 °C)		

*OPR\_UFR1, GH\_ER2, CM\_MC1  
are reference sites*

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
FR_UFR1	Water Sample	Teck Coal	FR_UFR1_WS_2017-10-02_N_36		
GH_ER2	Water Sample	Teck Coal	GH_ER2_WS_2017-10-02_N		
CM_MC1	Water Sample	Teck Coal	CM_MC1_WS_20171003_N		
FR_FRCP1	Water Sample	Teck Coal	FR_FRCP1_WS_2017-10-02_N_3		
GH_FR1	Water Sample	Teck Coal	GH_FR1_WS_2017-10-02_N		
GH_ERC	Water Sample	Teck Coal	GH_ERC_WS_2017-10-02_N		
EV_HC1	Water Sample	Teck Coal	EV_HC1_WS_2017-10-02_N		
EV_MC2	Water Sample	Teck Coal	EV_MC2_WS_2017-10-02_N		
CM_MC2	Water Sample	Teck Coal	CM_MC2_WS_20171003_N		
LC_LCDSSLCC	Water Sample	Teck Coal	LC_LCDSSLCC_WS_2017-10-02		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.2%	

**Dunnnett Multiple Comparison Test**

Sample Code	vs Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
CM_MC1	FR_UFR1	0.7891	2.735	11.97	5	0.6739	CDF	Non-Significant Effect
	GH_ER2	0.806	2.735	12.8	4	0.6662	CDF	Non-Significant Effect
	FR_FRCP1	-0.2503	2.735	14.31	3	0.9641	CDF	Non-Significant Effect
	GH_FR1	-0.5307	2.735	18.1	2	0.9844	CDF	Non-Significant Effect
	GH_ERC	1.03	2.735	14.31	3	0.5592	CDF	Non-Significant Effect
	EV_HC1	1.708	2.735	12.8	4	0.2610	CDF	Non-Significant Effect
	EV_MC2	0.2538	2.735	14.31	3	0.8737	CDF	Non-Significant Effect
	CM_MC2	-2.609	2.735	18.1	2	1.0000	CDF	Non-Significant Effect
LC_LCDSSLCC	-2.388	2.735	12.8	4	1.0000	CDF	Non-Significant Effect	

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1030.463	114.4958	9	3.487	0.0181	Significant Effect
Error	459.7314	32.83796	14			
Total	1490.194		23			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance	1.647	4.03	0.1941	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9803	0.884	0.9015	Normal Distribution





Client: TECK

W.O.#: A609A

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
FRUFPI	Oct5/17	Oct5/17	50	7.5	7.7	146	50	9.6	192	AWZ
CM MCI	↓	↓	↓	7.4	7.6	144	50	7.8	156	↓
FR-PRCP1	↓	↓	↓	11.8	12.0	232	100	8.1	810	↓
CHL-FPI	↓	↓	↓	10.3	10.5	202	100	5.5	550	↓
CM MCI	↓	↓	↓	10.6	10.8	208	100	6.9	690	↓
Dechlor	↓	↓	↓	0.6	0.7	10	100	1.1	11	↓
FRUFPI	Oct11/17	Oct11/17	50	7.7	7.9	150	50	9.6	192	AWZ
CM MCI	↓	↓	↓	7.5	7.7	146	50	7.7	154	↓
FR-PRCP1	↓	↓	↓	11.8	12.1	230	100	8.0	800	↓
CHL-FPI	↓	↓	↓	10.3	10.6	200	100	5.7	570	↓
CM MCI	↓	↓	↓	10.9	11.1	214	100	6.0	600	↓
Dechlor	Oct12/17	Oct12/17	100	1.2	1.3	11	100	0.8	8	↓
FRUFPI	Oct18/17	Oct18/17	50	7.9	8.1	154	50	9.2	184	W
CM MCI	↓	↓	↓	7.5	7.7	146	50	7.4	148	↓
FR-PRCP1	↓	↓	↓	11.3	11.5	222	100	9.3	930	↓
CHL-FPI	↓	↓	↓	10.5	10.7	206	100	5.5	550	↓
CM MCI	↓	↓	↓	10.1	10.3	198	100	5.8	580	↓
Dechlor	Oct19/17	Oct19/17	100	1.1	1.2	10	100	1.1	11	↓

Notes: ☉ Sample diluted w/ DI water up to 100 mL

Reviewed by: Jon

Date Reviewed: Nov-27/17

Client: Teck

W.O.#: A1097

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
PR_UFP1	Oct 25/17	Oct 25/17	50	7.5	7.6	148	50	10.0	200	JK
CM_MC1	↓	↓	↓	7.2	7.3	142	50	7.4	148	↓
PR_PPCP1	↓	↓	↓	10.5	10.7	206	100	8.5	850	↓
GH_FP1	↓	↓	↓	10.7	10.8	212	100	4.9	490	↓
CM_MC2	↓	↓	↓	10.1	10.3	198	100	5.9	590	↓
Dechlor	Oct 23/17	Oct 23/17	100	1.1	1.2	10	100	1.2	12	↓
PR_UFP1	Nov 1/17	Nov 1/17	50	7.8	7.9	154	50	9.0	180	JK
CM_MC1	↓	↓	↓	7.4	7.6	144	50	7.5	150	↓
PR_PPCP1	↓	↓	↓	11.5	11.7	226	100	7.6	760	↓
GH_FP1	↓	↓	↓	10.5	10.7	206	100	5.7	570	↓
CM_MC2	↓	↓	↓	10.8	11.0	212	100	6.6	660	↓
Dechlor	↓	↓	100	1.3	1.4	12	100	1.2	12	↓

Notes: ① Sample diluted w/ DI water up to 100ml

Reviewed by: JGM

Date Reviewed: Nov 27/17

Client: Teck

W.O.#: A1002

### Hardness and Alkalinity Datasheet

Sample ID	Subsample Date	Date Measured	Alkalinity				Hardness			Technician
			Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
① FR-UFR1	Oct 5/17	Oct 5/17	50	7.5	7.7	146	50	9.6	192	AWB
② GH-ER2	↓	↓	↓	7.5	7.6	148	50	8.0	160	AWB
③ CM-MC1	↓	↓	↓	7.4	7.6	144	50	7.8	156	AWB
④ FR-FRCM1	↓	↓	↓	11.8	12.0	232	100	8.1	810	AWB
⑤ GH-FR1	↓	↓	↓	10.3	10.5	202	100	5.5	550	AWB
⑥ GH-ERC	↓	↓	↓	7.8	8.0	152	50	9.2	184	AWB
⑦ EV-HC1	↓	↓	↓	9.8	10.1	190	① 50/10	5.9	540	AWB
⑧ EV-MC2	↓	↓	↓	9.9	10.1	194	50	16.3	326	AWB
⑨ CM-MC2	↓	↓	↓	10.6	10.8	208	100	6.9	690	AWB
⑩ LC-LC/SS/LCC	↓	↓	↓	10.6	10.8	208	100	6.6	660	AWB
Dechlor	↓	↓	50	0.6	0.7	10	100	1.1	11	↓

Notes: ① diluted up to 100ml w DI

Reviewed by: POW Date Reviewed: Nov-15/17

Client: Teck

W.O.#: 171092

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FR-UFR1	Oct 11/A	Oct 11/A	50	7.87 AWB	7.9	150	50	9.6	192	AWB
GH-ER2				<del>8.2</del> 7.3 AWB	7.4	144	50	8.3	166	AWB
CM-MC1				7.5	7.7	146	50	7.7	154	AWB
FR-FRCP1				11.8	12.1	230	100	8.0	800	AWB
GH-FR1				10.3	10.6	200	100	5.7	570	AWB
GH-ERC				8.1	8.3	158	50	8.9	<del>178</del> 178	AWB
EV-HC1				9.8	10.1	190	100	5.4	540	AWB
EV-MC2				9.8	10.0	192	50 100	4.1 <sup>AWB</sup> 3.8	380	AWB
CM-MC2				10.9	11.1	214	100	6.0	600	AWB
LC-LCDSSLCC				10.3	10.5	<del>196</del> 202	100	6.3	630	AWB
Dechlor	Oct 11/A	Oct 12/A	100	1.2	1.3	11	100	0.8	8	J

Notes: ① Diluted to 100mL w DI

Reviewed by: JOU Date Reviewed: Nov - 15/17

Client: TECK

W.O.#: A1092

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
FRUPP1	Oct 18/17	Oct 18/17	50	7.9	8.1	154	50	9.2	184	K
CHERC				7.6	7.8	148	50	7.9	158	↓
CM-MC1				7.5	7.7	146	50	7.4	148	
PR-FRC1				11.3	11.5	222	100	9.3	930	
CH-FR1				10.5	10.7	206	100	5.5	550	
CH-ERC				7.9	8.0	156	<del>50</del>	8.9	178	
EV-HL1				10.2	10.3	202	<del>100</del>	3.8	380	
EV-MC2				10.1	10.2	200	<del>50</del>	15.0	300	
CM-MC2				10.1	10.3	198	<del>100</del>	5.8	580	
LL-LOSS1				10.2	10.5	198	100	4.3	430	
Dechlor	Oct 17/17	Oct 17/17	100	1.1	1.2	10	<del>100</del>	1.1	11	

Notes: ① Sample diluted w/ DI water up to 100mL

Reviewed by: Jon Date Reviewed: Nov. 15/17

Client: Teck

W.O.#: 171092

### Hardness and Alkalinity Datasheet

Sample ID	Alkalinity						Hardness			Technician
	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	
FRUFF1	Oct 25/17	Oct 25/17	50	7.5	7.6	148	50	10.0	200	W
CHLFP2	↓	↓	↓	7.6	<del>7.7</del> 7.7	150	50	8.4	168	↓
CM MCL				7.2	7.3	142	50	7.4	148	
FR-FRCP1				10.5	10.7	206	100	8.5	850	
CHLFP1				10.7	10.8	212	100	4.9	490	
CHLERC				8.1	8.3	158	50	9.4	188	
EV LCL				10.3	10.5	202	100	4.9	490	
EV MCL				8.9	9.1	174	50	13.5	270	
CM MCL				10.1	10.3	198	100	5.9	590	
LS-LDSSICC				11.0	11.2	216	100	4.8	480	
Dechlor				Oct 23/17	Oct 23/17	100	1.1	1.2	10	

Notes: ① Sample diluted w/ DI water up to 100mL

Reviewed by: JOB

Date Reviewed: Nov. 15/17

Client: Teck

W.O.#: 171092

### Hardness and Alkalinity Datasheet

Alkalinity							Hardness			
Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.5	(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2	Total Alkalinity (mg/L CaCO <sub>3</sub> )	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO <sub>3</sub> )	Technician
FR_UFH1	NOV/17	NOV/17	50	7.8	7.9	154	50	9.0	180	K
AH_ER2				7.7	7.8	152	50	8.5	170	
CM_MCI				7.4	7.6	144	50	7.5	150	
FR_FCI1				11.5	11.7	226	100	7.6	760	
AH_FCI				10.5	10.7	206	100	5.7	570	
AH_ERC				8.0	8.2	156	<del>50</del> 100	2.0	200	
EV_HCI				10.5	10.6	208	100	5.2	520	
EV_MCI				9.2	9.4	180	<del>50</del> 100	3.6	360	
CM_MCI				10.8	11.0	212	100	6.6	660	
CC_CROSSCC				11.1	11.3	218	100	6.1	610	
Denlor			100	1.3	1.4	12	100	1.2	12	

Notes: <sup>Ⓢ</sup> Sample diluted w/ DI water up to 100mL

Reviewed by: JGU

Date Reviewed: Nov. 17/17



**APPENDIX F – Chain-of-Custody Forms**

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COC ID: 20171002-1500

TURNAROUND TIME:

RUSH:

**PROJECT/CLIENT INFO**

**LABORATORY**

**OTHER INFO**

Facility Name / Job#	Line Creek Operation	Lab Name	Nautilus Environmental	Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton	Lab Contact	Kyria Percy	Email 1:	drake.tymstra@teck.com		
Email	chris.blurton@teck.com	Email	Kyria@NautilusEnvironmental.ca	Email 2:	chris.blurton@teck.com		
Address	Box 2003	Address	8664 commerce Court	Email 3:	tedcooal@equisonline.com		
	15km North Hwy 43			Email 4:	lee.wilm@teck.com		
City	Sparwood	City	Burnaby	Province	BC		
Postal Code	V0B 2G0	Postal Code	V5A 4N7	Country	Canada		
Phone Number	250-425-3196	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.	ANALYSIS	PRESERV.	FIN.	Temp °C
LC.LCDSSLCC_WS_2017-10-02_N	LC.LCDSSLCC	WS	N	2-Oct-17	9:14	G	8 X 20L	72h P. subcapitata P/F			8.2
LC.DC1_WS_2017-10-02_N	LC.DC1	WS	N	2-Oct-17	12:51	G	5 X 20L	7d C.dubia P/F			8.0
LC.FRSDSC_WS_2017-10-02_N	LC.FRSDSC	WS	N	2-Oct-17	10:15	G	5 X 20L	30 d rainbow trout early life stage P/F			7.8
LC.DCDS_WS_2017-10-02_N	LC.DCDS	WS	N	2-Oct-17	12:40	G	5 X 20L	7 d Cdubia dilution series			7.8
LC.LC5_WS_2017-10-02_N	LC.LC5	WS	N	2-Oct-17	12:45	G	5 X 20L	72hr Psubcapitata dilution series			8.1
								7d L minor plant grown dilution series			
								7 d O mykis development dilution series			

**ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS**

**RELINQUISHED BY/AFFILIATION**

**DATE/TIME**

**ACCEPTED BY/AFFILIATION**

**DATE/TIME**

				T Phillips/ D Tymstra	October 2, 2017	Nan - Nan Yamamoto	October 3/17 @ 12:20
<b>NB OF BOTTLES RETURNED/DESCRIPTION</b>							
	Regular (default)	X	Sampler's Name	Tyler Phillips, Drake Tymstra	Mobile #	(250) 919-0965	
	Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	October 2, 2017	
	Emergency (1 Business Day) - 100% surcharge						
	For Emergency <1 Day, ASAP or Weekend - Contact ALS						

Clear, colorless, odorless, some particulates  
 @ light yellow, clear, odorless, some particulates.

# Teck

COC ID: 20171002-Toxicity		TURNAROUND TIME:		LABORATORY:		REGULAR:		RUSH:	
PROJECT/CLIENT INFO		LABORATORY		REGULAR		OTHER INFO			
Facility Name / Job# W/LC AWT/		Lab Name Nanitius Environmental		Report Delivery Formats		Excel		PDF	
Project Manager Thomas Davidson		Lab Contact Krysta Percy		Email 1: thomas.davidson@teck.com		X		X	
Email Thomas.Davidson@teck.com		Email Krysta@NanitiusEnvironmental.ca		Email 2: teckcoal@scisonline.com		X		X	
Address 15 Km North HWY 43		Address 8664 Commerce Court		Email 3: teckwclab@teck.com		X		X	
City Sparrowood		City Burnaby		Email 4: marty.hatke@teck.com		X		X	
Postal Code V0B 2G0		Postal Code V5A 4N7		Email 5: colin.lynch@teck.com		X		X	
Phone Number 250.603.9417		Phone Number +1.604.420.8773		VPO 00473572					
SAMPLE DETAILS									
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# OF Cont.	ANALYSIS REQUESTED	Filtered - F; Shd. L; Lab; Y; Z; Rhd & L; N; N; N; N
W/L_BWVB_OUT_SP21_20171002_N	W/L_BWVB_OUT_SP21	WS	N	2-Oct-17	0900	G	1	7 d Cdubia dilution series	
								72hr Psubcapitata dilution series	
								7d L minor plant growth dilution series	
								7 d O mykis development dilution series	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS									
RELINQUISHED BY/AFFILIATION									
DATE/TIME									
ACCEPTED BY/AFFILIATION									
DATE/TIME									
NB ON BOTTLER 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		Retha Akerman		Mobile #					
Sampler's Signature		Date/Time		October 2, 2017					

October 1st onwards, myp/accrion above was particulates.

171086  
171087  
171088  
171089

W0 #

Nanitius - Burnaby  
NY - New Yamanop

Oct 03/17 @ 12:20

Temp °C  
9.0  
5x20L

COC ID: 20171002-1356

TURNAROUND TIME:

RUSH:

**PROJECT/CLIENT INFO**

Facility Name / Job# Forcing River Operation  
 Project Manager Neil MacDonald  
 Email Neil.MacDonald@teck.com  
 Address PO Box 100  
 City Elkford  
 Postal Code V0B 1H0  
 Phone Number 1-250-865-5204

**LABORATORY**

Lab Name Nauticus Environmental  
 Lab Contact  
 Email  
 Address 8664 Commerce Court  
 City Burnaby  
 Postal Code V5A 4N7  
 Phone Number 604-420-8773

**OTHER INFO**

Report Format / Distribution  
 Email 1: neil.macdonald@teck.com  
 Email 2: dylan.begin@teck.com  
 Email 3: byron.coppen@teck.com  
 Email 4: jason.gardie@teck.com  
 Email 5: teckcom@equiniline.com

**SAMPLE DETAILS**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# OF Cont.
FR-FRCPL_WS_2017-10-02_N_39	FR-FRCPL	WS		2017/10/02	13:17	G	1
FR-UFRL_WS_2017-10-02_N_36	FR-UFRL	WS		2017/10/02	11:42	G	11

**ANALYSIS REQUESTED**

ANALYSIS	PRESERV	Vol	DATE/TIME	DATE/TIME
72h P. subcapitata P/F			171090	10/02
7d C. dubia P/F			171091	
28d Hyalella P/F			171093	
30d rainbow trout early life stage P/F			171092	
7d rainbow trout P/F			171096	
Rainbow Trout microbial testing			171097	
30d FHM P/F (10 µg/L CU Treated)			171094	
30d FHM P/F (20 µg/L CU Treated)			171095	

**RELEASING/REAFFILIATION**

Dylan Begin

Dylan Begin

Nauticus - Burnaby  
 NY - Neil Yamamoto

Oct 03/17 @ 12:30

**ACCEPTED/REAFFILIATION**

Mobile #

250 865 5273

Date/Time

Oct 25 2017

**ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS**

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

*Clear, colourless, odourless, sour particulate*

Temp °C  
 9.0 9x2  
 9.0 11x2



# Teck

COG ID: 20171002N

TURNAROUND TIME:

LABORATORY:

OTHER INFO:

RUSH:

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name / Job/ Elevator Operations	Job Description SA Chrome Toxicity Sampling	Lab Name Nautius Environmental	Lab Contact Krysta Perry	Report Format / Distribution	Excel <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EDD <input checked="" type="checkbox"/>
Project Manager Cam Griffin	Email Cameron.Griffin@teck.com	Email Krysta@nautiusevironmental.ca	Address 1864 Commerce Court Imperial Square, Lake City	Email 1: Chelsea.Leneart@teck.com	<input checked="" type="checkbox"/>
Address RR#1 HWY# 3	City Sparwood	Province BC	Country Canada	Email 2: helena@teck.com	<input checked="" type="checkbox"/>
Postal Code VIC 4C3	Postal Code USA 4N7	Province BC	Country Canada	Email 3: James.Pedro@teck.com	<input checked="" type="checkbox"/>
Phone Number 1-250-425-8137	Phone Number	Province BC	Country Canada	Email 4: Cameron.Griffin@teck.com	<input checked="" type="checkbox"/>
		Province BC	Country Canada	Email 5: Teck Lab Results@nautiusevironmental.teck.com	<input checked="" type="checkbox"/>
		Province BC	Country Canada	PO number 475474	<input checked="" type="checkbox"/>

SAMPLE DETAILS				ANALYSIS REQUESTED			
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.
EV_HCI_WS_2017-10-02_N	EV_HCI	WS	N	2017/10/02	9:40	G	4
EV_MC2_WS_2017-10-02_N	EV_MC2	WS	N	2017/10/02	11:00	G	4
				Total		8	
				ANALYSIS			
				30-day rainbow trout early life stage P/F CARBOYS			
				72h P.subcapitata P/F			
				7d C.dupia P/F			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
72h P.subcapitata P/F 30d rainbow trout early life stage P/F		7d C.dupia P/F		Cameron Griffin		Nautius - Burnaby NY - Navi Yamancho		Oct 03/17 @ 12:20	
NB OF BOTTLES RETURNED/DESCRIPTION		Kendall (default) X		Sampler's Name		Mobile #		Date/Time	
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		2 OCT - 17			

Clear, colorless, odorless, some particulates

\* Carboy leaked till 1/2 full

Pump

5.8  
6.0  
4x20L

**END OF REPORT**

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# Appendix B-5 Summary of 2017 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 2017 are provided in Appendix H of Teck 2018<sup>1</sup>. Teck has authored this appendix to provide a summary of the results.

### Summary of 2017 Acute Toxicity Testing

Two hundred and ten (210) 96-h rainbow trout 100% (single concentration) acute lethality toxicity tests and 235 48-h *Daphnia magna* 100% (single concentration) acute lethality toxicity tests were conducted in 2017 as a requirement of Permit 107517. Of the 235 *D. magna* acute toxicity tests, ten (4.3%) exhibited >50% mortality and as such were considered failed test results based on Permit 107517 criteria. There were no failures of rainbow trout toxicity tests in 2017 (i.e., mortality was ≤50% for all 2017 rainbow trout acute toxicity tests). A summary table of acute toxicity test results is provided in Appendix G of Teck 2018. Failed toxicity testing results are listed below in Table 1.

In response to the failed toxicity testing results, Teck followed the requirements of Permit 107517 Section 10.2.2 with respect to confirmatory testing (i.e., LC<sub>50</sub> follow-up tests), took immediate corrective action where possible, and provided follow-up test information to applicable regulators and the Ktunaxa Nation Council (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.

**Table 1. Failed 48-hour *Daphnia magna* acute toxicity tests and results.**

EMS	Site ID	Date	48-h <i>Daphnia magna</i> (single concentration) Units of % Mortality	Field Temperature (°C) Measured in Samples for Acute Toxicity Tests
0200384	GH_CC1	03/21/2017	90	1.9
E3E06924	FR_LMP1	04/21/2017	93	2.2
0200384	GH_CC1	05/08/2017	100	3
E291569	WL_BFWB_OUT_SP21	07/10/2017	100	11.3
E293371	WL_WLCI_SP01	07/14/2017	83	4.7
E291569	WL_BFWB_OUT_SP21	08/08/2017	87	12.3
0200384	GH_CC1	08/08/2017	67	7.1
E291569	WL_BFWB_OUT_SP21	09/18/2017	100	9.3
0200384	GH_CC1	11/01/2017	100	1.9
E221329	GH_SC1	11/01/2017	93	3.2

Teck currently hypothesizes, based on the results of additional investigative studies and recent scientific literature (e.g., Bogart et al. 2016<sup>2</sup>), that the formation of one or more mineral precipitates (including but not necessarily limited to calcite) was responsible for adverse effects

<sup>1</sup> Teck. 2018. Permit 107517 Annual Water Quality Monitoring Report.31 March 2018.

<sup>2</sup> 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.

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 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 TDS concentrations).

For acute toxicity test failures in 2017, tests conducted at the lower temperature (10°C) were generally more representative of temperature conditions in the field during the time of collection (1.9 – 12.3°C). At mainstem Fording River sites upstream (FR\_FR4) and downstream (FR\_FRCP1) from GH\_CC1, temperatures in 2017 ranged from -0.1 to 14.5°C; temperatures at these sites measured on or around the 2017 dates of the acute toxicity test failures observed at GH\_CC1 ranged from 0.3 to 14.5°C. Temperatures measured downstream of the WLC AWTF at LC\_LC3 (i.e., downstream of WL\_BFWB\_OUT\_SP3) ranged from 6.6 to 8.5°C on or around the dates of the acute toxicity failures observed in 2017 at WL\_BFWB\_OUT\_SP21; the maximum daily temperature observed in 2017 at LC\_LC3 was 9.3°C. The maximum daily temperature observed in 2017 was 7.4°C (May 31) at GH\_CC1 and 14.8°C at WL\_BFWB\_OUT\_SP21 (July 21). The association of test failures with relatively cool field temperatures (typically <10°C) is consistent with the hypothesis that warming the samples to 20°C for testing contributed to adverse effects by promoting precipitate formation.

In 2012 to 2015 near the northern portions of Teck's operations, the mainstem Fording River had maximum temperatures of ~15-19°C (Cope et al. 2016<sup>3</sup>). Test failures were not observed in 2017 under such relatively warm field conditions. For example, in 2017, the two highest temperatures at WL\_BFWB\_OUT\_SP21 (14.8 and 13.5°C) were observed on July 16 and 17; acute *D. magna* tests passed on July 17 with <50% mortality, although variability in *D. magna* response was observed between the two laboratories conducting the tests. Acute *D. magna*

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<sup>3</sup> Cope, S, CJ Schwarz, A Prince, J Bisset. 2016. Upper Fording River Westslope Cutthroat Trout Population Assessment and Telemetry Project: Final Report. Report Prepared for Teck Coal Limited, Sparwood, BC. Report Prepared by Westslope Fisheries Ltd., Cranbrook, BC.

toxicity test failures that occurred in 2016 at GH\_CC1 were observed when field temperatures of Cataract Creek were <10°C. The results of the acute toxicity tests conducted at 10 and 20°C are useful in evaluating risk of acute toxicity to invertebrates under actual environmental conditions. Results of the acute toxicity tests should be interpreted within the context of the temperatures and water quality in the effluent and receiving environments at the time of a failure.

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)<sup>4</sup>. 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 total dissolved solids (TDS). These results indicated that other trace elements or TDS were not causing the observed toxicity.

In one instance in which a single failure of the *D. magna* acute toxicity test occurred at FR\_LMP1 in 2017, toxicity did not appear to be caused by calcite; however, acute toxicity was not observed in subsequent TIE investigations (i.e., the toxicity dissipated in between the initial test and when the TIE investigation was conducted). Total aluminum and iron concentrations were noted to be elevated in the FR\_LMP1 sample but dissolved concentrations were below BC WQG. It is possible that precipitation in the FR\_LMP1 effluent occurred during sample storage, which may have reduced the toxicity of the effluent. Laboratory staff noted precipitate on the bottom of the test vessel during the original *D. magna* single concentration acute toxicity test. The cause of toxicity could not be definitively determined in this sample.

In 2017, failures of *D. magna* acute toxicity tests were most commonly observed at GH\_CC1 (no active water treatment) and WL\_BFWB\_OUT\_SP21 (active water treatment). Active water treatment at Cataract Creek (GH\_CC1) is planned as part of the Fording River South AWTF. Results of follow-up studies conducted at 10°C, with antiscalant treatment, as well as other TIE investigations and acute toxicity tests repeated in multiple laboratories for these two locations generally supported the hypothesis that a mineral precipitate (e.g., calcite) is responsible for the *D. magna* acute toxicity. Adverse effects in *D. magna* were typically reduced or eliminated when acute toxicity tests were conducted at lower temperatures or with addition of antiscalant, and under TIE conditions that reduced toxicity associated with carbonate precipitation, although results of some of the TIE tests were inconclusive as the original acute toxicity was not observed during the follow-up investigations. Acute toxicity and TIE laboratory reports are provided in Appendix H of Teck 2018.

Teck is currently drafting a Compliance Action Plan that identifies short-term actions and Key Performance Indicators to support the goals of 1) identifying the cause(s) of *D. magna* acute toxicity failures and 2) meeting the Permit 107517 requirement that effluent must not be acutely toxic. 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

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<sup>4</sup> CCME (Canadian Council of Ministers of the Environment). 1999. Water Quality Quality Guidelines for Protection of Aquatic Life. Available at <http://st-ts.ccme.ca/>.

due to laboratory conditions. The draft Compliance Action Plan will identify additional laboratory tests that 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, the draft Compliance Action Plan will also include an objective 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. Treatment designed to prevent calcite formation in AWTF effluent prior to discharge into the receiving environment is being considered meet the acute toxicity requirement in the Permit. The Compliance Action Plan will identify actions and Key Performance Indicators associated with a reduction of calcite formation. The Compliance Action Plan will support Teck's ongoing commitment to the implementation of the EVWQP to improve water quality in the Elk River watershed and meet the conditions detailed in Permit 107517.

**APPENDIX C**

# Water Quality Screening

Table C-1: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_UFR1

Parameter	Unit	Guidelines for the protection of:				Q1							
		Aquatic Life		EWWQP Benchmarks	Feb 21 ( <i>C. dubia</i> and <i>P. subcapitata</i> )	Feb 28	Mar 07	Mar 14	Mar 21	Feb 21, 28, Mar 7, 14 ( <i>H. azteca</i> )		Feb 21, 28, Mar 7, 14, 21 ( <i>P. promelas</i> )	
		30-day mean (BC MOE)	Maximum (BC MOE)							Mean	CV	Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.3	8.2	8.1	8.2	8.2	0.008	8.2	0.007
Temperature	°C	-	-	-	0	-0.1	0.10	0.10	-0.1	0.025	3.830	0	-
Dissolved oxygen	mg/L	8.0	5.0	-	12	11	12	12	12	0.026	12	0.027	
Conductivity	µS/cm	-	-	-	327	315	312	326	302	320	0.0244	316	0.0328
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.1	8.2	8.1	8.3	8.2	0.012	8.2	0.011
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	185	164	196	181	160	182	0.0732	177	0.0846
Total Alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(i)</sup>	-	-	146	143	138	137	133	141	0.0301	139	0.0368
Total dissolved solids	mg/L	-	-	-	194	185	193	209	199	195	0.0513	196	0.0451
Total suspended solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	0	1.0	0
Total organic carbon	mg/L	-	-	-	1.0	0.97	<0.5	0.57	<0.5	0.77	0.35	0.71	0.37
Dissolved organic carbon	mg/L	-	-	-	0.96	0.92	<0.5	0.51	<0.5	0.72	0.35	0.68	0.35
Turbidity	NTU	-	-	-	0.25	0.38	0.25	0.20	0.59	0.27	0.29	0.33	0.47
Conductivity	µS/cm	-	-	-	341	341	330	338	317	338	0.0154	333	0.0306
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0	0.050	0
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.50	0	0.50	0
Fluoride	mg/L	-	1.3 - 1.6 <sup>(b)</sup>	-	0.14	0.13	0.13	0.14	0.14	0.14	0.039	0.14	0.035
Sulphate	mg/L	309 - 429 <sup>(b,c)</sup>	-	481	45	46	47	47	44	46	0.021	46	0.025
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	4.6 - 8.8 <sup>(i)</sup>	0.22	0.21	0.21	0.21	0.20	0.21	0.017	0.21	0.038
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	<0.001	0.0018	<0.001	<0.001	<0.001	0.00120	0.33	0.0012	0.31
Total Ammonia	mg-N/L	0.21 - 1.4 <sup>(e)</sup>	1.1 - 7.0 <sup>(f)</sup>	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0050	0	0.0050	0
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	<0.05	<0.05	0.063	0.13	<0.05	0.074	0.53	0.069	0.51
Total phosphorus	mg-P/L	-	-	-	0.0071	0.0051	0.014	0.021	0.027	0.012	0.60	0.015	0.62
Orthophosphate	mg-P/L	-	-	-	0.0049	0.0050	0.0046	0.013	0.043	0.070	0.61	0.064	0.61
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0046	0.0055	0.0047	0.0052	0.018	0.0050	0.085	0.0076	0.774
Antimony	mg/L	0.0090	-	-	0.00026	<0.0001	0.00011	<0.0001	<0.0001	0.00014	0.55	0.00013	0.53
Arsenic	mg/L	-	0.0050	-	0.00012	0.00011	<0.0001	0.00012	0.00012	0.00011	0.09	0.00011	0.08
Barium	mg/L	1.0	-	-	0.073	0.075	0.078	0.098	0.084	0.081	0.14	0.082	0.12
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	0.000050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0100	0	0.010	0
Cadmium	mg/L	-	-	-	0.000011	0.000010	0.0000094	0.000013	0.000012	0.000011	0.15	0.000011	0.13
Calcium	mg/L	-	-	-	52	48	53	43	55	49	0.099	50	0.102
Chromium	mg/L	0.0010 <sup>(g)</sup>	-	-	0.00011	0.00011	0.00014	0.00017	0.00018	0.00013	0.22	0.00014	0.23
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Copper	mg/L	0.0041 - 0.0078 <sup>(b)</sup>	0.012 - 0.020 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	0.00050	0
Iron	mg/L	-	1.0	-	<0.01	<0.01	<0.01	<0.01	0.015	0.0100	0	0.011	0
Lead	mg/L	0.0066 - 0.011 <sup>(b)</sup>	0.084 - 0.19 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	0.000050	0
Lithium	mg/L	-	-	-	0.0014	0.0015	0.0015	0.0017	0.0020	0.0015	0.083	0.0016	0.147
Magnesium	mg/L	-	-	-	14	14	15	16	15	15	0.066	15	0.062
Manganese	mg/L	1.1 - 1.5 <sup>(h)</sup>	1.7 - 2.7 <sup>(h)</sup>	-	0.00027	0.00027	0.00025	0.00029	0.00060	0.00027	0.060	0.00034	0.441
Mercury	mg/L	0.000010	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	0.0000050	0
Molybdenum	mg/L	1.0	2.0	-	0.00062	0.00057	0.00063	0.00056	0.00073	0.00059	0.056	0.00062	0.110
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	0.00050	0
Potassium	mg/L	-	-	-	0.38	0.40	0.41	0.51	0.45	0.43	0.14	0.43	0.12
Selenium	mg/L	0.0020	-	0.019	0.00100	0.00085	0.0011	0.00084	0.00099	0.00094	0.12	0.00095	0.11
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0000100	0	0.000010	0
Sodium	mg/L	-	-	-	0.77	0.84	1.0	0.89	0.84	0.89	0.13	0.85	0.11
Strontium	mg/L	-	-	-	0.097	0.089	0.100	0.083	0.11	0.092	0.081	0.096	0.110
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0000100	0	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0100	0	0.010	0
Uranium	mg/L	0.0085	-	-	0.00048	0.00048	0.00050	0.00040	0.00060	0.00046	0.098	0.00049	0.145
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	0.00050	0
Zinc	mg/L	0.017 - 0.087 <sup>(b)</sup>	0.042 - 0.11 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	0.0057	<0.003	0.0037	0.37	0.0035	0.34
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(h)</sup>	0.10 <sup>(h)</sup>	-	<0.001	0.0010	<0.001	<0.001	0.0032	0.00100	0	0.0014	0.68
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Barium	mg/L	-	-	-	0.073	0.071	0.079	0.080	0.067	0.076	0.059	0.074	0.074
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	0.000050	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0100	0	0.010	0
Cadmium	mg/L	0.00021 - 0.00035 <sup>(b)</sup>	0.00060 - 0.0012 <sup>(b)</sup>	0.00044 - 0.00076 <sup>(i)</sup>	0.000010	0.0000079	0.0000073	0.0000084	0.0000084	0.0000085	0.15	0.000084	0.13
Chromium	mg/L	-	-	-	<0.0001	0.00010	<0.0001	0.00010	<0.0001	0.000100	0	0.00010	0.00
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Copper	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00020	0	0.00020	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0100	0	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	0.000050	0
Lithium	mg/L	-	-	-	0.0013	0.0016	0.0016	0.0019	0.0016	0.0016	0.15	0.0016	0.13
Manganese	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	0.0000050	0
Molybdenum	mg/L	-	-	-	0.00062	0.00052	0.00061	0.00065	0.00053	0.00060	0.089	0.00058	0.095
Nickel	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	0.00050	0
Selenium	mg/L	-	-	-	0.0012	0.00098	0.0011	0.00095	0.00090	0.0010	0.11	0.0010	0.12
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0000100	0	0.000010	0
Strontium	mg/L	-	-	-	0.097	0.083	0.099	0.086	0.094	0.084	0.083	0.093	0.083
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0000100	0	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000100	0	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0100	0	0.010	0
Uranium	mg/L	-	-	-	0.00046	0.00043	0.00047						

Table C-1: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_UFR1

Parameter	Unit	Guidelines for the protection of:				Q2											
		Aquatic Life		EWWQP Benchmarks	Apr 24 ( <i>C. dubia</i> and <i>P. subcapitata</i> )	May 02	May 09	May 16	Apr 24, May 2, 9, 16 ( <i>H. azteca</i> )		May 23	Apr 24, May 2, 9, 16, 23 ( <i>P. promelas</i> )		May 30	Jun 06	May 9, 16, 23, 30 June 6 ( <i>O. mykiss</i> )	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV			Mean	CV
<b>Field Measured</b>																	
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.0	8.3	8.3	8.3	8.2	0.021	8.3	8.2	0.019	8.2	8.2	8.3	0.0085
Temperature	°C	-	-	-	0.70	1.1	2.5	1.6	1.5	0.53	2.7	1.7	0.50	2.8	3.5	2.6	0.26
Dissolved oxygen	mg/L	8.0	5.0	-	12	11	11	11	11	0.029	12	11	0.030	9.4	11	11	0.077
Conductivity	µS/cm	-	-	-	235	256	229	211	233	0.0795	197	226	0.100	190	198	205	0.075
<b>Conventional Parameters</b>																	
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.3	8.3	8.4	8.3	0.0052	8.2	8.3	0.0059	8.2	8.3	8.3	0.0071
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	121	141	120	122	126	0.080	106	122	0.102	102	109	112	0.079
Total Alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(i)</sup>	-	-	113	118	115	129	119	0.060	105	116	0.075	108	107	113	0.087
Total dissolved solids	mg/L	-	-	-	143	164	139	138	146	0.084	129	143	0.091	118	129	131	0.065
Total suspended solids	mg/L	-	-	-	4.4	<1.0	4.0	2.6	3.0	0.59	20	6	1.23	22	2.5	10.4	0.97
Total organic carbon	mg/L	-	-	-	3.7	2.7	3.8	2.9	3.3	0.17	2.5	3.1	0.19	2.6	2.7	2.9	0.18
Dissolved organic carbon	mg/L	-	-	-	3.3	2.6	3.7	2.6	3.0	0.18	2.6	2.9	0.18	2.0	1.9	2.5	0.28
Turbidity	NTU	-	-	-	4.7	1.3	2.6	1.6	2.6	0.60	11	4	0.92	13	1.5	6.0	0.95
Conductivity	µS/cm	-	-	-	239	274	238	237	247	0.073	202	238	0.107	197	216	218	0.088
<b>Major Ions</b>																	
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	0.05	0	<0.05	0.05	0	<0.05	<0.05	0.05	0
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	<0.5	0.5	0	<0.5	0.5	0	<0.5	<0.5	0.5	0
Fluoride	mg/L	-	1.3 - 1.6 <sup>(b)</sup>	-	0.11	0.11	0.11	0.12	0.11	0.054	0.099	0.111	0.076	0.11	0.11	0.11	0.077
Sulphate	mg/L	309 - 429 <sup>(b,c)</sup>	-	-	481	24	14	12	18	0.34	8.8	15.9	0.41	7.6	9.3	10.2	0.24
<b>Nutrients</b>																	
Nitrate	mg-N/L	3.0	33	4.6 - 8.8 <sup>(i)</sup>	0.098	0.048	0.098	0.072	0.079	0.30	0.075	0.078	0.27	0.073	0.034	0.070	0.33
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	<0.001	<0.001	<0.001	0.0057	0.0022	1.20	<0.001	0.002	1.20	<0.001	<0.001	0.002	1.20
Total Ammonia	mg-N/L	0.21 - 1.4 <sup>(e)</sup>	1.1 - 7.0 <sup>(f)</sup>	-	0.011	<0.005	0.0069	<0.005	0.007	0.59	<0.005	0.007	0.58	<0.005	0.0063	0.0056	0.40
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.18	0.13	<0.05	0.11	0.12	0.56	0.15	0.12	0.48	0.13	<0.05	0.10	0.60
Total phosphorus	mg-P/L	-	-	-	0.02	0.011	0.032	0.0093	0.0180	0.58	0.037	0.022	0.56	0.032	0.0070	0.0230	0.61
Orthophosphate	mg-P/L	-	-	-	0.0087	0.0047	0.011	0.0051	0.0074	0.41	0.0066	0.0072	0.36	0.0041	0.0036	0.0061	0.49
<b>Total Metals</b>																	
Aluminum	mg/L	-	-	-	0.15	0.051	0.095	0.061	0.090	0.52	0.30	0.13	0.77	0.28	0.055	0.157	0.77
Antimony	mg/L	0.0090	-	-	<0.0001	<0.0001	<0.0001	0.00014	0.00011	0.41	<0.0001	0.0001	0.37	<0.0001	<0.0001	0.0001	0.37
Arsenic	mg/L	-	0.0050	-	0.00019	0.00015	0.00016	0.00014	0.00016	0.14	0.00026	0.00018	0.27	0.00028	0.00015	0.00020	0.34
Barium	mg/L	1.0	-	-	0.051	0.055	0.043	0.037	0.047	0.17	0.042	0.046	0.16	0.039	0.040	0.040	0.061
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0	0.000023	<0.00002	0.00002	0.28
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0	<0.00005	<0.00005	0.00005	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	0.01	0.01	0	<0.01	0.01	0	<0.01	<0.01	0.01	0
Cadmium	mg/L	-	-	-	0.000023	0.000013	0.000024	0.000013	0.000018	0.33	0.000037	0.000022	0.44	0.000040	0.000014	0.000025	0.49
Calcium	mg/L	-	-	-	31	37	33	31	33	0.080	31	32	0.077	29	30	31	0.045
Chromium	mg/L	0.0010 <sup>(g)</sup>	-	-	0.00040	0.00027	0.00052	0.00064	0.00046	0.35	0.00062	0.00049	0.32	0.00092	0.00022	0.00058	0.43
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	0.00019	0.00012	0.53	0.00020	<0.0001	0.0001	0.58
Copper	mg/L	0.0041 - 0.0078 <sup>(h)</sup>	0.012 - 0.020 <sup>(h)</sup>	-	0.00067	<0.0005	0.00051	<0.0005	0.0005	0.38	0.00075	0.00059	0.40	0.00076	<0.0005	0.0006	0.42
Iron	mg/L	-	1.0	-	0.13	0.040	0.10	0.057	0.082	0.50	0.38	0.14	0.97	0.38	0.076	0.199	0.84
Lead	mg/L	0.0066 - 0.011 <sup>(h)</sup>	0.084 - 0.19 <sup>(h)</sup>	-	0.000092	<0.00005	0.000068	<0.00005	0.00007	0.51	0.00027	0.00011	0.95	0.00028	<0.00005	0.00014	0.91
Lithium	mg/L	-	-	-	0.0012	0.0014	0.0013	<0.001	0.001	0.33	0.0012	0.0012	0.29	0.0014	0.0011	0.0012	0.29
Magnesium	mg/L	-	-	-	8.7	10	9.5	8.8	9.4	0.082	8.0	9.1	0.10	7.9	8.6	8.6	0.080
Manganese	mg/L	1.1 - 1.5 <sup>(h)</sup>	1.7 - 2.7 <sup>(h)</sup>	-	0.0035	0.00076	0.00039	0.00024	0.00026	0.53	0.017	0.005	1.17	0.018	0.0032	0.0087	0.87
Mercury	mg/L	0.000010	-	-	0.0000031	0.0000017	0.0000024	0.0000017	0.0000022	0.31	0.0000031	0.0000024	0.29	0.0000029	0.0000011	0.0000022	0.37
Molybdenum	mg/L	1.0	2.0	-	0.00050	0.00053	0.00053	0.00051	0.00052	0.28	0.00054	0.00052	0.30	0.00055	0.00056	0.00054	0.38
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.00069	<0.0005	0.00051	<0.0005	0.0006	0.39	0.00081	0.00060	0.42	0.00087	<0.0005	0.0006	0.46
Potassium	mg/L	-	-	-	0.38	0.34	0.39	0.33	0.36	0.076	0.50	0.39	0.17	0.48	0.38	0.42	0.17
Selenium	mg/L	0.0020	-	0.019	0.00060	0.00098	0.00063	0.00050	0.00068	0.31	0.00050	0.00064	0.30	0.00040	0.00043	0.00049	0.18
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	0.000020	<0.00001	<0.00001	<0.00001	0.00001	0.60	<0.00001	0.00001	0.56	<0.00001	<0.00001	0.00001	0
Sodium	mg/L	-	-	-	0.62	0.59	0.53	0.60	0.53	0.10	0.51	0.50	0.11	0.50	0.53	0.53	0.065
Strontium	mg/L	-	-	-	0.062	0.070	0.065	0.060	0.064	0.068	0.060	0.063	0.067	0.058	0.060	0.060	0.043
Thallium	mg/L	0.00080	-	-	<0.00001	0.000012	<0.00001	<0.00001	0.00001	0.33	0.000014	0.000011	0.40	0.000015	<0.00001	0.00001	0.44
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0	<0.0001	<0.0001	0.0001	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	0.01	0.01	0	<0.01	0.01	0	<0.01	<0.01	0.01	0
Uranium	mg/L	0.0085	-	-	0.00034	0.00036	0.00033	0.00032	0.00034	0.047	0.00029	0.00033	0.081	0.00026	0.00029	0.00030	0.10
Vanadium	mg/L	-	-	-	0.0010	0.00051	0.00059	<0.0005	0.0007	0.50	0.0013	0.0008	0.54	0.0012	0.00054	0.00083	0.55
Zinc	mg/L	0.017 - 0.087 <sup>(b)</sup>	0.042 - 0.11 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.003	0	<0.003	0.003	0	0.0035	<0.003	0.003	0.29
<b>Dissolved Metals</b>																	
Aluminum	mg/L	0.050 <sup>(h)</sup>	0.10 <sup>(h)</sup>	-	<b>0.088<sup>(Mn)</sup></b>	0.028	0.0069	0.0046	0.0319	1.2	0.0039	0.0263	1.4	0.0089	0.0036	0.0056	0.41
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0	<0.0001	<0.0001	0.0001	0
Arsenic	mg/L	-	-	-	0.00015	0.00012	0.00012	0.00014	0.00014	0.092	0.00012	0.00013	0.10	0.00013	0.00011	0.00012	0.092
Barium	mg/L	-	-	-	0.053	0.057	0.043	0.041	0.049	0.16	0.037	0.046	0.18	0.035	0.037	0.039	0.087
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0	<0.00002	<0.00002	0.00002	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0	<0.00005	<0.00005	0.00005	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0	<0.01	<0.01	0.01	0
Cadmium	mg/L	0.															

Table C-1: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_UFR1

Parameter	Unit	Guidelines for the protection of:			Q3								
		Aquatic Life		EVWQP Benchmarks	Jul 25 ( <i>C.dubia</i> and <i>P.subcapitata</i> )	Aug 01	Aug 08	Aug 15	Jul 25, Aug 1, 8, 15 ( <i>H. azteca</i> )		Aug 22	Jul 25, Aug 1, 8, 15, 22 ( <i>P.promelas</i> )	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	7.9	8.0	8.4	8.2	0.030	8.2	8.2	0.026
Temperature	°C	-	-	-	9.3	8.7	8.7	7.6	8.6	0.083	7.8	8.4	0.084
Dissolved oxygen	mg/L	8.0	5.0	-	9.6	9.6	9.5	11	10	0.079	9.9	10.0	0.069
Conductivity	µS/cm	-	-	-	294	314	303	307	304	0.027	320	308	0.032
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.3	8.4	8.4	8.4	0.006	8.4	8.4	0.006
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	159	194	182	177	178	0.082	186	180	0.073
Total Alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(i)</sup>	-	-	148	144	151	145	147	0.022	148	147	0.019
Total dissolved solids	mg/L	-	-	-	164	213	218	208	201	0.12	216	204	0.11
Total suspended solids	mg/L	-	-	-	1.1	1.4	<1.0	<1.0	1.1	0.17	<1.0	1.1	0.16
Total organic carbon	mg/L	-	-	-	2.7	1.3	1.1	0.94	1.49	0.53	0.87	1.37	0.54
Dissolved organic carbon	mg/L	-	-	-	1.8	0.93	0.88	0.88	1.11	0.38	2.3	1.3	0.48
Turbidity	NTU	-	-	-	0.36	0.20	0.20	0.19	0.24	0.34	0.43	0.28	0.40
Conductivity	µS/cm	-	-	-	319	325	350	336	333	0.041	336	333	0.036
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	0.05	0	<0.05	0.05	0
Chloride	mg/L	150	600	-	<0.5	0.11	0.11	0.12	0.21	0.92	<0.5	0.3	0.79
Fluoride	mg/L	-	1.3 - 1.6 <sup>(b)</sup>	-	0.14	0.16	0.16	0.17	0.15	0.087	0.14	0.15	0.094
Sulphate	mg/L	309 - 429 <sup>(b,c)</sup>	-	481	32	35	37	39	36	0.084	40	37	0.089
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	4.6 - 8.8 <sup>(f)</sup>	0.011	0.012	0.012	0.016	0.012	0.18	0.018	0.014	0.23
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	<0.001	<0.001	<0.001	<0.001	0.001	0	<0.001	0.001	0
Total Ammonia	mg-N/L	0.21 - 1.4 <sup>(e)</sup>	1.1 - 7.0 <sup>(f)</sup>	-	0.010	<0.005	<0.005	<0.005	0.006	0.42	<0.005	0.006	0.39
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.078	0.074	<0.05	<0.05	0.06	0.24	<0.05	0.06	0.24
Total phosphorus	mg-P/L	-	-	-	0.0078	0.0030	0.0030	0.0030	0.0042	0.57	0.0045	0.0043	0.49
Orthophosphate	mg-P/L	-	-	-	0.0027	0.0023	0.0027	0.0023	0.0025	0.092	0.0031	0.0026	0.13
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0071	0.0071	0.0045	0.0045	0.0058	0.26	0.0051	0.0057	0.24
Antimony	mg/L	0.0090	-	-	0.00011	<0.0001	<0.0001	<0.0001	0.0001	0.049	<0.0001	0.0001	0.044
Arsenic	mg/L	-	0.0050	-	0.00013	<0.0001	0.00015	0.00012	0.00013	0.17	<0.0001	0.0001	0.18
Barium	mg/L	1.0	-	-	0.069	0.073	0.075	0.073	0.073	0.032	0.076	0.073	0.032
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Cadmium	mg/L	-	-	-	0.000012	0.000013	0.000012	0.000010	0.000012	0.080	0.000011	0.000012	0.072
Calcium	mg/L	-	-	-	45	52	54	51	50	0	50	50	0.062
Chromium	mg/L	0.0010 <sup>(g)</sup>	-	-	0.00028	0.00012	0.00022	0.00021	0.00021	0.32	0.00016	0.00020	0.31
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Copper	mg/L	0.0041 - 0.0078 <sup>(b)</sup>	0.012 - 0.020 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Iron	mg/L	-	1.0	-	0.011	<0.01	<0.01	<0.01	0.01	0.049	<0.01	0.01	0.044
Lead	mg/L	0.0066 - 0.011 <sup>(b)</sup>	0.084 - 0.19 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Lithium	mg/L	-	-	-	0.0015	0.0016	0.0018	0.0018	0.0017	0.090	0.0020	0.0017	0.11
Magnesium	mg/L	-	-	-	13	14	13	14	13	0	13	13	0.029
Manganese	mg/L	1.1 - 1.5 <sup>(h)</sup>	1.7 - 2.7 <sup>(b)</sup>	-	0.0011	0.00083	0.00062	0.00046	0.00075	0.35	0.00057	0.00071	0.34
Mercury	mg/L	0.000010	-	-	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.0000005	0	<0.0000005	0.0000005	0
Molybdenum	mg/L	1.0	2.0	-	0.00068	0.00070	0.00068	0.00064	0.00067	0.036	0.00064	0.00067	0.040
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Potassium	mg/L	-	-	-	0.48	0.46	0.47	0.43	0.46	0.044	0.45	0.46	0.040
Selenium	mg/L	0.0020	-	0.019	0.00059	0.00061	0.00061	0.00056	0.00059	0.042	0.00054	0.00058	0.053
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Sodium	mg/L	-	-	-	0.69	0.70	0.68	0.67	0.69	0.018	0.68	0.68	0.017
Strontium	mg/L	-	-	-	0.090	0.097	0.10	0.097	0.096	0.047	0.096	0.096	0.041
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Uranium	mg/L	0.0085	-	-	0.00038	0.00042	0.00044	0.00042	0.00041	0.060	0.00046	0.00042	0.071
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Zinc	mg/L	0.017 - 0.087 <sup>(b)</sup>	0.042 - 0.11 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.003	0	<0.003	0.003	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(h)</sup>	0.10 <sup>(h)</sup>	-	0.0015	<0.003	<0.003	<0.003	0.003	0.286	<0.003	0.003	0.25
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Barium	mg/L	-	-	-	0.068	0.078	0.077	0.075	0.074	0.060	0.078	0.075	0.056
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Cadmium	mg/L	0.00021 - 0.00035 <sup>(b)</sup>	0.00060 - 0.0012 <sup>(b)</sup>	0.00044 - 0.00076 <sup>(f)</sup>	0.000080	0.000089	0.000096	0.000063	0.000082	0.17	0.000085	0.000083	0.15
Chromium	mg/L	-	-	-	<0.0001	0.00010	0.00012	0.00010	0.00011	0.095	<0.0001	0.0001	0.086
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Copper	mg/L	-	-	-	<0.0002	<0.0005	<0.0005	<0.0005	0.0004	0.35	<0.0005	0.0004	0.30
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Lithium	mg/L	-	-	-	0.0015	0.0017	0.0021	0.0018	0.0018	0.14	0.0020	0.0018	0.13
Manganese	mg/L	-	-	-	0.00036	0.00022	<0.0001	0.00017	0.00021	0.52	0.00032	0.00023	0.46
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	0	<0.000005	0.000005	0
Molybdenum	mg/L	-	-	-	0.00064	0.00066	0.00066	0.00059	0.00063	0.050	0.00061	0.00063	0.045
Nickel	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Selenium	mg/L	-	-	-	0.00060	0.00052	0.00055	0.00054	0.00055	0.060	0.00051	0.00054	0.062
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Strontium	mg/L	-	-	-	0.088	0.10	0.10	0.095	0.096	0.066	0.099	0.097	0.058
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Uranium	mg/L	-	-	-	0.00037	0.00046	0.00047	0.00044	0.00043	0.10	0.00048		



**Table C-1: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_UFR1**

Parameter	Unit	Guidelines for the protection of:			Q4								
		Aquatic Life		EWWQP Benchmarks	Oct 02 (C.dubia and P.subcapitata)	Oct 10	Oct 17	Oct 24	Oct 2, 10, 17, 24 (H. azteca)		Oct 31	Oct 2, 10, 17, 24, 31 (P.promelas and O.mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.2	8.2	8.6	8.3	0.024	8.5	8.4	0.023
Temperature	°C	-	-	-	2.4	2.4	3.9	2.6	2.8	0.26	0.90	2.44	0.44
Dissolved oxygen	mg/L	8.0	5.0	-	12	12	11	12	12	0.027	12	12	0.027
Conductivity	µS/cm	-	-	-	323	327	327	307	321	0.030	319	321	0.026
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.4	8.4	8.4	8.4	0.0039	8.3	8.4	0.0054
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	185	191	177	177	183	0.037	189	184	0.036
Total Alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	138	146	149	143	144	0.033	144	144	0.028
Total dissolved solids	mg/L	-	-	-	221	232	235	252	235	0.055	235	235	0.047
Total suspended solids	mg/L	-	-	-	1.2	<1.0	<1.0	<1.0	1.1	0.10	<1.0	1.0	0.086
Total organic carbon	mg/L	-	-	-	1.0	0.80	0.61	0.67	0.8	0.23	0.91	0.80	0.21
Dissolved organic carbon	mg/L	-	-	-	1.1	0.62	0.55	0.65	0.7	0.33	0.67	0.71	0.29
Turbidity	NTU	-	-	-	0.45	0.24	0.36	0.38	0.36	0.24	0.44	0.37	0.22
Conductivity	µS/cm	-	-	-	333	341	317	339	333	0.033	339	334	0.030
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	0.058	<0.05	<0.05	0.05	0.077	<0.05	0.05	0.069
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	<0.5	0.5	0	<0.5	0.5	0
Fluoride	mg/L	-	1.3 - 1.6 <sup>(b)</sup>	-	0.11	0.12	0.11	0.11	0.11	0.030	0.11	0.11	0.033
Sulphate	mg/L	309 - 429 <sup>(b,c)</sup>	-	481	44	46	47	47	46	0.026	46	46	0.023
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	4.6 - 8.8 <sup>(i)</sup>	0.0094	0.013	0.032	0.041	0.0239	0.63	0.062	0.031	0.68
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	0.0011	<0.001	<0.001	0.0010	0.0010	0.049	<0.001	0.001	0.044
Total Ammonia	mg-N/L	0.21 - 1.4 <sup>(e)</sup>	1.1 - 7.0 <sup>(e)</sup>	-	<0.005	<0.005	0.0059	<0.005	0.005	0.086	<0.005	0.005	0.078
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	<0.05	0.068	0.11	<0.05	0.07	0.43	0.095	0.075	0.38
Total phosphorus	mg-P/L	-	-	-	0.0023	0.0039	<0.002	0.0030	0.0028	0.30	0.0028	0.0028	0.26
Orthophosphate	mg-P/L	-	-	-	0.0016	<0.001	0.0015	0.0016	0.0014	0.20	0.0016	0.0015	0.18
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0037	<0.003	0.0033	<0.003	0.0033	0.10	0.0035	0.0033	0.093
Antimony	mg/L	0.0090	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Arsenic	mg/L	-	0.0050	-	0.00011	0.00012	0.00010	0.00012	0.00011	0.085	<0.0001	0.0001	0.091
Barium	mg/L	1.0	-	-	0.072	0.079	0.078	0.065	0.074	0.083	0.073	0.073	0.072
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Cadmium	mg/L	-	-	-	0.000010	0.000097	0.000012	0.000097	0.000010	0.11	0.000072	0.000098	0.18
Calcium	mg/L	-	-	-	50	54	51	50	51	0.036	52	51	0.032
Chromium	mg/L	0.0010 <sup>(g)</sup>	-	-	0.00012	0.00010	0.00015	<0.0002	0.00014	0.31	0.00031	0.00018	0.48
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Copper	mg/L	0.0041 - 0.0078 <sup>(b)</sup>	0.012 - 0.020 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Iron	mg/L	-	1.0	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Lead	mg/L	0.0066 - 0.011 <sup>(b)</sup>	0.084 - 0.19 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Lithium	mg/L	-	-	-	0.0017	0.0020	0.0018	0.0013	0.0017	0.17	0.0018	0.0017	0.15
Magnesium	mg/L	-	-	-	14	15	14	15	14	0.028	15	14	0.032
Manganese	mg/L	1.1 - 1.5 <sup>(b)</sup>	1.7 - 2.7 <sup>(b)</sup>	-	0.00056	0.00060	0.00043	0.00041	0.00050	0.19	0.00035	0.00047	0.22
Mercury	mg/L	0.000010	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	0	<0.000005	0.000005	0
Molybdenum	mg/L	1.0	2.0	-	0.00054	0.00060	0.00060	0.00060	0.00058	0.050	0.00060	0.00059	0.44
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Potassium	mg/L	-	-	-	0.40	0.41	0.40	0.38	0.40	0.033	0.35	0.39	0.060
Selenium	mg/L	0.0020	-	0.019	0.00055	0.00065	0.00062	0.00061	0.00061	0.071	0.00064	0.00061	0.067
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Sodium	mg/L	-	-	-	0.72	0.70	0.72	0.67	0.70	0.034	0.63	0.69	0.053
Strontium	mg/L	-	-	-	0.095	0.10	0.100	0.098	0.099	0.029	0.099	0.099	0.025
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Uranium	mg/L	0.0085	-	-	0.00045	0.00050	0.00057	0.00050	0.00051	0.095	0.00044	0.00049	0.10
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Zinc	mg/L	0.017 - 0.087 <sup>(b)</sup>	0.042 - 0.11 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.003	0	<0.003	0.003	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(h)</sup>	0.10 <sup>(h)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.003	0	<0.003	0.003	0
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Barium	mg/L	-	-	-	0.072	0.075	0.077	0.067	0.073	0.063	0.080	0.074	0.067
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0	<0.00002	0.00002	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Cadmium	mg/L	0.00021 - 0.00035 <sup>(b)</sup>	0.00060 - 0.0012 <sup>(b)</sup>	0.00044 - 0.00076 <sup>(i)</sup>	0.000069	0.000069	0.000074	0.000061	0.000068	0.079	0.000069	0.000068	0.068
Chromium	mg/L	-	-	-	<0.0001	0.00010	<0.0001	0.00010	0.0001	0	<0.0001	0.0001	0
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Copper	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0	<0.00005	0.00005	0
Lithium	mg/L	-	-	-	0.0019	0.0018	0.0018	0.0013	0.0017	0.16	0.0016	0.0017	0.14
Manganese	mg/L	-	-	-	<0.0001	0.00020	<0.0001	<0.0001	0.0001	0.40	0.00011	0.00012	0.36
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	0	<0.000005	0.000005	0
Molybdenum	mg/L	-	-	-	0.00055	0.00056	0.00056	0.00059	0.00057	0.031	0.00058	0.00057	0.028
Nickel	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0
Selenium	mg/L	-	-	-	0.00058	0.00065	0.00063	0.00060	0.00059	0.082	0.00060	0.00059	0.072
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Strontium	mg/L	-	-	-	0.10	0.10	0.095	0.093	0.10	0.042	0.11	0.10	0.050
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0	<0.00001	0.00001	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.01	0	<0.01	0.01	0
Uranium	mg/L	-	-	-	0.00051	0.00051	0.00056	0.00051	0.00052	0.050	0.00051	0.00052	0.44
Vanadium													



Table C-3: Water Quality Screening for 2017 Chronic Toxicity Tests at CM\_MC1

Parameter	Unit	Guidelines for the protection of:			Q2										Q3				Q4				
		Aquatic Life		EVWQP Benchmarks	May 02 (C. dubia and P. subcapitata)	Jul 25 (C. dubia and P. subcapitata)	Aug 01	Aug 08	Aug 15	Jul 25, Aug 1, 8, 15 (H. azteca)		Aug 22	Jul 25, Aug 1, 8, 15, 22 (P. promelas)		Oct 02 (C. dubia and P. subcapitata)	Oct 10	Oct 17	Oct 24	Oct 2, 10, 17, 24 (H. azteca)		Oct 31	Oct 2, 10, 17, 24, 31 (P. promelas and O. mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)							Mean	CV		Mean	CV					Mean	CV		Mean	CV
<b>Field Measured</b>																							
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.1	8.2 <sup>(Mn)</sup>	8.2	7.9	8.5	7.7	0.14	8.0	7.8	0.12	8.3	8.5	8.1	8.3	8.3	0.016	8.1	8.3	0.017
Temperature	°C	-	-	-	1.2	7.0	8.2	8.4	7.7	7.8	0.085	6.8	7.6	0.098	3.5	3.1	3.6	3.0	2.32	1.4	2.7	0.35	
Dissolved oxygen	mg/L	8.0	5.0	-	17	11	15	14	13	13	0.14	13	13	0.12	14	14	12	13	13	0.085	12	13	0.079
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	286	-	-
<b>Conventional Parameters</b>																							
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.2	8.2	8.3	8.4	8.3	0.010	8.3	8.3	0.010	8.3	8.3	8.3	8.1	8.2	0.012	8.2	8.2	0.011
Specific conductivity	µS/cm	-	-	-	271	274	281	283	275	0.036	286	286	277	0.036	286	286	286	274	286	0.028	287	286	0.025
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	134	138	147	150	148	0.036	148	146	0.032	144	155	137	136	143	0.061	147	144	0.054	
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(f)</sup>	-	-	133	141	138	145	143	0.021	143	142	0.019	134	146	126	136	136	0.061	136	136	0.053	
Total dissolved solids	mg/L	-	-	-	148	162	179	144	161	0.089	171	163	0.080	166	177	179	170	173	0.035	163	171	0.040	
Total suspended solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	0	1.0	1.0	0	2.4	<1.0	<1.0	<1.0	1.4	0.519	<1.0	1.3	0.49	
Total organic carbon	mg/L	-	-	-	1.9	1.2	1.2	0.95	0.95	1.08	0.14	0.98	1.06	0.13	1.4	1.1	0.67	1.6	1.2	0.34	1.1	1.2	0.30
Dissolved organic carbon	mg/L	-	-	-	1.8	1.2	2.0	0.98	0.88	1.26	0.42	2.1	1.43	0.41	1.6	1.1	0.75	1.7	1.3	0.34	1.0	1.2	0.32
Turbidity	NTU	0.41	0.37	-	0.41	0.35	0.35	0.35	0.35	0.37	0.076	0.44	0.38	0.104	1.3	0.16	0.22	0.42	0.52	0.998	0.30	0.48	0.97
Conductivity	µS/cm	-	-	-	267	265	268	266	275	0.017	275	270	0.018	280	275	265	270	273	0.024	287	275	0.031	
<b>Major Ions</b>																							
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0	<0.05	0.05	0	<0.05	<0.05	<0.05	<0.05	0.05	0	<0.25	0.09	0.99
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	<0.5	0.5	0	<0.5	0.5	0	<0.5	<0.5	<0.5	<0.5	0.52	0.57	0.020	3.50	1.10	1.21
Fluoride	mg/L	-	1.2 - 1.5 <sup>(h)</sup>	-	0.052	0.054	0.055	0.058	0.052	0.055	0.046	0.047	0.053	0.077	0.055	0.059	0.048	0.045	0.052	0.024	0.260	0.093	0.989
Sulphate	mg/L	309 <sup>(h)</sup>	-	-	481	11	13	13	14	13	0.068	14	13	0.068	13	14	14	15	14	0.061	85	28	1.121
<b>Nutrients</b>																							
Nitrate	mg-N/L	3.0	33	6.0 - 6.9 <sup>(h)</sup>	0.012	0.012	0.017	0.016	0.014	0.015	0.17	0.031	0.018	0.42	0.015	0.011	0.010	0.024	0.015	0.43	0.278	0.068	1.74
Nitrite	mg-N/L	0.020 - 0.040 <sup>(f)</sup>	0.060 - 0.12 <sup>(f)</sup>	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0	<0.001	0.001	0	<0.001	<0.001	<0.001	0.0011	0.0010	0.049	<0.0050	0.0018	0.977
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.098	0.10	<0.05	<0.05	<0.05	0.06	0.43	<0.05	0.06	0.40	<0.2	<0.05	0.12	0.097	0.118	0.53	0.090	0.112	0.50
Orthophosphate	mg-P/L	-	-	-	0.0029	0.0050	0.0055	0.0044	0.0048	0.0049	0.093	0.0053	0.0050	0.086	0.0035	0.0033	0.0035	0.0036	0.0035	0.036	0.0034	0.0035	0.033
Total Ammonia	mg-N/L	0.38 - 1.9 <sup>(f)</sup>	2.0 - 28 <sup>(h)</sup>	-	<0.005	0.0067	0.0069	0.0067	<0.005	0.006	0.14	<0.001	0.006	0.12	<0.005	<0.005	0.011	0.0093	0.0075	0.39	<0.0050	0.0070	0.39
Phosphorus	mg-P/L	-	-	-	0.0094	0.0090	0.0083	0.0075	0.0080	0.0210	1.24	0.0081	0.0184	1.27	0.0045	<0.002	<0.002	0.0027	0.0028	0.42	0.0051	0.0033	0.44
<b>Total Metals</b>																							
Aluminum	mg/L	-	-	-	0.020	0.021	0.012	0.0092	0.0092	0.0129	0.45	0.0065	0.0116	0.061	0.0086	0.0035	<0.003	0.0066	0.0054	0.488	0.0119	0.0067	0.550
Antimony	mg/L	0.0090	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.095	<0.0001	0.0001	0.086	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.000	<0.0001	0.0001	0.000
Arsenic	mg/L	-	0.0050	-	0.0024	0.0022	0.0025	0.0023	0.0023	0.0023	0.097	0.0021	0.0022	0.093	0.0019	0.0017	0.0019	0.0019	0.0019	0.054	0.0017	0.0018	0.060
Barium	mg/L	1.0	-	-	0.046	0.046	0.051	0.052	0.053	0.050	0.062	0.056	0.052	0.073	0.051	0.053	0.054	0.047	0.051	0.060	0.048	0.051	0.055
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	<0.00002	0.00002	0	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	<0.00005	0.00005	0	0
Boron	mg/L	-	1.2	-	0.013	0.013	0.013	0.016	0.017	0.015	0.14	0.016	0.015	0.12	0.014	0.013	0.015	0.014	0.06	0.13	0.014	0.06	
Cadmium	mg/L	-	-	-	0.00015	0.00015	0.00012	0.00010	0.00011	0.00012	0.19	0.00013	0.00012	0.16	0.000083	0.000075	0.000075	0.000075	0.000075	0.18	0.00008	0.00009	0.17
Calcium	mg/L	-	-	-	36	36	40	39	42	39	0.067	41	40	0.063	41	46	39	41	42	0.070	37	41	0.082
Chromium	mg/L	0.0010 <sup>(g)</sup>	-	-	0.00018	0.00028	0.00025	0.00023	0.00025	0.00023	0.082	0.00022	0.00025	0.094	0.00018	0.00021	0.00019	0.00018	0.00019	0.074	0.00021	0.00019	0.078
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	0.0001	0	
Copper	mg/L	0.0031 - 0.0062 <sup>(h)</sup>	0.0004 - 0.017 <sup>(h)</sup>	-	<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	<0.0005	0.0005	0	
Iron	mg/L	-	1.0	-	0.021	0.033	0.011	<0.01	<0.01	0.02	0.71	<0.01	0.01	0.69	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	
Lead	mg/L	0.0057 - 0.0089 <sup>(h)</sup>	0.000 - 0.14 <sup>(h)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0	<0.0005	0.0005	0	<0.0005	<0.0005	<0.0005	0.00005	0.39	<0.0005	0.00005	0	
Lithium	mg/L	-	-	-	0.0042	0.0045	0.0043	0.0046	0.0047	0.0045	0.038	0.0043	0.0045	0.040	0.0046	0.0044	0.0048	0.0048	0.072	0.0043	0.0047	0.077	
Magnesium	mg/L	-	-	-	10	9.5	11	11	11	11	0.077	11	11	0.069	11	12	11	11	0.034	11	11	0.030	
Manganese	mg/L	0.95 - 1.3 <sup>(h)</sup>	1.4 - 2.2 <sup>(h)</sup>	-	0.00057	0.0010	0.00054	0.00032	0.00027	0.00054	0.65	0.0041	0.00052	0.60	0.0035	0.00014	0.00016	0.00031	0.00024	0.44	0.00032	0.00026	0.38
Mercury	mg/L	0.000010	-	-	0.0000011	0.0000067	0.0000052	<0.0000005	<0.0000005	0.0000005	0.15	0.0000053	0.0000005	0.13	0.00000059	<0.0000005	<0.0000005	0.00000056	0.00000054	0.08	<0.00000050	0.00000053	0.08
Molybdenum	mg/L	1.0	2.0	-	0.00080	0.00080	0.00080	0.00080	0.00080	0.00080	0.040	0.00091	0.00090	0.034	0.00087	0.00090	0.00087	0.00087	0.023	0.00090	0.00087	0.026	
Nickel	mg/L	0.005 <sup>(h)</sup>	-	-	<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	<0.0005	0.0005	0	
Potassium	mg/L	-	-	-	0.43	0.45	0.51	0.50	0.50	0.49	0.061	0.52	0.50	0.060	0.49	0.50	0.59	0.47	0.51	0.100	0.43	0.50	0.113
Selenium	mg/L	0.0020	-	0.019	0.00025	0.00019	0.00023	0.00024	0.00023	0.00023	0.10	0.00019	0.00022	0.12	0.00019	0.00018	0.00024	0.00021	0.13	0.00027	0.00022	0.16	
Silver	mg/L	0.000050 -																					

Table C-4: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_FRCP1

Parameter	Unit	Guidelines for the protection of:				Q1							
		Aquatic Life		EWWQP Benchmarks	Feb 21 ( <i>C. dubia</i> and <i>P. subcapitata</i> )	Feb 28	Mar 07	Mar 14	Feb 21, 28, Mar 7, 14 ( <i>H. azteca</i> )		Mar 21	Feb 21, 28, Mar 7, 14, 21 ( <i>P. promelas</i> )	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.2	8.1	8.3	8.2	0.0071	8.2	8.2	0.0062
Temperature	°C	-	-	-	0.30	-0.1	-0.1	0.20	0.075	2.75	0.30	0.12	1.71
Dissolved oxygen	mg/L	8.0	5.0	-	12	12	11	-	12	0.032	12	12	0.029
Conductivity	µS/cm	-	-	-	1,394	1,342	1,820	1,415	1,493	0.148	1,016	1,397	0.205
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.1	8.2	8.1	8.2	0.011	8.3	8.2	0.010
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	841	819	1,520	852	1,008	0.339	600	926	0.375
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	251	253	300	232	259	0.112	212	250	0.131
Total dissolved solids	mg/L	-	-	-	1,140	1,140	1,840	1,200	1,330	0.257	837	1,231	0.299
Total suspended solids	mg/L	-	-	-	1.2	<1.0	<1.0	1.0	1.1	0.095	2.4	1.3	0.462
Total organic carbon	mg/L	-	-	-	1.5	1.6	1.0	0.93	1.3	0.25	1.2	1.3	0.22
Dissolved organic carbon	mg/L	-	-	-	1.5	1.5	1.0	0.92	1.2	0.26	0.91	1.2	0.27
Turbidity	NTU	-	-	-	0.44	0.25	0.29	0.40	0.35	0.26	4.1	1.1	1.53
Conductivity	µS/cm	-	-	-	1,430	1,430	2,040	1,440	1,585	0.191	1,070	1,482	0.236
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.25	<0.25	<0.25	<0.25	0.25	0	<0.25	0.25	0
Chloride	mg/L	150	600	-	<2.5	<2.5	3.8	<2.5	2.8	0.23	<2.5	2.8	0.21
Fluoride	mg/L	-	1.7 - 2.4 <sup>(b)</sup>	-	0.13	0.15	0.12	0.17	0.14	0.16	0.16	0.15	0.14
Sulphate	mg/L	429 <sup>(b, c)</sup>	-	481	531 <sup>(Mn, E)</sup>	565 <sup>(Mn, E)</sup>	1,030 <sup>(Mn, E)</sup>	593 <sup>(Mn, E)</sup>	680 <sup>(Mn, E)</sup>	0.345	381	620 <sup>(Mn, E)</sup>	0.393
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	11 - 22 <sup>(f)</sup>	20 <sup>(Mn)</sup>	23 <sup>(Mn, E)</sup>	26 <sup>(Mn, E)</sup>	23 <sup>(Mn, E)</sup>	23 <sup>(Mn, E)</sup>	0.09	18 <sup>(Mn)</sup>	22 <sup>(Mn)</sup>	0.14
Nitrite	mg-N/L	0.020 - 0.040 <sup>(g)</sup>	0.060 - 0.12 <sup>(g)</sup>	-	0.020	0.010	0.0067	0.0081	0.011	0.53	0.0092	0.011	0.48
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	<0.05	0.088	0.70	<0.05	0.22	1.435	0.56	0.29	1.086
Orthophosphate	mg-P/L	-	-	-	<0.001	0.0016	0.0033	0.015	0.0052	1.251	0.0011	0.0043	1.351
Total Ammonia	mg-N/L	0.45 - 1.0 <sup>(g)</sup>	2.4 - 5.2 <sup>(h)</sup>	-	0.0066	0.0081	<0.005	<0.005	0.0062	0.241	<0.005	0.0059	0.234
Phosphorus	mg-P/L	-	-	-	0.0054	0.0084	0.0094	0.031	0.014	0.87	0.018	0.015	0.72
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0050	<0.003	<0.003	<0.003	0.0035	0.29	0.042	0.011	1.53
Antimony	mg/L	0.0090	-	-	0.00066	0.00026	0.00044	0.00023	0.00040	0.50	0.00028	0.00037	0.48
Arsenic	mg/L	-	0.0050	-	0.00013	0.00015	0.00012	<0.0001	0.00013	0.17	0.00014	0.00013	0.15
Barium	mg/L	1.0	-	-	0.077	0.083	0.063	0.072	0.073	0.12	0.093	0.077	0.15
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00020	0	<0.00002	0.00020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0	<0.00005	0.00050	0
Boron	mg/L	-	1.2	-	0.011	0.010	0.011	<0.01	0.011	0.055	0.013	0.014	0.11
Cadmium	mg/L	-	-	-	0.00062	0.00066	0.00045	0.00054	0.00057	0.16	0.00076	0.00061	0.19
Calcium	mg/L	-	-	-	179	179	278	150	197	0.29	143	186	0.29
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	0.00078	<0.0001	<0.0001	0.00011	0.00027	1.24	0.00017	0.00025	1.18
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	0.00012	0.00010	0.086
Copper	mg/L	0.0100 - 0.010 <sup>(b)</sup>	0.025 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	1.0	-	0.030	0.023	0.015	0.022	0.023	0.27	0.070	0.032	0.68
Lead	mg/L	0.013 - 0.020 <sup>(b)</sup>	0.26 - 0.42 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0	0.000052	0.000050	0.018
Lithium	mg/L	-	-	-	0.056	0.066	0.066	0.053	0.060	0.11	0.055	0.059	0.11
Magnesium	mg/L	-	-	-	106	105	183	94	122	0.34	77	113	0.36
Manganese	mg/L	1.7 - 2.6 <sup>(b)</sup>	3.3 - 3.4 <sup>(b)</sup>	-	0.010	0.0083	0.0046	0.0075	0.0076	0.30	0.014	0.0089	0.40
Mercury	mg/L	0.000010	-	-	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.0000050	0	0.0000076	0.0000055	0.21
Molybdenum	mg/L	1.0	2.0	-	0.0017	0.0017	0.0023	0.0015	0.0018	0.201	0.0019	0.0018	0.174
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0102 <sup>(Mn)</sup>	0.0102 <sup>(Mn)</sup>	0.0197 <sup>(Mn)</sup>	0.0098 <sup>(Mn)</sup>	0.0124 <sup>(Mn)</sup>	0	0.0071 <sup>(Mn)</sup>	0.0114 <sup>(Mn)</sup>	0.42
Potassium	mg/L	-	-	-	2.4	2.5	3.2	2.2	2.6	0.16	2.3	2.5	0.15
Selenium	mg/L	0.0020	-	0.019	0.15 <sup>(Mn, E)</sup>	0.16 <sup>(Mn, E)</sup>	0.31 <sup>(Mn, E)</sup>	0.13 <sup>(Mn, E)</sup>	0.19 <sup>(Mn, E)</sup>	0.44	0.095 <sup>(Mn, E)</sup>	0.17 <sup>(Mn, E)</sup>	0.49
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	2.3	2.3	2.2	2.1	2.3	0.039	2.9	2.4	0.123
Strontium	mg/L	-	-	-	0.20	0.20	0.23	0.17	0.20	0.117	0.21	0.20	0.102
Thallium	mg/L	0.00080	-	-	0.000012	0.000013	0.000026	0.000012	0.000016	0.435	0.000014	0.000015	0.389
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0060	0.0067	0.012 <sup>(Mn)</sup>	0.0051	0.0073	0.397	0.0051	0.0069	0.393
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	0.00061	0.00052	0.094
Zinc	mg/L	0.13 - 0.19 <sup>(b)</sup>	0.15 - 0.34 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	0.0036	0.0031	0.086
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(i)</sup>	0.10 <sup>(i)</sup>	-	<0.001	<0.001	<0.001	<0.001	0.0010	0	0.0015	0.0011	0.203
Antimony	mg/L	-	-	-	0.00023	0.00024	0.00035	0.00025	0.00027	0.208	0.00022	0.00026	0.204
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Barium	mg/L	-	-	-	0.072	0.078	0.068	0.084	0.076	0.091	0.082	0.077	0.085
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00020	0	<0.00002	0.00020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0	<0.00005	0.00050	0
Boron	mg/L	-	-	-	0.010	<0.01	0.011	0.010	0.010	0.049	0.011	0.010	0.053
Cadmium	mg/L	0.00041 - 0.00046 <sup>(b)</sup>	0.0015 - 0.0028 <sup>(b)</sup>	0.00093 - 0.001 <sup>(b)</sup>	0.00052	0.00056	0.00035	0.00028	0.00043	0.31	0.00055	0.00045	0.28
Chromium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	0.00020	0	<0.0002	0.00020	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0	<0.00005	0.00050	0
Lithium	mg/L	-	-	-	0.056	0.063	0.068	0.061	0.062	0.082	0.050	0.059	0.119
Manganese	mg/L	-	-	-	0.0080	0.0071	0.0043	0.0062	0.0064	0.244	0.0096	0.0071	0.280
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.0017	0.0016	0.0022	0.0017	0.0018	0.169	0.0017	0.0018	0.152
Nickel	mg/L	-	-	-	0.0097	0.0097	0.020	0.011	0.013	0	0.0092	0.011	0.470
Selenium	mg/L	-	-	-	0.17	0.17	0.30	0.15	0.20	0.34	0.088	0.17	0.43
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.19	0.19	0.23	0.19	0.20	0.10	0.19	0.20	0.09
Thallium	mg/L	-	-	-	0.000013	0.000012	0.000020	0.000013	0.000015	0	0.000010	0.000014	0.28
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0			

Table C-4: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_FRCP1

Parameter	Unit	Guidelines for the protection of:																
		Aquatic Life		EWWQP Benchmarks	Apr 24 (C. dubia and P. subcapitata)	May 02	May 09	May 16	Q2		Apr 24, May 2, 9, 16 (H. azteca)	May 23	Apr 24, May 2, 9, 16, 23 (P. promelas)		May 30	Jun 06	May 9, 16, 23, 30 June 6 (O. mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV			Mean	CV			Mean	CV
<b>Field Measured</b>																		
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.3	8.2	8.2	8.2	0.0067	8.2	8.2	0.0072	8.1	8.1	8.1	0.0057	
Temperature	°C	-	-	-	4.3	4.7	3.9	4.1	4.3	0.08	4.4	4.3	0.07	6.2	5.7	4.9	0.21	
Dissolved oxygen	mg/L	8.0	5.0	-	11	11	11	10	11	0.032	11	11	0.031	9.1	11	11	0.088	
Conductivity	µS/cm	-	-	-	710	880	554	582	681	0.218	484	642	0.243	460	482	512	0.103	
<b>Conventional Parameters</b>																		
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.4	8.3	8.3	8.3	0.003	8.3	8.3	0.005	8.2	8.3	8.3	0.005	
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	392	529	309	328	390	0.256	250	362	0.294	249	257	279	0.133	
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	169	197	153	203	181	0.131	151	175	0.139	149	164	164	0.138	
Total dissolved solids	mg/L	-	-	-	496	693	355	437	495	0.291	330	462	0.314	338	349	362	0.119	
Total suspended solids	mg/L	-	-	-	17	3.2	10	5.2	8.9	0.693	47	17	1.087	66	5.4	27	1.051	
Total organic carbon	mg/L	-	-	-	3.2	2.0	3.7	2.1	2.8	0.30	2.5	2.7	0.17	3.0	1.9	2.7	0.27	
Dissolved organic carbon	mg/L	-	-	-	2.1	1.8	2.7	2.0	2.2	0.18	1.9	2.1	0.17	1.8	1.7	2.0	0.20	
Turbidity	NTU	-	-	-	23	4.9	7.2	2.9	9.4	0.95	14	10	0.78	37	2.9	13	1.11	
Conductivity	µS/cm	-	-	-	725	947	577	646	724	0.222	496	678	0.254	471	508	540	0.132	
<b>Major Ions</b>																		
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	0.050	0	<0.05	0.050	0	<0.05	<0.05	0.050	0	
Chloride	mg/L	150	600	-	0.72	0.96	<0.5	0.51	0.67	0.32	<0.5	0.64	0.32	<0.5	<0.5	0.50	0.01	
Fluoride	mg/L	-	1.7 - 2.4 <sup>(b)</sup>	-	0.14	0.15	0.16	0.16	0.15	0.06	0.15	0.15	0.06	0.16	0.16	0.16	0.04	
Sulphate	mg/L	429 <sup>(b,c)</sup>	-	481	205	276	132	147	190	0.344	98	172	0.408	87	90	111	0.244	
<b>Nutrients</b>																		
Nitrate	mg-N/L	3.0	33	11 - 22 <sup>(d)</sup>	12 <sup>(Mn)</sup>	16 <sup>(Mn)</sup>	7.1 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	0.32	8.2 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	0.31	8.5 <sup>(Mn)</sup>	8.4 <sup>(Mn)</sup>	8.7 <sup>(Mn)</sup>	0.17	
Nitrite	mg-N/L	0.020 - 0.040 <sup>(e)</sup>	0.060 - 0.12 <sup>(e)</sup>	-	0.0045	0.0061	0.0037	0.0036	0.0045	0.26	0.0013	0.0038	0.45	0.0030	0.0040	0.0031	0.35	
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.67	0.48	0.32	0.53	0.50	0.287	1.0	0.60	0.425	0.59	0.37	0.56	0.477	
Orthophosphate	mg-P/L	-	-	-	0.0028	0.0012	0.0023	0.0024	0.0022	0.315	0.0030	0.0023	0.299	0.0022	0.0024	0.0025	0.127	
Total Ammonia	mg-N/L	0.45 - 1.0 <sup>(g)</sup>	2.4 - 5.2 <sup>(h)</sup>	-	0.026	0.011	0.018	<0.005	0.015	0.616	<0.005	0.013	0.704	<0.005	<0.005	0.0076	0.761	
Phosphorus	mg-P/L	-	-	-	0.042	0.012	0.029	0.014	0.024	0.60	0.067	0.033	0.70	0.12	0.010	0.048	0.97	
<b>Total Metals</b>																		
Aluminum	mg/L	-	-	-	0.36	0.12	0.19	0.096	0.19	0.63	0.35	0.22	0.56	0.49	0.090	0.24	0.71	
Antimony	mg/L	0.0090	-	-	0.00025	0.00030	0.00017	0.00023	0.00024	0.23	0.00018	0.00023	0.24	0.00018	0.00020	0.00019	0.12	
Arsenic	mg/L	-	0.0050	-	0.00038	0.00023	0.00026	0.00014	0.00025	0.39	0.00034	0.00027	0.35	0.00045	0.00018	0.00027	0.46	
Barium	mg/L	1.0	-	-	0.081	0.063	0.071	0.058	0.071	0.18	0.060	0.069	0.17	0.058	0.045	0.057	0.12	
Beryllium	mg/L	0.00013	-	-	0.000031	<0.00002	<0.00002	<0.00002	0.000023	0.24	0.000033	0.000025	0.27	0.000042	<0.00002	0.000027	0.37	
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0	<0.00005	<0.00005	0.000050	0	
Boron	mg/L	-	1.2	-	<0.01	0.010	<0.01	<0.01	0.010	0	<0.01	0.010	0	<0.01	<0.01	0.010	0	
Cadmium	mg/L	-	-	-	0.00013	0.00010	0.00011	0.000071	0.00011	0.25	0.00012	0.00011	0.22	0.00014	0.000098	0.00011	0.25	
Calcium	mg/L	-	-	-	86	114	72	75	87	0.22	65	82	0.23	64	62	68	0.08	
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	0.00082	0.00042	0.00069	0.00043	0.00059	0.34	0.00064	0.00060	0.29	0.00095	0.00023	0.00059	0.46	
Cobalt	mg/L	0.0040	0.11	-	0.00027	0.00013	0.00025	0.00011	0.00019	0.430	0.00034	0.00022	0.443	0.00050	0.00014	0.00027	0.582	
Copper	mg/L	0.0100 - 0.010 <sup>(j)</sup>	0.025 - 0.040 <sup>(j)</sup>	-	0.0011	<0.0005	0.00094	0.00050	0.00076	0.40	0.00097	0.00080	0.35	0.0014	0.00050	0.00087	0.45	
Iron	mg/L	-	1.0	-	0.49	0.12	0.29	0.10	0.25	0.72	0.54	0.31	0.66	0.86	0.16	0.39	0.80	
Lead	mg/L	0.013 - 0.020 <sup>(k)</sup>	0.26 - 0.42 <sup>(k)</sup>	-	0.00035	0.000097	0.00022	0.000075	0.00019	0.675	0.00040	0.00023	0.632	0.00060	0.00011	0.00028	0.783	
Lithium	mg/L	-	-	-	0.030	0.044	0.020	0.022	0.029	0.38	0.018	0.027	0.41	0.018	0.020	0.019	0.09	
Magnesium	mg/L	-	-	-	39	58	31	33	40	0.31	25	37	0.34	25	27	28	0.13	
Manganese	mg/L	1.7 - 2.6 <sup>(l)</sup>	3.3 - 3.4 <sup>(l)</sup>	-	0.022	0.0087	0.019	0.0073	0.014	0.51	0.033	0.018	0.59	0.046	0.0088	0.023	0.73	
Mercury	mg/L	0.000010	-	-	0.0000038	0.0000012	0.0000022	0.0000013	0.0000021	0.55	0.0000037	0.0000025	0.51	0.0000040	0.0000026	0.0000028	0.40	
Molybdenum	mg/L	1.0	2.0	-	0.0015	0.0012	0.0012	0.0012	0.0014	0.159	0.0011	0.0013	0.177	0.0012	0.0013	0.0012	0.062	
Nickel	mg/L	0.005 <sup>(n)</sup>	-	-	0.0056 <sup>(Mn)</sup>	0.0067 <sup>(Mn)</sup>	0.0048	0.0031	0.0050	0.30	0.0036	0.0047	0.31	0.0040	0.0031	0.0037	0.19	
Potassium	mg/L	-	-	-	1.5	1.9	1.3	1.3	1.5	0.19	1.3	1.5	0.19	1.3	1.4	1.3	0.02	
Selenium	mg/L	0.0020	-	0.019	0.051 <sup>(Mn, E)</sup>	0.072 <sup>(Mn, E)</sup>	0.032 <sup>(Mn, E)</sup>	0.040 <sup>(Mn, E)</sup>	0.049 <sup>(Mn, E)</sup>	0.36	0.027 <sup>(Mn, E)</sup>	0.044 <sup>(Mn, E)</sup>	0.41	0.027 <sup>(Mn, E)</sup>	0.030 <sup>(Mn, E)</sup>	0.031 <sup>(Mn, E)</sup>	0.17	
Silver	mg/L	0.0015 <sup>(p)</sup>	0.0030 <sup>(b)</sup>	-	0.000025	0.000011	<0.00001	<0.00001	0.000014	0.52	0.000013	0.000014	0.46	0.000015	<0.00001	0.000012	0.20	
Sodium	mg/L	-	-	-	1.3	2.1	1.1	1.3	1.4	0.291	1.1	1.4	0.295	0.99	1.1	1.1	0.091	
Strontium	mg/L	-	-	-	0.13	0.16	0.11	0.10	0.13	0.197	0.100	0.12	0.202	0.089	0.083	0.097	0.111	
Thallium	mg/L	0.00080	-	-	0.000030	0.000014	0.000016	<0.00001	0.000018	0.497	0.000019	0.000018	0.425	0.000029	0.000010	0.000017	0.468	
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0	<0.0001	<0.0001	0.00010	0	
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0	<0.01	<0.01	0.010	0	
Uranium	mg/L	0.0085	-	-	0.0025	0.0032	0.0016	0.0020	0.0023	0.296	0.0015	0.0021	0.318	0.0014	0.0016	0.0016	0.142	
Vanadium	mg/L	-	-	-	0.0032	0.0011	0.0013	0.00069	0.0016	0.708	0.0018	0.0016	0.602	0.0022	0.00072	0.0013	0.489	
Zinc	mg/L	0.13 - 0.19 <sup>(q)</sup>	0.15 - 0.34 <sup>(q)</sup>	-	0.0098	0.0049	0.0082	0.0033	0.0066	0.454	0.0069	0.0066	0.390	0.0083	0.0043	0.0062	0.369	
<b>Dissolved Metals</b>																		
Aluminum	mg/L	0.050 <sup>(r)</sup>	0.10 <sup>(r)</sup>	-	0.013	0.0081	0.0041	0.0021	0.0069	0.716	0.0023	0.0060	0.794	0.0057	0.0021	0.0033	0.492	
Antimony	mg/L	-	-	-	0.00021	0.00023	0.00017	0.00021	0.00021	0.123	0.00015	0.00019	0.169	0.00019	0.00019	0.00018	0.125	
Arsenic	mg/L	-	-	-	0.00013	0.00013	0.00012	<0.0001	0.00012	0.118	0.00011	0.00012	0.110	0.00012	<0.0001	0.00011	0.091	
Barium	mg/L	-	-	-	0.076	0.062	0.070	0.063	0.070	0.137	0.051	0.067	0.179	0.049	0.045	0.054	0.148	
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0	<0.00002	<0.00002	0.000020	0	
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0	<0.00005	<0.00005	0.000050	0	
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0	<0.01	<0.01	0.010		

**Table C-4: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_FRCP1**

Parameter	Unit	Guidelines for the protection of:			Q3								
		Aquatic Life		EWWQP Benchmarks	Jul 25 (C. dubia and P. subcapitata)	Aug 01	Aug 08	Aug 15	Jul 25, Aug 1, 8, 15 (H. azteca)		Aug 22	Jul 25, Aug 1, 8, 15, 22 (P. promelas)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.4	8.3	8.3	8.3	0.0096	8.3	8.3	0.0083
Temperature	°C	-	-	-	9.2	14	13	7.7	11	0.27	11	11	0.23
Dissolved oxygen	mg/L	8.0	5.0	-	9.9	8.9	9.5	11	9.9	0.104	9.6	9.8	0.092
Conductivity	µS/cm	-	-	-	792	951	980	962	921	0.094	1,080	953	0.109
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.3	8.3	8.3	8.3	0.002	8.2	8.3	0.006
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	447	647	660	580	584	0.167	672	601	0.155
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	196	202	211	207	204	0.032	204	204	0.028
Total dissolved solids	mg/L	-	-	-	587	824	887	870	792	0.176	918	817	0.163
Total suspended solids	mg/L	-	-	-	1.8	1.9	1.4	<1.0	1.5	0.270	<1.0	1.4	0.300
Total organic carbon	mg/L	-	-	-	3.4	1.1	1.4	1.1	1.8	0.62	1.2	1.6	0.60
Dissolved organic carbon	mg/L	-	-	-	1.6	1.1	1.0	1.0	1.2	0.24	2.3	1.4	0.59
Turbidity	NTU	-	-	-	0.47	0.50	0.36	0.95	0.57	0.46	0.48	0.55	0.41
Conductivity	µS/cm	-	-	-	857	976	1,090	1,050	993	0.103	1,100	1,015	0.099
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	<0.25	<0.25	<0.25	0.20	0.50	<0.25	0.21	0.43
Chloride	mg/L	150	600	-	0.87	1.5	1.6	1.7	1.4	0.26	<2.5	1.6	0.36
Fluoride	mg/L	-	1.7 - 2.4 <sup>(b)</sup>	-	0.18	0.21	0.18	0.20	0.19	0.08	0.17	0.19	0.09
Sulphate	mg/L	429 <sup>(b,c)</sup>	-	481	260	346	380	376	341	0.164	432 <sup>(Mn)</sup>	359	0.176
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	11 - 22 <sup>(i)</sup>	8.9 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	12 <sup>(Mn)</sup>	12 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	0.12	12 <sup>(Mn)</sup>	11 <sup>(Mn)</sup>	0.13
Nitrite	mg-N/L	0.020 - 0.040 <sup>(d)</sup>	0.060 - 0.12 <sup>(d)</sup>	-	0.0041	0.0064	0.0062	0.0067	0.0059	0.20	0.0075	0.0062	0.20
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.85	0.33	0.24	0.25	0.42	0.700	0.75	0.48	0.607
Orthophosphate	mg-P/L	-	-	-	0.0020	<0.001	<0.001	<0.001	0.0013	0.400	0.0016	0.0013	0.349
Total Ammonia	mg-N/L	0.45 - 1.0 <sup>(g)</sup>	2.4 - 5.2 <sup>(h)</sup>	-	0.0084	<0.005	0.0053	<0.005	0.0059	0.280	0.0078	0.0063	0.264
Phosphorus	mg-P/L	-	-	-	0.0071	0.0040	0.0030	0.0022	0.0041	0.53	<0.002	0.0037	0.57
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0082	0.0077	0.0035	0.0052	0.0062	0.36	0.0035	0.0056	0.40
Antimony	mg/L	0.0090	-	-	0.00027	0.00026	0.00026	0.00027	0.00027	0.02	0.00028	0.00027	0.03
Arsenic	mg/L	-	0.0050	-	0.00012	0.00010	0.00017	<0.0001	0.00012	0.27	<0.0001	0.00012	0.26
Barium	mg/L	1.0	-	-	0.069	0.072	0.074	0.075	0.072	0.03	0.073	0.073	0.03
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	0.010	0.012	0.011	0.011	0.011	0	0.012	0.011	0.075
Cadmium	mg/L	-	-	-	0.000051	0.000049	0.000052	0.000049	0.000050	0.03	0.00042	0.00049	0.08
Calcium	mg/L	-	-	-	100	131	142	135	127	0.15	141	130	0.13
Chromium	mg/L	0.0010 <sup>(e)</sup>	-	-	0.00012	0.00019	0.00019	0.00019	0.00017	0.20	0.00060	0.00026	0.75
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	0.0100 - 0.010 <sup>(b)</sup>	0.025 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	1.0	-	0.022	0.022	0.020	0.021	0.021	0.05	0.031	0.023	0.19
Lead	mg/L	0.013 - 0.020 <sup>(b)</sup>	0.26 - 0.42 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.029	0.036	0.035	0.036	0.034	0.10	0.040	0.035	0.11
Magnesium	mg/L	-	-	-	54	69	73	75	68	0.14	79	70	0.14
Manganese	mg/L	1.7 - 2.6 <sup>(b)</sup>	3.3 - 3.4 <sup>(b)</sup>	-	0.0075	0.0090	0.0095	0.0093	0.0088	0.11	0.0087	0.0088	0.09
Mercury	mg/L	0.000010	-	-	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.00000050	0	<0.0000005	0.00000050	0
Molybdenum	mg/L	1.0	2.0	-	0.0013	0.0014	0.0014	0.0014	0.0014	0.045	0.0015	0.0014	0.060
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0050	0.0068 <sup>(Mn)</sup>	0.0075 <sup>(Mn)</sup>	0.0075 <sup>(Mn)</sup>	0.0067 <sup>(Mn)</sup>	0.18	0.0082 <sup>(Mn)</sup>	0.0070 <sup>(Mn)</sup>	0.18
Potassium	mg/L	-	-	-	1.8	2.0	2.1	2.0	2.0	0.08	2.0	2.0	0.07
Selenium	mg/L	0.0020	-	0.019	0.063 <sup>(Mn, E)</sup>	0.086 <sup>(Mn, E)</sup>	0.10 <sup>(Mn, E)</sup>	0.094 <sup>(Mn, E)</sup>	0.086 <sup>(Mn, E)</sup>	0.19	0.11 <sup>(Mn, E)</sup>	0.091 <sup>(Mn, E)</sup>	0.19
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	1.5	1.6	1.7	1.6	1.6	0.057	1.7	1.6	0.058
Strontium	mg/L	-	-	-	0.13	0.15	0.16	0.16	0.15	0.087	0.16	0.15	0.081
Thallium	mg/L	0.00080	-	-	<0.00001	0.000012	0.000011	0.000011	0.000011	0.074	0.000012	0.000011	0.075
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0027	0.0040	0.0042	0.0041	0.0038	0.183	0.0050	0.0040	0.202
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Zinc	mg/L	0.13 - 0.19 <sup>(b)</sup>	0.15 - 0.34 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	0.0011	<0.003	<0.003	<0.003	0.0025	0.376	<0.003	0.0026	0.324
Antimony	mg/L	-	-	-	0.00020	0.00026	0.00026	0.00025	0.00024	0.118	0.00025	0.00024	0.103
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0.000	<0.0002	0.00012	0.373
Barium	mg/L	-	-	-	0.069	0.077	0.078	0.071	0.074	0.057	0.073	0.074	0.050
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00004	0.000024	0.373
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.0001	0.000060	0.373
Boron	mg/L	-	-	-	<0.01	0.011	0.011	0.011	0.011	0.047	<0.02	0.013	0.330
Cadmium	mg/L	0.00041 - 0.00046 <sup>(b)</sup>	0.0015 - 0.0028 <sup>(b)</sup>	0.00093 - 0.001 <sup>(b)</sup>	0.000044	0.000025	<0.000005	0.000015	0.000022	0.74	<0.000005	0.000019	0.87
Chromium	mg/L	-	-	-	<0.0001	0.00012	<0.0001	0.00010	0.00011	0.095	<0.0002	0.00012	0.350
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0002	0.00012	0.373
Copper	mg/L	-	-	-	<0.0002	<0.0005	<0.0005	<0.0005	0.00043	0.35	<0.0005	0.00044	0.305
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.02	0.012	0.373
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.0001	0.000060	0.373
Lithium	mg/L	-	-	-	0.029	0.038	0.040	0.039	0.037	0.133	0.039	0.037	0.118
Manganese	mg/L	-	-	-	0.0054	0.0064	0.0028	0.0059	0.0051	0.314	0.0050	0.0051	0.274
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.0013	0.0014	0.0014	0.0013	0.0013	0.050	0.0013	0.0013	0.044
Nickel	mg/L	-	-	-	0.0045	0.0066	0.0081	0.0066	0.0065	0.232	0.0081	0.0066	0.219
Selenium	mg/L	-	-	-	0.065	0.082	0.10	0.082	0.086	0.19	0.11	0.091	0.19
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00002	0.000012	0.37
Strontium	mg/L	-	-	-	0.13	0.18	0.18	0.15	0.15	0.10	0.16	0.15	0.09
Thallium	mg/L	-	-	-	<0.00001	0.000011	0.000013	<0.00001	0.000011	0.13	<0.0002	0.000013	0.33
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0002	0.00012	0.37
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium													

Table C-4: Water Quality Screening for 2017 Chronic Toxicity Tests at FR\_FRCP1

Parameter	Unit	Guidelines for the protection of:				Q4							
		Aquatic Life		EWWQP Benchmarks	Oct 02 (C. dubia and P. subcapitata)	Oct 10	Oct 17	Oct 24	Oct 2, 10, 17, 24 (H. azteca)		Oct 31	Oct 2, 10, 17, 24, 31 (P. promelas and O. mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.2	8.2	8.4	8.3	0.0123	8.3	8.3	0.0109
Temperature	°C	-	-	-	3.4	3.4	6.7	2.9	4.1	0.43	0.60	3.4	0.64
Dissolved oxygen	mg/L	8.0	5.0	-	11	12	10	12	11	0.064	12	11	0.069
Conductivity	µS/cm	-	-	-	1,167	1,168	1,249	1,136	1,180	0.041	1,229	1,190	0.040
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.1	8.2	8.3	8.2	0.010	8.3	8.2	0.010
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	734	753	749	701	734	0.032	788	745	0.042
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	146	151	193	227	179	0.213	234	190	0.216
Total dissolved solids	mg/L	-	-	-	980	1,060	1,140	1,030	1,053	0.064	1,080	1,058	0.056
Total suspended solids	mg/L	-	-	-	<1.0	1.9	1.4	<1.0	1.3	0.322	<1.0	1.3	0.315
Total organic carbon	mg/L	-	-	-	0.84	1.2	1.1	0.85	1.00	0.17	0.93	0.98	0.16
Dissolved organic carbon	mg/L	-	-	-	0.56	1.0	1.2	0.83	1.0	0.10	0.78	0.97	0.15
Turbidity	NTU	-	-	-	0.70	0.48	0.90	0.67	0.69	0.25	0.41	0.63	0.31
Conductivity	µS/cm	-	-	-	1,110	1,150	1,150	1,200	1,153	0.032	1,260	1,174	0.049
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.25	0.29	0.36	0.31	0.30	0.15	<0.25	0.29	0.16
Chloride	mg/L	150	600	-	<2.5	<2.5	<2.5	<2.5	2.5	0	<2.5	2.5	0
Fluoride	mg/L	-	1.7 - 2.4 <sup>(b)</sup>	-	0.10	0.11	0.11	0.12	0.11	0.07	0.13	0.11	0.10
Sulphate	mg/L	429 <sup>(b, c)</sup>	-	481	510 <sup>(Mn, E)</sup>	496 <sup>(Mn, E)</sup>	559 <sup>(Mn, E)</sup>	486 <sup>(Mn, E)</sup>	513 <sup>(Mn, E)</sup>	0.063	523 <sup>(Mn, E)</sup>	515 <sup>(Mn, E)</sup>	0.055
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	11 - 22 <sup>(f)</sup>	15 <sup>(Mn)</sup>	15 <sup>(Mn)</sup>	16 <sup>(Mn)</sup>	15 <sup>(Mn)</sup>	15 <sup>(Mn)</sup>	0.03	15 <sup>(Mn)</sup>	15 <sup>(Mn)</sup>	0.03
Nitrite	mg-N/L	0.020 - 0.040 <sup>(g)</sup>	0.060 - 0.12 <sup>(g)</sup>	-	0.0082	0.0053	0.0052	0.010	0.0072	0.33	<0.005	0.0067	0.33
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.57	0.60	0.35	0.28	0.45	0.351	0.083	0.38	0.567
Orthophosphate	mg-P/L	-	-	-	<0.001	<0.001	<0.001	<0.001	0.0010	0	<0.001	0.0010	0
Total Ammonia	mg-N/L	0.45 - 1.0 <sup>(g)</sup>	2.4 - 5.2 <sup>(h)</sup>	-	0.0051	0.0097	<0.005	0.0068	0.0067	0.330	<0.005	0.0063	0.323
Phosphorus	mg-P/L	-	-	-	<0.002	0.0031	0.0027	<0.002	0.0025	0.22	0.0011	0.0022	0.35
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	<0.003	0.064	0.0038	<0.003	0.019	1.65	0.0039	0.016	1.74
Antimony	mg/L	0.0090	-	-	0.00026	0.00024	0.00028	0.00028	0.00027	0.07	0.00022	0.00026	0.10
Arsenic	mg/L	-	0.0050	-	0.00012	0.00018	0.00011	0.00014	0.00014	0.23	0.00010	0.00013	0.24
Barium	mg/L	1.0	-	-	0.073	0.081	0.075	0.071	0.075	0.06	0.078	0.075	0.05
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	0.011	0.012	0.010	0.011	0.011	0.074	<0.01	0.011	0.077
Cadmium	mg/L	-	-	-	0.000051	0.000074	0.000050	0.000050	0.000056	0.21	0.000055	0.000056	0.19
Calcium	mg/L	-	-	-	153	150	153	142	150	0.03	156	151	0.04
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	<0.0001	0.00020	0.00011	<0.0002	0.00015	0.36	0.00027	0.00018	0.40
Cobalt	mg/L	0.0040	0.11	-	<0.0001	0.00015	<0.0001	<0.0001	0.00011	0.22	<0.0001	0.00011	0.20
Copper	mg/L	0.0100 - 0.010 <sup>(b)</sup>	0.025 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	1.0	-	0.027	0.14	0.029	0.026	0.055	1.01	0.025	0.049	1.02
Lead	mg/L	0.013 - 0.020 <sup>(b)</sup>	0.26 - 0.42 <sup>(b)</sup>	-	<0.00005	0.000085	<0.00005	<0.00005	0.000059	0.30	<0.00005	0.000057	0.27
Lithium	mg/L	-	-	-	0.042	0.041	0.041	0.038	0.041	0.05	0.039	0.040	0.04
Magnesium	mg/L	-	-	-	90	91	94	90	91	0.02	104	94	0.06
Manganese	mg/L	1.7 - 2.6 <sup>(b)</sup>	3.3 - 3.4 <sup>(b)</sup>	-	0.011	0.020	0.010	0.012	0.013	0.34	0.012	0.013	0.30
Mercury	mg/L	0.000010	-	-	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.00000050	0	<0.0000005	0.00000050	0
Molybdenum	mg/L	1.0	2.0	-	0.0013	0.0013	0.0014	0.0014	0.0014	0.040	0.0014	0.0014	0.038
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0088 <sup>(Mn)</sup>	0.0098 <sup>(Mn)</sup>	0.0098 <sup>(Mn)</sup>	0.0085 <sup>(Mn)</sup>	0.0093 <sup>(Mn)</sup>	0.08	0.0088 <sup>(Mn)</sup>	0.0092 <sup>(Mn)</sup>	0.07
Potassium	mg/L	-	-	-	2.1	2.1	2.3	2.1	2.1	0.04	2.2	2.2	0.03
Selenium	mg/L	0.0020	-	0.019	0.12 <sup>(Mn, E)</sup>	0.13 <sup>(Mn, E)</sup>	0.14 <sup>(Mn, E)</sup>	0.12 <sup>(Mn, E)</sup>	0.13 <sup>(Mn, E)</sup>	0.07	0.13 <sup>(Mn, E)</sup>	0.13 <sup>(Mn, E)</sup>	0.06
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	2.0	2.1	2.1	1.9	2.0	0.044	2.1	2.0	0.039
Strontium	mg/L	-	-	-	0.17	0.17	0.18	0.17	0.17	0.012	0.19	0.18	0.047
Thallium	mg/L	0.00080	-	-	0.000012	0.000015	0.000013	0.000011	0.000013	0.134	0.000011	0.000012	0.135
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0054	0.0053	0.0067	0.0057	0.0058	0.110	0.0054	0.0057	0.102
Vanadium	mg/L	-	-	-	<0.0005	0.00058	<0.0005	<0.0005	0.00052	0.077	<0.0005	0.00052	0.069
Zinc	mg/L	0.13 - 0.19 <sup>(b)</sup>	0.15 - 0.34 <sup>(b)</sup>	-	<0.003	0.0038	<0.003	<0.003	0.0032	0.125	<0.003	0.0032	0.113
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(j)</sup>	0.10 <sup>(j)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
Antimony	mg/L	-	-	-	0.00024	0.00024	0.00024	0.00022	0.00024	0.043	0.00025	0.00024	0.046
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Barium	mg/L	-	-	-	0.070	0.077	0.073	0.068	0.072	0.056	0.083	0.074	0.079
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	-	-	0.011	0.011	<0.01	<0.01	0.011	0.055	0.011	0.011	0.052
Cadmium	mg/L	0.00041 - 0.00046 <sup>(b)</sup>	0.0015 - 0.0028 <sup>(b)</sup>	0.00093 - 0.001 <sup>(b)</sup>	0.000012	0.000028	<0.000005	<0.000005	0.000012	0.86	0.000011	0.000012	0.77
Chromium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	0.35	-	0.010	0.010	<0.01	<0.01	0.010	0	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.042	0.041	0.041	0.039	0.041	0.036	0.044	0.041	0.047
Manganese	mg/L	-	-	-	0.0073	0.0096	0.0048	0.0069	0.0072	0.278	0.0088	0.0075	0.251
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.0013	0.0013	0.0014	0.0014	0.0013	0.041	0.0014	0.0013	0.044
Nickel	mg/L	-	-	-	0.0082	0.0096	0.0092	0.0090	0.0085	0.060	0.0090	0.0086	0.057
Selenium	mg/L	-	-	-	0.14	0.14	0.14	0.12	0.14	0.07	0.13	0.14	0.07
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.17	0.18	0.17	0.18	0.17	0.02	0.19	0.18	0.05
Thallium	mg/L	-	-	-	0.000012	0.000011	0.000012	0.000011	0.000012	0.05	0.000011	0.000011	0.05
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010				

Table C-5: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_FR1

Parameter	Unit	Guidelines for the protection of:			Q1								
		Aquatic Life		EVWQP Benchmarks	Feb 21 ( <i>C. dubia</i> and <i>P. subcapitata</i> )	Feb 28	Mar 07	Mar 14	Feb 21, 28, Mar 7, 14 ( <i>H. azteca</i> )		Mar 21	Feb 21, 28, Mar 7, 14, 21 ( <i>P. promelas</i> )	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	-	-	8.5	8.1	8.3	0.0290	8.2	8.3	0.022
Temperature	°C	-	-	-	-	-	-0.1	0	-0.05	-1.41	0.40	0.10	2.646
Dissolved oxygen	mg/L	8.0	5.0	-	-	-	11	12	11	0.017	10	11	0.073
Conductivity	µS/cm	-	-	-	-	-	738	706	722	0.031	731	725	0.023
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.3	8.3	8.3	8.3	0.003	8.3	8.3	0.003
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	479	483	510	524	499	0.043	538	507	0.050
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(b)</sup>	-	-	202	206	212	197	204	0.031	203	204	0.027
Total dissolved solids	mg/L	-	-	-	618	637	627	609	623	0.019	624	623	0.017
Total suspended solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	1.0	0	1.5	1.1	0.203
Total organic carbon	mg/L	-	-	-	0.63	0.65	0.85	1.0	0.78	0.22	2.3	1.1	0.626
Dissolved organic carbon	mg/L	-	-	-	0.57	0.72	0.68	1.5	0.86	0.47	0.93	0.87	0.402
Turbidity	NTU	-	-	-	0.47	0.43	0.17	0.43	0.38	0.37	2.4	0.77	1.160
Conductivity	µS/cm	-	-	-	843	870	895	868	869	0.024	903	876	0.027
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.25	<0.25	<0.25	<0.25	0.25	0	<0.25	0.25	0
Chloride	mg/L	150	600	-	1.8	1.9	2.1	1.8	1.9	0.076	2.7	2.1	0.171
Fluoride	mg/L	-	1.7 - 2.0 <sup>(b)</sup>	-	0.14	0.14	0.15	0.14	0.14	0.035	0.14	0.14	0.031
Sulphate	mg/L	429 <sup>(b), (c)</sup>	-	481	232	250	255	218	239	0.071	234	238	0.063
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	9.9 - 22 <sup>(b)</sup>	13 <sup>(Mn)</sup>	13 <sup>(Mn)</sup>	13 <sup>(Mn)</sup>	12 <sup>(Mn)</sup>	13 <sup>(Mn)</sup>	0.045	12 <sup>(Mn)</sup>	13 <sup>(Mn)</sup>	0.043
Nitrite	mg-N/L	0.020 - 0.040 <sup>(d)</sup>	0.060 - 0.12 <sup>(d)</sup>	-	<0.005	<0.005	<0.005	<0.005	0.0050	0	<0.005	0.0050	0
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.10	<0.05	0.12	0.10	0.092	0.31	0.11	0.095	0.273
Total phosphorus	mg-P/L	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	0.0011	0.0032	<0.001	0.0011	0.0016	0.67	0.0036	0.0020	0.643
Total Ammonia	mg-N/L	0.13 - 1.9 <sup>(g)</sup>	0.68 - 25 <sup>(h)</sup>	-	<0.005	<0.005	0.0079	<0.005	0.0057	0.25	<0.005	0.0056	0.232
Phosphorus	mg-P/L	-	-	-	0.0039	0.0039	<0.002	0.0020	0.0030	0.37	0.0062	0.0036	0.482
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0085	0.0070	<0.003	0.0077	0.0066	0.37	0.035	0.012	1.046
Antimony	mg/L	0.0090	-	-	0.0011	0.0013	0.0013	0.0013	0.0013	0.080	0.0016	0.0013	0.136
Arsenic	mg/L	-	0.0050	-	0.0011	<0.001	0.0011	<0.001	0.0011	0.055	0.0013	0.0011	0.111
Barium	mg/L	1.0	-	-	0.12	0.12	0.11	0.12	0.12	0.038	0.12	0.12	0.033
Beryllium	mg/L	0.0013	-	-	<0.0002	<0.0002	<0.0002	<0.0002	0.00020	0	<0.0002	0.00020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	-	-	-	0.000018	0.000018	0.000018	0.000017	0.000018	0.034	0.000024	0.000019	0.162
Calcium	mg/L	-	-	-	115	112	125	117	117	0.047	119	118	0.041
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	0.00014	0.00014	0.00013	0.00012	0.00013	0.072	0.00016	0.00014	0.107
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	0.0089 - 0.010 <sup>(b)</sup>	0.023 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	1.0	-	-	0.011	0.011	<0.01	<0.01	0.011	0.055	0.034	0.015	0.692
Lead	mg/L	0.012 - 0.020 <sup>(b)</sup>	0.23 - 0.42 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.016	0.018	0.018	0.017	0.017	0.065	0.017	0.017	0.056
Magnesium	mg/L	-	-	-	49	50	50	49	49	0.012	54	50	0.044
Manganese	mg/L	1.6 - 2.6 <sup>(b)</sup>	3.0 - 3.4 <sup>(b)</sup>	-	0.0015	0.0015	0.0014	0.0017	0.0015	0.11	0.0032	0.0019	0.399
Mercury	mg/L	0.000010	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	0.0000060	0.0000052	0.086
Molybdenum	mg/L	1.0	2.0	-	0.00084	0.00084	0.00093	0.00083	0.00086	0.057	0.00092	0.00087	0.057
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0013	0.0014	0.0016	0.0012	0.0014	0.12	0.0018	0.0015	0.160
Potassium	mg/L	-	-	-	1.2	1.2	1.2	1.2	1.2	0.012	1.4	1.2	0.082
Selenium	mg/L	0.0020	-	0.019	0.051 <sup>(Mn)</sup>	0.054 <sup>(Mn)</sup>	0.055 <sup>(Mn)</sup>	0.052 <sup>(Mn)</sup>	0.053 <sup>(Mn)</sup>	0.035	0.053 <sup>(Mn)</sup>	0.053 <sup>(Mn, E)</sup>	0.030
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	2.2	2.3	2.4	2.2	2.3	0.040	2.6	2.4	0.077
Strontium	mg/L	-	-	-	0.16	0.17	0.18	0.17	0.17	0.034	0.16	0.17	0.033
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0023	0.0025	0.0025	0.0023	0.0024	0.045	0.0024	0.0024	0.039
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Zinc	mg/L	0.11 - 0.19 <sup>(b)</sup>	0.13 - 0.34 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
Antimony	mg/L	-	-	-	0.0012	0.0011	0.0012	<0.001	0.0011	0.085	0.0014	0.0012	0.126
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Barium	mg/L	-	-	-	0.12	0.13	0.11	0.13	0.12	0.057	0.12	0.12	0.049
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	0.00038 - 0.00046 <sup>(b)</sup>	0.0013 - 0.0028 <sup>(b)</sup>	0.00085 - 0.001 <sup>(j)</sup>	0.000014	0.000017	0.000015	0.000015	0.000015	0.098	0.000024	0.000017	0.240
Chromium	mg/L	-	-	-	<0.0001	0.00011	<0.0001	<0.0001	0.00010	0.049	<0.0001	0.00010	0.044
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.016	0.018	0.015	0.017	0.017	0.091	0.018	0.017	0.084
Manganese	mg/L	-	-	-	0.0012	0.0012	0.0012	0.0013	0.0012	0.064	0.0023	0.0014	0.347
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.00081	0.00078	0.00090	0.00077	0.00081	0.072	0.00093	0.00084	0.086
Nickel	mg/L	-	-	-	0.0014	0.0014	0.0016	0.0012	0.0014	0.115	0.0017	0.0015	0.137
Selenium	mg/L	-	-	-	0.057	0.054	0.054	0.049	0.053	0.064	0.052	0.053	0.056
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.16	0.16	0.18	0.17	0.17	0.067	0.17	0.17	0.058
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	-											



**Table C-5: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_FR1**

Parameter	Unit	Guidelines for the protection of:				Q2											
		Aquatic Life		EVWQP Benchmarks	Apr 24 (C.dubia and P.subcapitata)	May 02	May 09	May 16	Apr 24, May 2, 9, 16 (H. azteca)		May 23	Apr 24, May 2, 9, 16, 23 (P. promelas)		May 30	Jun 11 <sup>(1)</sup>	May 9, 16, 23, 30 June 11 (O. mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV			Mean	CV
<b>Field Measured</b>																	
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.1	8.2	8.0	8.2	8.1	0.010	8.2	8.2	0.009	8.2	8.3	8.2	0.013
Temperature	°C	-	-	-	3.4	3.8	3.7	4.2	3.8	0.088	4.5	3.9	0.110	4.4	5.9	4.5	0.181
Dissolved oxygen	mg/L	8.0	5.0	-	10	10	11	11	10	0.032	11	10	0.032	10	10	11	0.021
Conductivity	µS/cm	-	-	-	900	614	443	458	604	0.351	421	567	0.354	377	466	433	0.083
<b>Conventional Parameters</b>																	
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.3	8.4	8.3	8.3	0.010	8.4	8.3	0.010	8.4	8.4	8.4	0.008
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	404	415	330	314	366	0.140	257	344	0.191	222	282	281	0.155
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	194	194	165	163	179	0.097	158	175	0.101	146	164	159	0.049
Total dissolved solids	mg/L	-	-	-	497	487	362	347	423	0.188	327	404	0.201	277	344	331	0.099
Total suspended solids	mg/L	-	-	-	15	6.0	16	10	12	0.384	64	22	1.059	57	21	34	0.736
Total organic carbon	mg/L	-	-	-	5.9	2.5	5.3	3.6	4.3	0.355	4.7	4.4	0.305	5.4	2.0	4.2	0.343
Dissolved organic carbon	mg/L	-	-	-	3.4	2.1	2.9	2.2	2.6	0.236	2.0	2.5	0.247	1.8	1.7	2.1	0.226
Turbidity	NTU	-	-	-	25	4.5	19	7.5	14	0.695	26	16	0.606	27	7.3	17	0.555
Conductivity	µS/cm	-	-	-	735	727	525	531	630	0.186	485	601	0.200	445	546	506	0.081
<b>Major Ions</b>																	
Bromide	mg/L	-	-	-	<0.25	<0.25	<0.05	<0.05	0.15	0.770	<0.05	0.13	0.843	<0.05	<0.05	0.050	0
Chloride	mg/L	150	600	-	1.7	2.1	1.1	1.0	1.5	0.335	0.76	1.3	0.402	0.61	0.67	0.84	0.269
Fluoride	mg/L	-	1.7 - 2.0 <sup>(b)</sup>	-	0.13	0.14	0.15	0.17	0.15	0.117	0.15	0.15	0.102	0.17	0.17	0.16	0.053
Sulphate	mg/L	429 <sup>(b, c)</sup>	-	481	170	183	109	109	143	0.276	95	133	0.302	77	105	99	0.137
<b>Nutrients</b>																	
Nitrate	mg-N/L	3.0	33	9.9 - 22 <sup>(d)</sup>	6.7 <sup>(Min)</sup>	8.8 <sup>(Min)</sup>	5.2 <sup>(Min)</sup>	6.2 <sup>(Min)</sup>	6.7 <sup>(Min)</sup>	0.221	5.6 <sup>(Min)</sup>	6.5 <sup>(Min)</sup>	0.210	5.1 <sup>(Min)</sup>	6.9 <sup>(Min)</sup>	5.8 <sup>(Min)</sup>	0.124
Nitrite	mg-N/L	0.020 - 0.040 <sup>(e)</sup>	0.060 - 0.12 <sup>(e)</sup>	-	<0.005	<0.005	0.0018	0.0028	0.0037	0.441	0.0019	0.0033	0.485	0.0017	0.0038	0.0024	0.374
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.39	0.21	0.36	0.27	0.31	0.262	0.34	0.31	0.227	0.40	0.52	0.38	0.239
Total phosphorus	mg-P/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	0.0038	<0.001	0.0042	0.0047	0.0034	0.484	0.0026	0.0033	0.455	0.0038	0.0011	0.0033	0.440
Total Ammonia	mg-N/L	0.13 - 1.9 <sup>(g)</sup>	0.68 - 25 <sup>(h)</sup>	-	<0.005	<0.005	<0.005	<0.005	0.0050	0	<0.005	0.0050	0	<0.005	0.012	0.0063	0.473
Phosphorus	mg-P/L	-	-	-	0.029	0.0070	0.024	0.012	0.018	0.573	0.049	0.024	0.681	0.078	0.019	0.037	0.745
<b>Total Metals</b>																	
Aluminum	mg/L	-	-	-	0.71	0.11	0.35	0.16	0.33	0.819	0.45	0.36	0.678	0.68	0.10	0.35	0.672
Antimony	mg/L	0.0090	-	-	0.00027	0.00020	0.00025	0.00017	0.00022	0.206	0.00020	0.00022	0.187	0.00018	0.00017	0.00019	0.173
Arsenic	mg/L	-	0.0050	-	0.00038	0.00018	0.00033	0.00025	0.00029	0.309	0.00041	0.00031	0.305	0.00049	0.00024	0.00034	0.310
Barium	mg/L	1.0	-	-	0.095	0.089	0.084	0.079	0.086	0.078	0.077	0.085	0.085	0.073	0.071	0.077	0.066
Beryllium	mg/L	0.00013	-	-	0.00038	<0.0002	0.00026	<0.0002	0.00026	0.326	0.00038	0.00028	0.320	0.00047	<0.0002	0.00030	0.395
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0	<0.00005	0.00050	0	<0.00005	<0.00005	0.00050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0	<0.01	<0.01	0.010	0
Cadmium	mg/L	-	-	-	0.000083	0.000041	0.000080	0.000057	0.000065	0.306	0.00012	0.000075	0.379	0.00014	0.000049	0.000088	0.441
Calcium	mg/L	-	-	-	92	88	71	67	80	0.158	71	78	0.147	62	67	68	0.060
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	0.0012 <sup>(Min)</sup>	0.00025	0.00074	0.00072	0.00072	0.526	0.00098	0.00077	0.450	0.0012 <sup>(Min)</sup>	0.00031	0.00078	0.407
Cobalt	mg/L	0.0040	0.11	-	0.00037	0.00011	0.00034	0.00016	0.00025	0.527	0.00038	0.00027	0.468	0.00046	0.00013	0.00029	0.487
Copper	mg/L	0.0089 - 0.010 <sup>(b)</sup>	0.023 - 0.040 <sup>(b)</sup>	-	0.0013	<0.0005	0.0011	0.00068	0.00089	0.403	0.0012	0.00096	0.361	0.0013	<0.0005	0.00097	0.373
Iron	mg/L	1.0	1.0	-	0.55	0.11	0.44	0.25	0.34	0.584	0.69	0.41	0.571	0.98	0.17	0.51	0.656
Lead	mg/L	0.012 - 0.020 <sup>(b)</sup>	0.23 - 0.42 <sup>(b)</sup>	-	0.00043	0.000083	0.00038	0.00015	0.00026	0.648	0.00059	0.00033	0.638	0.00064	0.00013	0.00038	0.628
Lithium	mg/L	-	-	-	0.015	0.015	0.012	0.014	0.014	0.100	0.014	0.014	0.089	0.011	0.014	0.013	0.087
Magnesium	mg/L	-	-	-	44	43	30	30	37	0.223	27	35	0.236	24	28	28	0.087
Manganese	mg/L	1.6 - 2.6 <sup>(b)</sup>	3.0 - 3.4 <sup>(b)</sup>	-	0.014	0.0048	0.016	0.0090	0.011	0.456	0.035	0.016	0.735	0.041	0.0094	0.022	0.678
Mercury	mg/L	0.00010	-	-	0.0000047	0.000015	<0.00001	<0.00005	0.0000053	0.658	<0.00001	0.0000063	0.589	<0.00001	<0.000005	0.0000080	0.342
Molybdenum	mg/L	1.0	2.0	-	0.0014	0.00100	0.0012	0.0011	0.0012	0.131	0.00095	0.0011	0.145	0.00091	0.0011	0.0011	0.122
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0048	0.0028	0.0034	0.0025	0.0034	0.307	0.0036	0.0034	0.264	0.0036	0.0027	0.0032	0.169
Potassium	mg/L	-	-	-	1.6	1.2	1.3	1.1	1.3	0.156	1.1	1.3	0.160	1.1	1.2	1.1	0.068
Selenium	mg/L	0.0020	-	0.019	0.041 <sup>(Min, E)</sup>	0.040 <sup>(Min, E)</sup>	0.026 <sup>(Min, E)</sup>	0.027 <sup>(Min, E)</sup>	0.033 <sup>(Min, E)</sup>	0.248	0.024 <sup>(Min, E)</sup>	0.032 <sup>(Min, E)</sup>	0.254	0.020 <sup>(Min, E)</sup>	0.027 <sup>(Min, E)</sup>	0.025 <sup>(Min, E)</sup>	0.120
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	0.000021	<0.00001	0.000020	<0.00001	0.000015	0.398	0.00016	0.00015	0.342	0.00019	<0.00001	0.00015	0.320
Sodium	mg/L	-	-	-	2.2	2.3	1.6	1.6	1.9	0.193	1.3	1.8	0.234	1.1	1.3	1.4	0.148
Strontium	mg/L	-	-	-	0.14	0.13	0.11	0.11	0.12	0.134	0.11	0.12	0.134	0.088	0.097	0.10	0.091
Thallium	mg/L	0.00080	-	-	0.000025	<0.00001	0.000020	<0.00001	0.000016	0.462	0.000024	0.000018	0.414	0.000028	<0.00001	0.000018	0.444
Tin	mg/L	-	-	-	<0.0001	<0.0001	0.00010	0.00010	0.00010	0	<0.0001	0.00010	0	<0.0001	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.015	<0.01	<0.01	<0.01	0.011	0.222	<0.01	0.011	0.203	<0.01	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0024	0.0016	0.0019	0.0016	0.0019	0.235	0.0015	0.0018	0.240	0.0013	0.0016	0.0015	0.075
Vanadium	mg/L	-	-	-	0.0027	0.00071	0.0017	0.0011	0.0016	0.565	0.0021	0.0017	0.479	0.0029	0.0012	0.0018	0.407
Zinc	mg/L	0.11 - 0.19 <sup>(b)</sup>	0.13 - 0.34 <sup>(b)</sup>	-	0.0072	<0.003	0.0057	0.0038	0.0049	0.384	0.0097	0.0059	0.458	0.0099	<0.003	0.0064	0.504
<b>Dissolved Metals</b>																	
Aluminum	mg/L	0.050 <sup>(i)</sup>	0.10 <sup>(i)</sup>	-	0.0069	<0.003	0.0053	0.0045	0.0049	0.330	0.0031	0.0046	0.357	0.0044	0.0032	0.0041	0.228
Antimony	mg/L	-	-	-	0.00022	0.00018	0.00019	0.00016	0.00019	0.133	0.00015	0.00018	0.152	0.00013	0.00016	0.00016	0.137
Arsenic	mg/L	-	-	-	0.00015	0.00012	0.00015	0.00013	0.00013	0.156	0.00013	0.00013	0.136	0.00014	0.00012	0.00013	0.122
Barium	mg/L	-	-	-	0.081	0.089	0.074	0.080	0.081	0.078	0.067	0.078	0.105	0.062	0.069	0.070	0.098
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0	<0.00002	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0	<0.00005	<0.00005	0.000	

Table C-5: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_FR1

Parameter	Unit	Guidelines for the protection of:				Q3							
		Aquatic Life		EVWQP Benchmarks	Jul 25 (C.dubia and P.subcapitata)	Aug 01	Aug 08	Aug 15	Jul 25, Aug 1, 8, 15 (H. azteca)		Aug 22	Jul 25, Aug 1, 8, 15, 22 (P.promelas)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.1	6.6	7.6	<b>9.0<sup>(Mn)</sup></b>	7.8	0.128	8.0	7.9	0.111
Temperature	°C	-	-	-	8.2	10	9.9	7.3	8.9	0.159	8.8	8.9	0.138
Dissolved oxygen	mg/L	8.0	5.0	-	9.7	9.7	10	10	9.9	0.026	<b>7.6<sup>(Mn)</sup></b>	9.4	0.114
Conductivity	µS/cm	-	-	-	643	702	674	688	677	0.037	812	704	0.091
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.4	8.3	8.3	8.3	0.008	8.3	8.3	0.007
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	391	442	435	467	434	0.073	447	436	0.064
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	191	197	194	183	191	0.031	203	194	0.038
Total dissolved solids	mg/L	-	-	-	502	599	592	580	568	0.079	581	571	0.069
Total suspended solids	mg/L	-	-	-	1.2	2.8	1.3	1.2	1.6	0.483	1.0	1.5	0.490
Total organic carbon	mg/L	-	-	-	0.99	1.4	1.2	1.0	1.2	0.175	1.4	1.2	0.168
Dissolved organic carbon	mg/L	-	-	-	1.0	0.90	1.0	0.85	0.95	0.091	1.4	1.0	0.208
Turbidity	NTU	-	-	-	0.54	0.24	0.40	0.35	0.38	0.325	0.36	0.38	0.286
Conductivity	µS/cm	-	-	-	742	768	774	785	767	0.024	762	766	0.021
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	<0.25	<0.25	<0.05	0.15	0.770	<0.05	0.13	0.843
Chloride	mg/L	150	600	-	1.1	1.5	1.5	1.4	1.4	0.157	1.1	1.3	0.164
Fluoride	mg/L	-	1.7 - 2.0 <sup>(b)</sup>	-	0.15	0.18	0.16	0.18	0.17	0.084	0.13	0.16	0.141
Sulphate	mg/L	429 <sup>(b, c)</sup>	-	481	186	207	216	215	206	0.068	216	208	0.062
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	9.9 - 22 <sup>(i)</sup>	<b>9.4<sup>(Mn)</sup></b>	<b>11<sup>(Mn)</sup></b>	<b>11<sup>(Mn)</sup></b>	<b>11<sup>(Mn)</sup></b>	<b>10<sup>(Mn)</sup></b>	0.066	<b>11<sup>(Mn)</sup></b>	<b>10<sup>(Mn)</sup></b>	0.058
Nitrite	mg-N/L	0.020 - 0.040 <sup>(d)</sup>	0.060 - 0.12 <sup>(d)</sup>	-	0.0072	0.0068	0.0076	0.0058	0.0069	0.113	0.0063	0.0067	0.106
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.82	0.30	0.27	0.28	0.37	0.467	0.32	0.36	0.419
Total phosphorus	mg-P/L	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	<0.001	<0.001	<0.001	<0.001	0.0010	0	0.0012	0.0010	0.086
Total Ammonia	mg-N/L	0.13 - 1.9 <sup>(g)</sup>	0.68 - 25 <sup>(h)</sup>	-	0.0074	<0.005	<0.005	<0.005	0.0056	0.214	0.0064	0.0058	0.191
Phosphorus	mg-P/L	-	-	-	0.0050	0.0027	<0.002	0.0020	0.0029	0.486	0.0056	0.0035	0.496
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	0.0070	0.0079	0.0061	0.0062	0.0068	0.123	0.0063	0.0067	0.113
Antimony	mg/L	0.0090	-	-	0.0023	0.0017	0.0017	0.0018	0.0019	0.153	0.0016	0.0018	0.152
Arsenic	mg/L	-	0.0050	-	0.0012	0.0012	0.0011	0.0011	0.0012	0.050	<0.0001	0.0011	0.075
Barium	mg/L	1.0	-	-	0.10	0.10	0.10	0.11	0.10	0.040	0.11	0.10	0.043
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.00020	0	<0.00002	0.00020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	-	-	-	0.000019	0.000020	0.000019	0.000018	0.000019	0.029	0.000017	0.000019	0.051
Calcium	mg/L	-	-	-	86	106	99	103	98	0.089	101	99	0.078
Chromium	mg/L	0.0010 <sup>(e)</sup>	-	-	0.00016	0.00014	0.00014	0.00017	0.00015	0.098	0.00011	0.00014	0.160
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	0.0089 - 0.010 <sup>(b)</sup>	0.023 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	1.0	1.0	-	0.013	0.012	0.011	<0.01	0.012	0.112	0.010	0.011	0.116
Lead	mg/L	0.012 - 0.020 <sup>(b)</sup>	0.23 - 0.42 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.018	0.021	0.019	0.019	0.019	0.062	0.019	0.019	0.054
Magnesium	mg/L	-	-	-	43	46	43	49	45	0.068	46	45	0.059
Manganese	mg/L	1.6 - 2.6 <sup>(b)</sup>	3.0 - 3.4 <sup>(b)</sup>	-	0.0023	0.0025	0.0022	0.0019	0.0022	0.114	0.0018	0.0021	0.129
Mercury	mg/L	0.000010	-	-	0.00000050	<0.00000050	<0.00000050	<0.00000050	0.00000050	0	<0.00000050	0.00000050	0
Molybdenum	mg/L	1.0	2.0	-	0.0010	0.0011	0.00099	0.00098	0.0010	0.039	0.00092	0.00099	0.055
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0028	0.0028	0.0025	0.0027	0.0027	0.049	0.0022	0.0026	0.093
Potassium	mg/L	-	-	-	1.3	1.3	1.1	1.3	1.3	0.063	1.2	1.3	0.055
Selenium	mg/L	0.0020	-	0.019	<b>0.044<sup>(Mn, E)</sup></b>	<b>0.048<sup>(Mn, E)</sup></b>	<b>0.048<sup>(Mn, E)</sup></b>	<b>0.053<sup>(Mn, E)</sup></b>	<b>0.048<sup>(Mn, E)</sup></b>	0.079	<b>0.050<sup>(Mn, E)</sup></b>	<b>0.049<sup>(Mn, E)</sup></b>	0.069
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	1.9	2.0	1.9	2.0	1.9	0.036	2.0	1.9	0.037
Strontium	mg/L	-	-	-	0.13	0.14	0.15	0.15	0.14	0.064	0.15	0.14	0.057
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0020	0.0024	0.0023	0.0024	0.0023	0.081	0.0025	0.0023	0.079
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Zinc	mg/L	0.11 - 0.19 <sup>(b)</sup>	0.13 - 0.34 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	0.0017	<0.003	<0.003	<0.003	0.0027	0.243	<0.003	0.0027	0.212
Antimony	mg/L	-	-	-	0.00016	0.00015	0.00015	0.00016	0.00016	0.037	0.00016	0.00016	0.035
Arsenic	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Barium	mg/L	-	-	-	0.10	0.100	0.11	0.11	0.11	0.055	0.11	0.11	0.054
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	0.00038 - 0.00046 <sup>(b)</sup>	0.0013 - 0.0028 <sup>(b)</sup>	0.00085 - 0.001 <sup>(i)</sup>	0.000019	0.000020	0.000021	0.000020	0.000020	0.052	0.000017	0.000019	0.085
Chromium	mg/L	-	-	-	<0.0001	0.00011	0.00011	0.00011	0.00011	0.047	0.00011	0.00011	0.041
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0002	<0.0005	<0.0005	<0.0005	0.00043	0.353	<0.0005	0.00044	0.305
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.019	0.019	0.018	0.020	0.019	0.049	0.019	0.019	0.044
Manganese	mg/L	-	-	-	0.0017	0.0013	0.00046	0.00056	0.0010	0.594	0.0012	0.0010	0.504
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.00094	0.0010	0.00098	0.00094	0.00097	0.044	0.00095	0.00097	0.040
Nickel	mg/L	-	-	-	0.0025	0.0025	0.0024	0.0027	0.0025	0.045	0.0022	0.0025	0.066
Selenium	mg/L	-	-	-	0.047	0.049	0.053	0.056	0.051	0.085	0.053	0.052	0.074
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.13	0.14	0.14	0.15	0.14	0.067	0.15	0.14	0.059
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	0.00011	<0.0001	<0.0001	<0.0001	0.00010	0.049	<0.0001	0.00010	0.044
Titanium	mg/L	-	-	-	&								

Table C-5: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_FR1

Parameter	Unit	Guidelines for the protection of:				Q4							
		Aquatic Life		EWWQP Benchmarks	Oct 02 (C.dubia and P.subcapitata)	Oct 10	Oct 17	Oct 24	Oct 2, 10, 17, 24 (H. azteca)		Oct 31	Oct 2, 10, 17, 24, 31 (P.promelas and O.mykiss)	
		30-day mean (BC MOE)	Maximum (BC MOE)						Mean	CV		Mean	CV
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.5	8.2	8.2	8.3	0.017	8.2	8.3	0.016
Temperature	°C	-	-	-	4.3	4.2	6.6	2.8	4.5	0.352	1.1	3.8	0.535
Dissolved oxygen	mg/L	8.0	5.0	-	11	11	9.9	12	11	0.073	11	11	0.066
Conductivity	µS/cm	-	-	-	737	852	280	893	691	0.408	787	710	0.349
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.3	8.4	8.5	8.4	0.017	8.4	8.4	0.015
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	476	580	487	478	505	0.099	465	497	0.094
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	160	151	201	197	177	0.143	197	181	0.131
Total dissolved solids	mg/L	-	-	-	586	736	721	697	685	0.099	621	672	0.097
Total suspended solids	mg/L	-	-	-	1.1	1.2	1.9	<1.0	1.3	0.314	36	8.3	1.887
Total organic carbon	mg/L	-	-	-	1.9	1.4	0.99	1.7	1.5	0.261	0.69	1.3	0.367
Dissolved organic carbon	mg/L	-	-	-	1.6	1.0	1.3	1.1	1.2	0.215	0.65	1.1	0.312
Turbidity	NTU	-	-	-	0.77	0.96	0.87	0.60	0.80	0.193	43	9.3	2.044
Conductivity	µS/cm	-	-	-	749	868	820	884	830	0.073	808	826	0.065
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	0.050	0.050	0	0.051	0.050	0.009
Chloride	mg/L	150	600	-	1.2	1.3	1.3	1.3	1.3	0.040	1.4	1.3	0.043
Fluoride	mg/L	-	1.7 - 2.0 <sup>(b)</sup>	-	0.13	0.13	0.15	0.13	0.13	0.063	0.12	0.13	0.078
Sulphate	mg/L	429 <sup>(b, c)</sup>	-	481	232	313	271	280	274	0.122	239	267	0.123
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	9.9 - 22 <sup>(i)</sup>	10 <sup>(Mn)</sup>	9.8 <sup>(Mn)</sup>	9.9 <sup>(Mn)</sup>	9.9 <sup>(Mn)</sup>	10 <sup>(Mn)</sup>	0.032	11 <sup>(Mn)</sup>	10 <sup>(Mn)</sup>	0.038
Nitrite	mg-N/L	0.020 - 0.040 <sup>(d)</sup>	0.060 - 0.12 <sup>(d)</sup>	-	0.0057	0.0063	0.0049	0.0052	0.0055	0.111	0.0059	0.0056	0.099
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.53	0.54	0.35	0.31	0.43	0.272	0.078	0.36	0.522
Total phosphorus	mg-P/L	-	-	-	0.0020	-	-	-	0.0020	-	-	0.0020	-
Orthophosphate	mg-P/L	-	-	-	<0.001	<0.001	<0.001	<0.001	0.0010	0	<0.001	0.0010	0
Total Ammonia	mg-N/L	0.13 - 1.9 <sup>(g)</sup>	0.68 - 25 <sup>(h)</sup>	-	0.0067	<0.005	0.011	0.0061	0.0073	0.387	<0.005	0.0068	0.388
Phosphorus	mg-P/L	-	-	-	-	0.0026	<0.002	0.0021	0.0022	0.144	0.0027	0.0024	0.149
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	<0.003	0.0069	0.0075	<0.003	0.0051	0.478	0.0072	0.0055	0.419
Antimony	mg/L	0.0090	-	-	0.0015	0.0026	0.0019	0.0021	0.0020	0.226	0.0014	0.0019	0.255
Arsenic	mg/L	-	0.0050	-	<0.0001	0.00017	0.00011	0.00014	0.00013	0.243	<0.0001	0.00012	0.246
Barium	mg/L	1.0	-	-	0.11	0.11	0.11	0.10	0.11	0.041	0.11	0.11	0.039
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	-	-	-	0.000019	0.000019	0.000020	0.000019	0.000019	0.000029	0.000021	0.000020	0.048
Calcium	mg/L	-	-	-	102	115	106	104	107	0.054	104	106	0.048
Chromium	mg/L	0.0010 <sup>(f)</sup>	-	-	0.00015	0.00019	0.00014	0.00012	0.00015	0.196	0.00014	0.00015	0.175
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	0.0089 - 0.010 <sup>(b)</sup>	0.023 - 0.040 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	1.0	-	<0.01	0.013	0.014	<0.01	0.012	0.175	0.016	0.013	0.207
Lead	mg/L	0.012 - 0.020 <sup>(b)</sup>	0.23 - 0.42 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.018	0.017	0.016	0.015	0.017	0.067	0.019	0.017	0.078
Magnesium	mg/L	-	-	-	51	74	56	58	60	0.168	49	57	0.175
Manganese	mg/L	1.6 - 2.6 <sup>(b)</sup>	3.0 - 3.4 <sup>(b)</sup>	-	0.0014	0.0020	0.0019	0.0022	0.0019	0.176	0.0023	0.0020	0.175
Mercury	mg/L	0.000010	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	0.0000034	0.000011	1.205
Molybdenum	mg/L	1.0	2.0	-	0.00092	0.0011	0.00100	0.0014	0.0011	0.189	0.0011	0.0011	0.166
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	0.0018	0.0048	0.0031	0.0029	0.0031	0.383	0.0015	0.0028	0.453
Potassium	mg/L	-	-	-	1.2	1.6	1.3	1.4	1.4	0.103	1.2	1.3	0.104
Selenium	mg/L	0.0020	-	0.019	0.05 <sup>(Mn, E)</sup>	0.075 <sup>(Mn, E)</sup>	0.063 <sup>(Mn, E)</sup>	0.064 <sup>(Mn, E)</sup>	0.065 <sup>(Mn, E)</sup>	0.114	0.055 <sup>(Mn, E)</sup>	0.063 <sup>(Mn, E)</sup>	0.123
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	2.3	2.4	2.3	2.1	2.3	0.043	2.2	2.2	0.041
Strontium	mg/L	-	-	-	0.15	0.16	0.16	0.16	0.16	0.026	0.16	0.16	0.023
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.0025	0.0033	0.0032	0.0030	0.0030	0.127	0.0024	0.0029	0.145
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Zinc	mg/L	0.11 - 0.19 <sup>(b)</sup>	0.13 - 0.34 <sup>(b)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	<0.003	<0.003	<0.003	<0.003	0.0030	0	<0.003	0.0030	0
Antimony	mg/L	-	-	-	0.00015	0.00022	0.00017	0.00017	0.00018	0.168	0.00013	0.00017	0.199
Arsenic	mg/L	-	-	-	<0.0001	0.00011	<0.0001	<0.0001	0.00010	0.049	<0.0001	0.00010	0.044
Barium	mg/L	-	-	-	0.11	0.12	0.11	0.10	0.11	0.051	0.12	0.11	0.065
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Cadmium	mg/L	0.00038 - 0.00046 <sup>(b)</sup>	0.0013 - 0.0028 <sup>(b)</sup>	0.00085 - 0.001 <sup>(i)</sup>	0.000015	0.000016	0.000016	0.000019	0.000017	0.112	0.000016	0.000017	0.101
Chromium	mg/L	-	-	-	<0.0001	0.00012	<0.0001	0.00017	0.00012	0.270	0.00011	0.00012	0.243
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0	<0.0005	0.00050	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.018	0.017	0.017	0.015	0.017	0.075	0.018	0.017	0.070
Manganese	mg/L	-	-	-	-	0.0013	0.00095	0.0023	0.0015	0.465	0.0018	0.0016	0.373
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.00089	0.0011	0.00097	0.0013	0.0011	0.175	0.0012	0.0011	0.152
Nickel	mg/L	-	-	-	0.0017	0.0043	0.0028	0.0027	0.0029	0.369	0.0016	0.0026	0.413
Selenium	mg/L	-	-	-	0.067	0.076	0.064	0.063	0.067	0.088	0.056	0.065	0.111
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.16	0.16	0.15	0.15	0.16	0.038	0.19	0.16	0.093
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	0.010</	

Table C-6: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_ERC

Parameter	Unit	Guidelines for the protection of:			EVWQP Benchmarks	Q2						May 9, 16, 23, 30 June 11 (O. mykiss)	
		Aquatic Life		Q1 Feb 21 (C. dubia and P. subcapitata)		Apr 24 (C. dubia and P. subcapitata)	May 09	May 16	May 23	May 30	Jun 11 (1)	Mean	CV
		30-day mean (BC MOE)	Maximum (BC MOE)										
<b>Field Measured</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	-	8.1	8.1	8.2	8.2	8.2	8.3	8.2	0.008
Temperature	°C	-	-	-	-	4.5	4.5	4.0	6.7	6.8	6.9	5.8	0.244
Dissolved oxygen	mg/L	8.0	5.0	-	-	11	10	12	11	9.9	9.7	10	0.074
Conductivity	µS/cm	-	-	-	-	298	284	275	257	245	244	261	0.069
<b>Conventional Parameters</b>													
pH	-	6.5 - 9.0	6.5 - 9.0	-	-	8.2	8.4	8.3	8.4	8.4	8.3	8.4	0.006
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	-	190	187	199	191	155	145	168	0.149
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(a)</sup>	-	-	-	156	157	159	150	150	138	149	0.050
Total dissolved solids	mg/L	-	-	-	-	223	210	209	192	179	170	184	0.088
Total suspended solids	mg/L	-	-	-	-	<1.0	6.8	34	25	106	225	129	0.784
Total organic carbon	mg/L	-	-	-	-	<0.5	1.1	3.3	2.5	4.9	7.9	4.4	0.478
Dissolved organic carbon	mg/L	-	-	-	-	<0.5	0.79	1.9	1.7	1.8	1.7	1.8	0.079
Turbidity	NTU	-	-	-	-	0.13	2.5	18	10	48	122	75	0.833
Conductivity	µS/cm	-	-	-	-	354	368	333	325	291	283	302	0.084
<b>Major Ions</b>													
Bromide	mg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0
Chloride	mg/L	150	600	-	-	0.38	0.50	0.81	0.63	0.43	0.40	<0.5	0.304
Fluoride	mg/L	-	1.5 - 1.6 <sup>(b)</sup>	-	-	0.14	0.16	0.14	0.15	0.13	0.14	0.13	0.054
Sulphate	mg/L	309 - 429 <sup>(b, c)</sup>	-	481	-	38	36	30	26	21	18	19	0.210
<b>Nutrients</b>													
Nitrate	mg-N/L	3.0	33	6.5 - 8.9 <sup>(i)</sup>	-	0.45	0.50	0.56	0.45	0.31	0.28	0.30	0.319
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	<0.05	0.074	0.21	0.13	0.27	0.53	0.30	0.515
Total phosphorus	mg-P/L	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	0.0010	<0.001	0.0010	0.0015	0.0016	0.0029	0.0019	0.396
Total Ammonia	mg-N/L	0.48 - 1.6 <sup>(g)</sup>	2.5 - 8.3 <sup>(h)</sup>	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0053	0.0056	0.052
Phosphorus	mg-P/L	-	-	-	-	<0.002	0.010	0.033	0.017	0.14	0.29	0.15	0.875
<b>Total Metals</b>													
Aluminum	mg/L	-	-	-	-	0.0065	0.12	0.44	0.34	0.96	1.8	0.85	0.641
Antimony	mg/L	0.0090	-	-	-	<0.0001	<0.0001	0.00015	<0.0001	0.00012	0.00015	0.00011	0.00013
Arsenic	mg/L	-	0.0050	-	-	<0.0001	0.00017	0.00042	0.00034	0.00076	0.0015	0.00082	0.612
Barium	mg/L	1.0	-	-	-	0.064	0.063	0.058	0.055	0.060	0.080	0.067	0.161
Beryllium	mg/L	0.00013	-	-	-	<0.00002	<0.00002	0.000035	0.000034	0.000072	<b>0.00014<sup>(Mn)</sup></b>	0.000081	0.000072
Bismuth	mg/L	-	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0
Boron	mg/L	-	1.2	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
Cadmium	mg/L	-	-	-	-	0.0000071	0.000019	0.000054	0.000041	0.00015	0.00030	0.00015	0.00014
Calcium	mg/L	-	-	-	-	56	56	56	49	60	65	52	0.113
Chromium	mg/L	0.0010 <sup>(e)</sup>	-	-	-	0.00027	0.00050	<b>0.0012<sup>(Mn)</sup></b>	<b>0.0010<sup>(Mn)</sup></b>	<b>0.0031<sup>(Mn)</sup></b>	<b>0.0042<sup>(Mn)</sup></b>	<b>0.0022<sup>(Mn)</sup></b>	<b>0.0023<sup>(Mn)</sup></b>
Cobalt	mg/L	0.0040	0.11	-	-	<0.0001	<0.0001	0.00027	0.00017	0.00061	0.0013	0.00059	0.00058
Copper	mg/L	0.0054 - 0.0084 <sup>(b)</sup>	0.015 - 0.022 <sup>(b)</sup>	-	-	<0.0005	<0.0005	0.00087	0.00071	0.0018	0.0032	0.0016	0.0016
Iron	mg/L	-	1.0	-	-	<0.01	0.13	0.56	0.38	<b>1.4<sup>(Mx)</sup></b>	<b>2.8<sup>(Mx)</sup></b>	<b>1.4<sup>(Mx)</sup></b>	0.737
Lead	mg/L	0.0079 - 0.012 <sup>(b)</sup>	0.12 - 0.21 <sup>(b)</sup>	-	-	<0.00005	0.000080	0.00040	0.00022	<b>0.021<sup>(Mn)</sup></b>	0.0019	0.00091	0.0049
Lithium	mg/L	-	-	-	-	0.0035	0.0032	0.0037	0.0032	0.0041	0.0046	0.0034	0.0038
Magnesium	mg/L	-	-	-	-	14	15	14	14	14	15	12	0.082
Manganese	mg/L	1.2 - 1.5 <sup>(b)</sup>	2.0 - 2.9 <sup>(b)</sup>	-	-	0.00032	0.0062	0.029	0.018	0.085	0.19	0.080	0.854
Mercury	mg/L	0.000010	-	-	-	<0.000005	0.0000073	0.000027	0.000019	0.000062	<b>0.00010<sup>(Mn)</sup></b>	0.000055	0.000053
Molybdenum	mg/L	1.0	2.0	-	-	0.00099	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.021
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	-	<0.0005	<0.0005	0.0015	0.0011	0.0027	<b>0.0053<sup>(Mn)</sup></b>	0.0028	0.0027
Potassium	mg/L	-	-	-	-	0.40	0.45	0.66	0.60	0.79	1.1	0.82	0.79
Selenium	mg/L	0.0020	-	0.019	-	0.0017	<b>0.0023<sup>(Mn)</sup></b>	<b>0.0026<sup>(Mn)</sup></b>	<b>0.0020<sup>(Mn)</sup></b>	0.0016	0.0014	0.0015	0.0018
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	-	<0.00001	<0.00001	0.000014	<0.00001	0.000020	0.000040	0.000026	0.00022
Sodium	mg/L	-	-	-	-	1.0	1.1	1.2	1.1	0.84	0.75	0.68	0.90
Strontium	mg/L	-	-	-	-	0.22	0.23	0.23	0.21	0.22	0.20	0.19	0.21
Thallium	mg/L	0.00080	-	-	-	<0.0001	<0.0001	0.000025	0.000010	0.000047	0.000086	0.000046	0.00043
Tin	mg/L	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
Titanium	mg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	0.011
Uranium	mg/L	0.0085	-	-	-	0.00083	0.00098	0.00094	0.00094	0.00092	0.0011	0.00081	0.00093
Vanadium	mg/L	-	-	-	-	<0.0005	0.00070	0.0021	0.0017	0.0041	0.0076	0.0043	0.0039
Zinc	mg/L	0.041 - 0.098 <sup>(b)</sup>	0.066 - 0.12 <sup>(b)</sup>	-	-	<0.003	<0.003	0.0057	0.0040	0.012	0.023	0.012	0.663
<b>Dissolved Metals</b>													
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	-	<0.003	<0.003	0.0041	<0.003	0.0056	0.0076	0.0047	0.0050
Antimony	mg/L	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
Arsenic	mg/L	-	-	-	-	<0.0001	<0.0001	<0.00012	<0.00012	<0.00012	<0.00014	<0.00012	0.090
Barium	mg/L	-	-	-	-	0.062	0.057	0.053	0.054	0.050	0.046	0.042	0.103
Beryllium	mg/L	-	-	-	-	<0.00002	<0.00002	<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	<0.00005	0
Boron	mg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
Cadmium	mg/L	0.00026 - 0.00037 <sup>(b)</sup>	0.00080 - 0.0013 <sup>(b)</sup>	0.00059 - 0.00077 <sup>(i)</sup>	-	<0.00005	0.000089	0.00012	0.00010	0.00010	0.00010	0.00012	0.00011
Chromium	mg/L	-	-	-	-	0.00026	0.00023	0.00019	0.00021	0.00020	0.00024	0.00019	0.00021
Cobalt	mg/L	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
Copper	mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.305
Iron	mg/L	-	0.35	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
Lead	mg/L	-	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0
Lithium	mg/L	-	-	-	-	0.0031	0.0029	0.0034	0.0028	0.0019	0.0020	0.0020	0.272
Manganese	mg/L	-	-	-	-	0.00012	0.00083	0.00026	0.00072	0.00086	0.0013	0.0025	0.0011
Mercury	mg/L	-	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0
Molybdenum	mg/L	-	-	-	-	0.00099	0.00097	0.00096	0.00100	0.00088	0.00093	0.00093	0.046
Nickel	mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0
Selenium	mg/L	-	-	-	-	0.0018	0.0024	0.0027	0.0020	0.0014	0.0013	0.0015	0.325
Silver	mg/L	-	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0
Strontium	mg/L	-	-	-	-	0.21	0.22	0.21	0.21	0.18	0.18	0.18	0.097
Thallium	mg/L	-	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0
Tin	mg/L	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
Titanium	mg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
Uranium	mg/L	-	-	-	-	0.00085	0.00094	0.00084	0.00094	0.00071	0.0007		

Table C-6: Water Quality Screening for 2017 Chronic Toxicity Tests at GH\_ERC

Parameter	Unit	Guidelines for the protection of:			Q3 (C.dubia and P.subcapitata)	Q4					Oct 2, 10, 17, 24, 31 (O.mykiss)	
		Aquatic Life		EWWQP Benchmarks		Oct 02 (C.dubia and P.subcapitata)	Oct 10	Oct 17	Oct 24	Oct 31	Mean	CV
		30-day mean (BC MOE)	Maximum (BC MOE)									
<b>Field Measured</b>												
pH	-	6.5 - 9.0	6.5 - 9.0	-	7.8	8.1	8.1	8.4	-	8.1	8.2	0.017
Temperature	°C	-	-	-	9.5	6.6	6.5	4.9	-	4.6	5.7	0.185
Dissolved oxygen	mg/L	8.0	5.0	-	9.2	9.0	10	11	-	11	10	0.084
Conductivity	µS/cm	-	-	-	254	284	278	797	-	289	412	0.623
<b>Conventional Parameters</b>												
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.4	8.4	8.4	8.4	8.4	8.4	8.4	0.004
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	149	174	175	156	162	168	167	0.048
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(M)</sup>	-	-	140	145	148	155	143	150	148	0.031
Total dissolved solids	mg/L	-	-	-	160	193	183	204	234	196	202	0.096
Total suspended solids	mg/L	-	-	-	4.0	<1.0	<1.0	1.3	<2.0	<1.0	1.3	0.344
Total organic carbon	mg/L	-	-	-	0.83	0.96	1.0	<0.5	0.60	<0.5	0.72	0.358
Dissolved organic carbon	mg/L	-	-	-	0.89	1.1	<0.5	0.61	0.71	<0.5	0.68	0.363
Turbidity	NTU	-	-	-	1.7	0.56	0.80	0.45	0.55	0.41	0.55	0.274
Conductivity	µS/cm	-	-	-	295	303	304	284	305	303	300	0.030
<b>Major Ions</b>												
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0
Chloride	mg/L	150	600	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.50	0
Fluoride	mg/L	-	1.5 - 1.6 <sup>(b)</sup>	-	0.14	0.12	0.13	0.14	0.12	0.12	0.13	0.081
Sulphate	mg/L	309 - 429 <sup>(b, c)</sup>	-	481	21	23	23	23	24	24	24	0.024
<b>Nutrients</b>												
Nitrate	mg-N/L	3.0	33	6.5 - 8.9 <sup>(i)</sup>	0.19	0.25	0.23	0.24	0.28	0.24	0.25	0.072
Nitrite	mg-N/L	0.020 <sup>(d)</sup>	0.060 <sup>(d)</sup>	-	<0.001	0.0022	<0.001	<0.001	0.0012	<0.001	0.0013	0.407
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.076	<0.05	0.068	<0.05	0.10	0.060	0.066	0.336
Total phosphorus	mg-P/L	-	-	-	-	0.0038	-	-	-	-	0.0038	-
Orthophosphate	mg-P/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0010	0
Total Ammonia	mg-N/L	0.48 - 1.6 <sup>(g)</sup>	2.5 - 8.3 <sup>(h)</sup>	-	0.0063	<0.005	<0.005	0.0096	0.018	<0.005	0.0085	0.654
Phosphorus	mg-P/L	-	-	-	0.0086	-	<0.002	<0.002	<0.002	0.0018	0.0020	0.051
<b>Total Metals</b>												
Aluminum	mg/L	-	-	-	0.042	0.0045	0.0047	0.0041	0.0038	0.0050	0.0044	0.108
Antimony	mg/L	0.0090	-	-	0.00016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Arsenic	mg/L	-	0.0050	-	0.00015	<0.0001	0.00013	0.00012	0.00012	0.00010	0.00011	0.118
Barium	mg/L	1.0	-	-	0.048	0.054	0.059	0.058	0.051	0.054	0.055	0.058
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Cadmium	mg/L	-	-	-	0.000013	0.0000075	0.0000069	0.0000080	0.0000055	0.0000070	0.0000070	0.134
Calcium	mg/L	-	-	-	42	48	48	46	45	49	47	0.034
Chromium	mg/L	0.0010 <sup>(e)</sup>	-	-	0.00029	0.00025	0.00030	0.00028	0.00036	0.00027	0.00029	0.144
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Copper	mg/L	0.0054 - 0.0084 <sup>(b)</sup>	0.015 - 0.022 <sup>(b)</sup>	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Iron	mg/L	-	1.0	-	0.061	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Lead	mg/L	0.0079 - 0.012 <sup>(b)</sup>	0.12 - 0.21 <sup>(b)</sup>	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000074	0.000055	0.196
Lithium	mg/L	-	-	-	0.0024	0.0025	0.0028	0.0026	0.0020	0.0029	0.0026	0.137
Magnesium	mg/L	-	-	-	11	12	13	12	12	12	12	0.044
Manganese	mg/L	1.2 - 1.5 <sup>(b)</sup>	2.0 - 2.9 <sup>(b)</sup>	-	0.0040	0.0011	0.00098	0.00093	0.0010	0.00087	0.00097	0.080
Mercury	mg/L	0.000010	-	-	0.0000070	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0
Molybdenum	mg/L	1.0	2.0	-	0.0010	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.011
Nickel	mg/L	0.005 <sup>(k)</sup>	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Potassium	mg/L	-	-	-	0.42	0.39	0.43	0.39	0.40	0.40	0.40	0.040
Selenium	mg/L	0.0020	-	0.019	0.0012	0.0012	0.0011	0.0012	0.0012	0.0012	0.0012	0.040
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0
Sodium	mg/L	-	-	-	0.72	0.84	0.89	0.89	0.79	0.83	0.85	0.048
Strontium	mg/L	-	-	-	0.19	0.21	0.21	0.21	0.20	0.21	0.21	0.013
Thallium	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	0.00015	<0.0001	<0.0001	<0.0001	0.00011	0.203
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Uranium	mg/L	0.0085	-	-	0.00064	0.00079	0.00079	0.00086	0.00085	0.00079	0.00081	0.042
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Zinc	mg/L	0.041 - 0.098 <sup>(b)</sup>	0.066 - 0.12 <sup>(b)</sup>	-	<0.003	<0.003	0.0036	<0.003	<0.003	<0.003	0.0031	0.086
<b>Dissolved Metals</b>												
Aluminum	mg/L	0.050 <sup>(f)</sup>	0.10 <sup>(f)</sup>	-	0.0031	<0.003	<0.003	<0.003	<0.003	<0.003	0.0030	0
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Arsenic	mg/L	-	-	-	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Barium	mg/L	-	-	-	0.047	0.056	0.061	0.056	0.052	0.061	0.057	0.070
Beryllium	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000020	0
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Cadmium	mg/L	0.00026 - 0.00037 <sup>(b)</sup>	0.00080 - 0.0013 <sup>(b)</sup>	0.00059 - 0.00077 <sup>(i)</sup>	0.0000073	0.0000058	0.0000079	0.0000059	0.0000054	0.0000064	0.0000063	0.155
Chromium	mg/L	-	-	-	0.00015	0.00022	0.00021	0.00022	0.00023	0.00022	0.00022	0.032
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Copper	mg/L	-	-	-	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Iron	mg/L	-	0.35	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0
Lithium	mg/L	-	-	-	0.0025	0.0027	0.0028	0.0026	0.0022	0.0030	0.0027	0.112
Manganese	mg/L	-	-	-	0.0011	0.00044	0.00058	<0.0001	<0.0001	0.00046	0.00034	0.661
Mercury	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.0000050	0
Molybdenum	mg/L	-	-	-	0.00099	0.0011	0.0010	0.00097	0.0010	0.0011	0.0010	0.058
Nickel	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Selenium	mg/L	-	-	-	0.0013	0.0014	0.0012	0.0012	0.0012	0.0012	0.0012	0.082
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0
Strontium	mg/L	-	-	-	0.19	0.21	0.20	0.19	0.20	0.25	0.21	0.117
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000010	0
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0
Titanium	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0
Uranium	mg/L	-	-	-	0.00058	0.00087	0.00078	0.00081	0.00083	0.00085	0.00083	0.040
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0
Zinc	mg/L	-	-	-	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	0.0030	0
<b>Σ Toxic Units</b>												
WQGs	mg/L				2.00	1.93	1.92	1.98	-	1.94	1.97	-
WQGs/EVVQP Benchmarks	mg/L				1.41	1.32	1.33	1.36	-	1.30	1.35	-

Table C-7: Water Quality Screening for 2017 Chronic Toxicity Tests at EV\_MC2

Parameter	Unit	Guidelines for the protection of:																Q1		Q2							Q3			Q4				
		Aquatic Life		EVWQP Benchmarks	Feb 21 (C.dubia and P.subcapitata)	Apr 24 (C.dubia and P.subcapitata)	May 09	May 16	May 23	May 30	Jun 06	May 9, 16, 23, 30 June (D.mykiss)		Jul 25 (C.dubia and P.subcapitata)	Oct 02 (C.dubia and P.subcapitata)	Oct 10	Oct 17	Oct 24	Oct 31	Oct 2, 10, 17, 24, 31 (O.mykiss)														
		30-day mean (BC MOE)	Maximum (BC MOE)									Mean	CV							Mean	CV													
<b>Field Measured</b>																																		
pH	-	6.5 - 9.0	6.5 - 9.0	-	5.6 <sup>(M)</sup>	8.3	7.9	7.9	7.9	8.0	7.8	7.9	8.3	8.0	7.8	7.9	8.1	8.1	8.0	0.13														
Temperature	°C	-	-	-	0.72	4.4	3.3	3.4	3.7	6.6	4.1	4.2	0.324	13	4.6	4.7	6.9	3.8	1.5	4.6	0.13													
Dissolved oxygen	mg/L	8.0	5.0	-	11	11	11	11	10	11	11	0.037	9.6	10	11	9.9	11	11	11	0.066														
Conductivity	µS/cm	-	-	-	658	388	306	333	232	225	-	274	0.196	-	-	-	-	-	-	-														
<b>Conventional Parameters</b>																																		
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.2	8.1	8.3	8.0	8.1	8.3	8.1	8.1	0.015	8.4	8.3	8.4	7.9	8.3	8.2	8.2	0.021													
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	266	266	-	550	644	644	731	591	596	642	0.088														
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	334	199	170	178	112	119	132	142	0.211	350	262	303	431	297	276	314	0.215													
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(b)</sup>	-	-	176	143	121	118	99	94	95	105	0.123	167	137	193	205	168	172	175	0.149													
Total dissolved solids	mg/L	-	-	-	429	222	198	220	153	160	157	178	0.168	362	420	394	544	352	354	413	0.191													
Total suspended solids	mg/L	-	-	-	<1.0	20	36	14	126	124	31	66	0.817	1.7	1.6	1.2	<1.0	1.7	<1.0	1.3	0.255													
Total organic carbon	mg/L	-	-	-	0.73	3.3	5.4	-	6.7	5.8	2.7	0.1	0.336	1.7	0.90	<0.5	1.1	1.6	0.91	0.59	0.384													
Dissolved organic carbon	mg/L	-	-	-	0.80	2.9	3.5	2.9	2.8	2.7	2.6	2.9	0.117	1.3	1.0	<0.5	1.0	1.3	0.81	0.93	0.327													
Turbidity	NTU	-	-	-	0.70	11	22	8.6	64	80	17	38	0.827	0.45	1.2	0.19	0.25	0.44	0.29	0.47	0.878													
Conductivity	µS/cm	-	-	-	615	402	309	339	241	238	258	277	0.162	531	565	552	756	511	555	588	0.164													
<b>Major Ions</b>																																		
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.090													
Chloride	mg/L	150	600	-	7.1	4.3	2.9	2.9	1.2	1.1	1.8	2.0	0.447	4.9	6.1	4.6	14	5.3	5.4	7.1	0.568													
Fluoride	mg/L	-	1.4 - 1.9 <sup>(b)</sup>	-	0.15	0.099	0.11	0.12	0.10	0.099	0.11	0.11	0.076	0.16	0.12	0.15	0.15	0.15	0.14	0.14	0.097													
Sulphate	mg/L	309 - 429 <sup>(b,c)</sup>	-	481	148	68	45	55	30	29	38	40	0.279	116	133	125	194	110	120	136	0.244													
<b>Nutrients</b>																																		
Nitrate	mg-N/L	3.0	33	5.0 - 19 <sup>(f)</sup>	3.5 <sup>(M)</sup>	1.1	0.74	1.2	0.52	0.56	0.75	0.76	0.277	2.2	2.7	2.1	4.9 <sup>(M)</sup>	2.0	2.2	2.8	0.444													
Nitrite	mg-N/L	0.020 - 0.20 <sup>(b)</sup>	0.060 - 0.60 <sup>(b)</sup>	-	<0.001	0.0011	0.0015	<0.001	<0.001	<0.001	<0.001	0.0011	0.203	0.0032	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.019													
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005													
Orthophosphate	mg-P/L	-	-	-	0.0044	0.0041	0.013	0.014	0.016	0.017	0.014	0.015	0.114	<0.001	0.0014	<0.001	0.0011	0.0022	0.0014	0.0014	0.332													
Total Ammonia	mg-N/L	0.57 - 2.1 <sup>(b)</sup>	2.9 - 28 <sup>(b)</sup>	-	0.0075	0.024	0.0082	<0.005	0.0056	<0.005	0.0058	0.241	0.0082	0.025	<0.005	<0.005	<0.005	0.0050	0.0091	1.005														
Phosphorus	mg-P/L	-	-	-	0.0056	0.033	0.051	0.026	0.20	0.22	0.060	0.11	0.814	0.0032	0.0029	<0.002	0.0029	0.0049	<0.002	0.0029	0.403													
<b>Total Metals</b>																																		
Aluminum	mg/L	-	-	-	0.022	0.11	0.91	0.33	1.7	1.5	0.51	1.00	0.613	0.0083	0.011	<0.003	0.0081	0.016	0.0051	0.0086	0.580													
Antimony	mg/L	0.0090	-	-	0.00022	0.00012	0.00014	0.00015	0.00025	0.00019	0.00016	0.00018	0.249	0.00020	0.00012	0.00012	0.00012	0.00014	0.00010	0.00012	0.118													
Arsenic	mg/L	-	0.0050	-	0.00017	0.00029	0.00048	0.00031	0.0011	0.0011	0.00050	0.00070	0.538	0.00018	0.00018	0.00020	0.00020	0.00017	0.00018	0.118														
Barium	mg/L	1.0	-	-	0.12	0.091	0.078	0.071	0.088	0.085	0.061	0.077	0.140	0.098	0.12	0.11	0.10	0.11	0.11	0.11	0.059													
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	0.000042	<0.00002	0.00011	0.00012	0.00034	0.00065	0.706	<0.00002	<0.00002	<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	<0.00005	0.00050	0	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00050	0													
Boron	mg/L	-	1.2	-	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0	0.012	0.014	0.012	0.017	0.012	0.012	0.013	0.163													
Cadmium	mg/L	-	-	-	0.000035	0.000063	0.000100	0.000060	0.00026	0.00028	0.00085	0.00016	0.666	0.000039	0.000034	0.000027	0.000056	0.000029	0.000029	0.000035	0.347													
Calcium	mg/L	-	-	-	84	48	45	44	34	35	34	38	0.144	78	87	73	105	71	70	81	0.185													
Chromium	mg/L	0.0010 <sup>(e)</sup>	-	-	0.00023	0.00025	0.00046	0.00044	0.0028	0.0028	0.0086	0.0016	0.586	0.00015	0.00019	0.00015	0.00014	0.00013	0.00015	0.00015	0.150													
Cobalt	mg/L	0.0040	0.11	-	<0.0001	0.00025	0.00046	0.00022	0.0012	0.0012	0.0038	0.0099	0.682	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00010	0													
Copper	mg/L	0.0045 - 0.010 <sup>(b)</sup>	0.013 - 0.040 <sup>(b)</sup>	-	<0.0005	0.00074	0.0014	0.00073	0.0027	0.0030	0.0097	0.0018	0.588	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00050	0													
Iron	mg/L	-	1.0	-	0.029	0.15	0.73	0.30	2.1 <sup>(M)</sup>	2.2 <sup>(M)</sup>	0.60	1.2 <sup>(M)</sup>	0.750	0.012	0.016	<0.01	0.015	0.029	0.011	0.016	0.469													
Lead	mg/L	0.0070 - 0.020 <sup>(b)</sup>	0.094 - 0.42 <sup>(b)</sup>	-	<0.00005	0.00016	0.00046	0.00020	0.0014	0.0015	0.00042	0.00080	0.764	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000050	0													
Lithium	mg/L	-	-	-	0.017	0.0058	0.0067	0.0049	0.0049	0.0052	0.0055	0.139	0.015	0.016	0.013	0.024	0.013	0.012	0.016	0.016	0.323													
Magnesium	mg/L	-	-	-	32	17	14	16	11	11	13	0.186	31	32	30	40	26	27	31	31	0.174													
Manganese	mg/L	1.1 - 2.5 <sup>(b)</sup>	1.8 - 3.4 <sup>(b)</sup>	-	0.0020	0.0085	0.019	0.0085	0.057	0.065	0.018	0.033	0.773	0.0022	0.0020	0.0018	0.0015	0.0018	0.0015	0.0017	0.124													
Mercury	mg/L	0.000010	-	-	<0.000005	0.000032	0.000052	0.000031	0.000097	0.000090	0.000037	0.000081	0.496	0.0000080	<0.000005	<0.000005	<0.000005	0.000014	0.000032	0.000032	1.723													
Molybdenum	mg/L	1.0	2.0	-	0.0015	0.00066	0.00062	0.00076	0.0028	0.0028	0.0094	0.0067	0.962	0.0013	0.00062	0.00062	0.00073	0.00060	0.00073	0.00060	0.062													
Nickel	mg/L	0.005 <sup>(b)</sup>	-	-	0.0025	0.0019	0.0025	0.0023	0.0055 <sup>(M)</sup>	0.0055 <sup>(M)</sup>	0.0029	0.0037	0.438	0.00021	0.000091	<0.00005	0.000056	0.00061	0.00053	0.00062	0.287													
Potassium	mg/L	-	-	-	1.2	0.78	0.94	0.80	1.1	1.0	0.73	0.92	0.164	1.1	1.1	0.90	1.3	0.91	0.90	1.0	0.187													
Selenium	mg/L	0.0020	-	0.019	0.016 <sup>(M)</sup>	0.0064 <sup>(M)</sup>	0.0046 <sup>(M)</sup>	0.0076 <sup>(M)</sup>	0.0030 <sup>(M)</sup>	0.0030 <sup>(M)</sup>	0.0040 <sup>(M)</sup>	0.0043 <sup>(M)</sup>	0.384	0.013 <sup>(M)</sup>	0.013 <sup>(M)</sup>	0.015 <sup>(M)</sup>	0.027 <sup>(M)</sup>	0.014 <sup>(M)</sup>	0.015 <sup>(M)</sup>	0.015 <sup>(M)</sup>	0.303													
Silver	mg/L	0.0015 <sup>(b)</sup>	0.0030 <sup>(b)</sup>	-	<0.00001	<0.00001	0.000020	<0.00001	0.000041	0.000045	0.000012	0.000026	0.640	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00010	0													
Sodium	mg/L	-	-	-	5.9	3.4	2.7	2.6	1.8	1.6	2.0	0.298	4.0	2.8	4.4	4.3	4.4	4.3	5.0	0.263														
Strontium	mg/L	-	-	-	0.20	0.14	0.11	0.11	0.086	0.079	0.079	0.093	0.174	0.18	0.20	0.17	0.24	0.18	0.17	0.19	0.156													
Thallium	mg/L	-	-	-	<0.00001	0.000011	0.000032	0.000017	0.000073	0.000070	0.000026	0.000044	0.597	<0.00001	<0.00001	<0.00001	<0.00001																	

Table C-8: Water Quality Screening for 2017 Chronic Toxicity Tests at EV\_HC1

Parameter	Unit	Guidelines for the protection of:				Q1					Q2					Q3					Q4				
		Aquatic Life		EWWQP Benchmarks	Feb 21 (C. dubia and P. subcapitata)	Apr 24 (C. dubia and P. subcapitata)	May 09	May 16	May 23	May 30	Jun 06	May 9, 16, 23, 30 Jun 6 (O. mykiss)		Jul 25 (C. dubia and P. subcapitata)	Oct 02 (C. dubia and P. subcapitata)	Oct 10	Oct 17	Oct 24	Oct 31	Oct 2, 10, 17, 24, 31 (O. mykiss)					
		30-day mean (BC MOE)	Maximum (BC MOE)									Mean	CV							Mean	CV				
<b>Field Measured</b>																									
pH	-	6.5 - 9.0	6.5 - 9.0	-	6.5 <sup>(a)</sup>	8.3	8.2	8.2	8.2	8.1	8.0	8.1	0.014	8.1	8.0	7.5	8.3	8.3	7.7	8.0	0.045				
Temperature	°C	-	-	-	3.1	3.2	3.2	3.6	4.5	4.7	4.5	0.112	4.7	4.6	3.7	3.6	3.2	3.1	3.1	3.1	0.498				
Dissolved oxygen	mg/L	8.0	5.0	-	11	11	11	11	11	11	11	0.015	10.0	10	11	11	11	12	11	11	0.053				
Conductivity	µS/cm	-	-	-	744	649	479	503	438	412	-	458	0.089	-	-	-	-	-	-	-	-				
<b>Conventional Parameters</b>																									
pH	-	6.5 - 9.0	6.5 - 9.0	-	8.3	8.3	8.4	8.3	8.3	8.3	8.4	8.3	0.007	8.4	8.5	8.4	8.3	8.3	8.3	8.4	0.009				
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-	432	432	470	470	708	708	705	734	669	669	0.167				
Hardness, as CaCO <sub>3</sub>	mg/L	-	-	-	411	335	286	288	254	233	241	260	0.098	416	388	378	391	443	396	399	0.065				
Total alkalinity, as CaCO <sub>3</sub>	mg/L	20 <sup>(b)</sup>	-	-	197	201	185	178	156	157	155	166	0.085	182	171	192	186	192	185	185	0.046				
Total dissolved solids	mg/L	-	-	-	492	398	311	333	274	252	280	290	0.110	436	474	495	492	525	483	494	0.039				
Total suspended solids	mg/L	-	-	-	<1.0	4.2	10	11	27	13	4.0	13	0.657	<1.0	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	0.308				
Total organic carbon	mg/L	-	-	-	0.89	3.1	4.3	3.2	4.6	3.0	2.1	3.4	0.284	1.0	0.97	1.0	0.97	1.4	0.89	1.0	0.178				
Dissolved organic carbon	mg/L	-	-	-	0.72	2.6	3.5	2.6	2.5	2.1	1.3	2.4	0.324	0.97	1.0	1.1	0.97	1.4	0.92	1.1	0.191				
Turbidity	NTU	-	-	-	0.40	3.4	8.0	7.3	26	14	3.0	12	0.769	0.31	0.31	0.31	0.25	0.44	0.21	0.21	0.286				
Conductivity	µS/cm	-	-	-	704	630	479	529	431	412	439	458	0.102	610	660	695	704	691	738	698	0.040				
<b>Major Ions</b>																									
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	0.090				
Chloride	mg/L	150	600	-	0.79	0.57	0.62	0.46	0.39	0.44	0.50	0.193	0.81	0.80	1.3	1.0	1.2	1.1	1.1	1.1	0.187				
Fluoride	mg/L	-	1.7 - 1.9 <sup>(c)</sup>	-	0.22	0.14	0.16	0.17	0.15	0.16	0.18	0.059	0.21	0.17	0.30	0.24	0.22	0.20	0.22	0.20	0.222				
Sulphate	mg/L	429 <sup>(d)</sup>	-	-	481	204	147	88	105	82	71	81	85	161	189	205	199	211	211	203	0.046				
<b>Nutrients</b>																									
Nitrate	mg-N/L	3.0	33	10 - 20 <sup>(e)</sup>	1.2	0.85	0.58	0.73	0.55	0.46	0.50	0.56	0.187	0.79	0.86	0.95	0.91	0.97	1.0	0.94	0.062				
Nitrite	mg-N/L	0.020 <sup>(f)</sup>	0.060 <sup>(f)</sup>	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.010	0	<0.001	<0.001	0.022	<0.001	<0.005	0.0020	0.850	0.020				
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	0.081	0.22	0.23	0.20	0.21	0.18	0.13	0.19	0.207	0.069	<0.2	0.051	<0.05	0.088	0.11	0.099	0.621				
Orthophosphate	mg-P/L	-	-	-	0.0068	0.0044	0.0071	0.0075	0.0077	0.0058	0.0067	0.149	0.0054	0.0048	0.0040	0.0034	0.0044	0.0051	0.0043	0.0043	0.154				
Total Ammonia	mg-N/L	0.61 - 2.1 <sup>(g)</sup>	3.2 - 28 <sup>(g)</sup>	-	0.0052	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0050	0	<0.005	0.024	<0.005	<0.005	<0.005	<0.005	<0.005	0.005				
Phosphorus	mg-P/L	-	-	-	0.0077	0.016	0.020	0.016	0.040	0.026	0.013	0.023	0.467	0.0072	0.0098	0.0058	0.0043	0.0073	0.0045	0.0063	0.359				
<b>Total Metals</b>																									
Aluminum	mg/L	-	-	-	0.0097	0.072	0.32	0.37	0.67	0.42	0.12	0.38	0.620	0.0097	0.0040	0.0060	0.0056	0.0089	0.0031	0.0055	0.403				
Antimony	mg/L	0.0090	-	-	<0.001	0.0011	<0.001	<0.001	0.0014	<0.001	<0.001	0.0011	0.166	<0.001	<0.001	0.0014	0.0011	<0.001	<0.001	0.0011	0.157				
Arsenic	mg/L	-	0.0050	-	0.0028	0.0028	0.0029	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028				
Barium	mg/L	1.0	-	-	0.066	0.051	0.044	0.045	0.046	0.046	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043				
Beryllium	mg/L	0.00013	-	-	<0.00002	<0.00002	0.000024	0.00001	0.000023	<0.00002	0.000028	0.478	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000020				
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0				
Boron	mg/L	-	1.2	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010				
Cadmium	mg/L	-	-	-	0.00043	0.00049	0.00049	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052	0.00052				
Calcium	mg/L	-	-	-	89	71	62	63	62	52	54	59	0.092	83	82	77	83	84	83	84	0.074				
Chromium	mg/L	0.0010 <sup>(i)</sup>	-	-	0.00023	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025				
Cobalt	mg/L	0.0040	0.11	-	<0.0001	<0.0001	0.00014	0.00014	0.00035	0.00018	<0.0001	0.00018	0.539	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0				
Copper	mg/L	0.0093 - 0.010 <sup>(j)</sup>	0.024 - 0.040 <sup>(j)</sup>	-	<0.0005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005				
Iron	mg/L	-	1.0	-	0.017	0.10	0.30	0.31	0.83	0.43	0.10	0.40	0.686	0.011	0.012	<0.01	0.011	0.013	<0.01	0.011	0.116				
Lead	mg/L	0.013 - 0.020 <sup>(k)</sup>	0.24 - 0.42 <sup>(k)</sup>	-	<0.0005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005				
Lithium	mg/L	-	-	-	0.0065	0.0068	0.0050	0.0056	0.0052	0.0056	0.0047	0.172	0.0066	0.0072	0.0074	0.0068	0.0087	0.0070	0.0074	0.0074	0.101				
Magnesium	mg/L	-	-	-	47	38	28	31	24	22	23	26	0.141	46	44	46	46	51	49	47	0.052				
Manganese	mg/L	1.6 - 2.6 <sup>(l)</sup>	3.1 - 3.4 <sup>(l)</sup>	-	0.0027	0.0034	0.0070	0.0070	0.018	0.0097	0.0034	0.0089	0.603	0.0057	0.0057	0.0044	0.0042	0.0042	0.0035	0.0044	0.181				
Mercury	mg/L	0.00010	-	-	<0.000005	0.0000013	0.0000024	0.0000022	0.0000040	0.0000026	0.0000012	0.0000025	0.416	0.0000012	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.0000047	0.0000013	1.403				
Molybdenum	mg/L	1.0	2.0	-	0.0093	0.0086	0.00074	0.00074	0.00068	0.00065	0.00089	0.130	0.00089	0.00087	0.00087	0.00091	0.00088	0.00090	0.00089	0.00089	0.021				
Nickel	mg/L	0.005 <sup>(m)</sup>	-	-	0.0078	0.0013	0.0013	0.0013	0.0022	0.0013	0.0090	0.0014	0.334	0.00078	0.00065	0.00062	0.00075	0.00065	0.00067	0.00067	0.141				
Potassium	mg/L	-	-	-	0.92	1.00	0.50	0.95	0.88	0.76	0.67	0.85	0.155	0.87	0.87	0.83	0.89	0.83	0.90	0.88	0.040				
Selenium	mg/L	0.0020	-	0.019	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.022 <sup>(n)</sup>	0.028 <sup>(n)</sup>	0.022 <sup>(n)</sup>	0.017 <sup>(n)</sup>	0.023 <sup>(n)</sup>	0.175	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.040 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.030 <sup>(n)</sup>	0.060				
Silver	mg/L	0.0015 <sup>(o)</sup>	0.0030 <sup>(o)</sup>	-	<0.00001	<0.00001	<0.00001	<0.00001	0.000014	<0.00001	<0.00001	0.000011	0.166	<0.00001	<0.00001	0.000015	<0.00001	<0.00001	<0.00001	0.000011	0.203				
Sodium	mg/L	-	-	-	1.5	1.3	1.3	1.3	1.3	1.3	0.92	1.1	0.165	1.4	1.5	1.7	1.7	1.7	1.6	1.6	0.061				
Strontium	mg/L	-	-	-	0.13	0.11	0.092	0.095	0.089	0.076	0.077	0.086	0.104	<0.0001	0.13	0.12	0.13	0.13	0.13	0.13	0.041				
Thallium	mg/L	0.00080	-	-	<0.00001	0.000017	0.000017	0.000017																	







**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 <sub>3</sub> ), lab measured.-N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l	ANTIMONY-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	111	103	149	< 0.0030	0.0032	< 0.00010
2015	Q1	Reference (FR_UFR1)	100	93	149	< 0.0030	0.0032	< 0.00010
2015	Q1	Reference (FR_UFR1)	100	102	145	< 0.0030	0.0059	< 0.00010
2015	Q2	Reference (FR_UFR1)	100	92	119	0.0092	0.083	< 0.00010
2015	Q3	Reference (FR_UFR1)	111	106	159	< 0.0030	0.0078	< 0.00010
2015	Q4	Reference (FR_UFR1)	100	112	146	< 0.0030	0.0046	< 0.00010
2015	Q2	Reference (GH_ER2)	100	93	157	< 0.0030	0.076	< 0.00010
2015	Q4	Reference (GH_ER2)	100	110	147	< 0.0030	0.0046	< 0.00010
2016	Q1	Reference (FR_UFR1)	111	114	138	< 0.0030	0.0048	< 0.00010
2016	Q2	Reference (FR_UFR1)	100	98	110	0.015	0.11	< 0.00010
2016	Q3	Reference (FR_UFR1)	100	99	160	< 0.0030	0.013	< 0.00010
2016	Q4	Reference (FR_UFR1)	100	92	141	0.011	0.051	< 0.00010
2016	Q2	Reference (GH_ER2)	90	74	143	0.0036	0.2	< 0.00010
2016	Q4	Reference (GH_ER2)	100	95	143	< 0.0030	0.0075	< 0.00010
2017	Q2	Reference (CM_MC1)	100	118	133	0.004	0.02	< 0.0001
2017	Q3	Reference (CM_MC1)	100	118	141	0.0026	0.021	< 0.0001
2017	Q4	Reference (CM_MC1)	100	101	134	< 0.003	0.0086	< 0.0001
2017	Q1	Reference (FR_UFR1)	100	131	146	< 0.001	0.0046	< 0.0001
2017	Q2	Reference (FR_UFR1)	100	104	113	0.089	0.15	< 0.0001
2017	Q3	Reference (FR_UFR1)	100	109	148	0.0015	0.0071	< 0.0001
2017	Q4	Reference (FR_UFR1)	100	102	138	< 0.003	0.0037	< 0.0001
2017	Q2	Reference (GH_ER2)	90	83	153	< 0.003	0.077	< 0.0001
2017	Q3	Reference (GH_ER2)	100	122	130	0.0027	0.012	< 0.0001
2017	Q4	Reference (GH_ER2)	100	97	155	< 0.003	0.0061	< 0.0001
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	111	87	213	0.0097	0.032	0.00017
2015	Q3	CM_MC2	111	104	198	< 0.0030	0.016	0.00018
2015	Q1	EV_HC1	100	97	135	0.003	0.009	0.0001
2015	Q2	EV_HC1	100	97	110	0.0032	0.05	0.0001
2015	Q3	EV_HC1	111	123	192	0.0049	0.034	< 0.00010
2015	Q4	EV_HC1	100	119	195	< 0.0030	0.0058	< 0.00010
2015	Q1	EV_MC2	100	96	193	0.0037	0.019	< 0.00010
2015	Q2	EV_MC2	100	90	116	< 0.0070	0.36	< 0.00010
2015	Q3	EV_MC2	111	114	194	0.003	0.0085	0.00041
2015	Q4	EV_MC2	100	111	193	< 0.0030	0.0056	0.00035
2015	Q2	FR_FRCP1	100	94	147	< 0.0030	0.073	0.00022
2015	Q3	FR_FRCP1	111	119	198	< 0.0030	0.022	0.00027
2015	Q1	GH_ERC	100	96	155	< 0.0030	0.028	< 0.00010
2015	Q2	GH_ERC	100	91	161	< 0.0030	0.13	< 0.00010
2015	Q3	GH_ERC	111	100	142	< 0.0030	0.083	< 0.00010
2015	Q4	GH_ERC	100	120	151	< 0.0030	0.007	< 0.00010
2015	Q1	GH_FR1	111	99	202	< 0.0030	0.0048	0.00014
2015	Q2	GH_FR1	100	103	167	< 0.0030	0.053	0.00017
2015	Q3	GH_FR1	111	114	182	< 0.0030	0.013	0.00022
2015	Q4	GH_FR1	100	124	188	< 0.0030	0.004	0.00011
2015	Q1	LC_LCDSSLCC	111	98	195	< 0.0030	0.0052	0.00022
2015	Q3	LC_LCDSSLCC	111	107	181	< 0.0030	0.013	0.00019
2015	Q4	LC_LCDSSLCC	100	89	197	< 0.0050	< 0.015	< 0.00050
2016	Q1	EV_HC1	111	113	191	< 0.0030	0.0096	< 0.00010
2016	Q3	EV_HC1	100	89	192	0.014	0.073	< 0.00010
2016	Q4	EV_HC1	100	88	192	0.0054	0.076	< 0.00010
2016	Q1	EV_MC2	111	109	179	< 0.0030	0.031	0.00025
2016	Q3	EV_MC2	100	96	204	< 0.0030	0.0054	0.00021
2016	Q1	GH_ERC	100	101	152	< 0.0030	0.0031	< 0.00010
2016	Q3	GH_ERC	100	95	144	< 0.0030	0.021	< 0.00010
2016	Q4	GH_ERC	100	84	148	< 0.0030	0.019	< 0.00010
2016	Q1	GH_FR1	89	92	190	< 0.0030	0.004	0.00012
2016	Q3	GH_FR1	100	100	198	< 0.0030	0.0079	0.00013
2016	Q4	GH_FR1	100	83	188	< 0.003	0.012	0.00015
2016	Q1	LC_LCDSSLCC	111	109	193	< 0.0030	0.0074	0.0002
2016	Q3	LC_LCDSSLCC	100	83	187	< 0.0030	0.0047	0.00021
2016	Q4	LC_LCDSSLCC	100	94	176	< 0.0030	0.0056	0.00019
2017	Q1	EV_HC1	100	121	197	< 0.003	0.0097	< 0.0001
2017	Q3	EV_HC1	100	105	182	< 0.003	0.0097	< 0.0001
2017	Q4	EV_HC1	100	100	171	< 0.003	0.004	< 0.0001
2017	Q2	EV_MC2	90	80	143	0.018	0.11	0.0001
2017	Q3	EV_MC2	100	96	167	< 0.003	0.0083	0.00018
2017	Q4	EV_MC2	100	126	137	< 0.003	0.011	< 0.0001
2017	Q1	GH_ERC	100	126	156	< 0.003	0.0065	< 0.0001
2017	Q2	GH_ERC	100	98	157	< 0.003	0.12	< 0.0001
2017	Q3	GH_ERC	100	95	140	0.0031	0.042	< 0.0001
2017	Q4	GH_ERC	100	101	145	< 0.003	0.0045	< 0.0001
2017	Q1	GH_FR1	100	108	202	< 0.003	0.0085	0.00012
2017	Q2	GH_FR1	100	85	194	0.0069	0.71	0.00022
2017	Q4	GH_FR1	100	116	160	< 0.003	< 0.003	0.00015
2017	Q2	LC_LCDSSLCC	100	124	199	0.0011	0.014	0.00028
2017	Q3	LC_LCDSSLCC	100	104	192	0.0015	0.0031	0.00026
2017	Q4	LC_LCDSSLCC	100	127	156	< 0.003	0.0038	0.00026
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	100	55	148	0.0044	0.31	0.00012
2015	Q4	CM_MC2	100	69	215	< 0.0030	0.0054	0.00013
2015	Q1	FR_FRCP1	100	47	337	< 0.0030	< 0.0060	0.00048
2015	Q4	FR_FRCP1	100	57	211	< 0.0030	0.0035	0.00025
2015	Q2	LC_LCDSSLCC	100	82	150	< 0.0030	0.016	0.00015
2016	Q1	CM_MC2	111	97	206	< 0.0030	0.012	0.00018
2016	Q2	CM_MC2	100	43	152	0.0076	0.34	0.00014
2016	Q3	CM_MC2	100	73	201	< 0.0030	0.0053	0.00019
2016	Q4	CM_MC2	100	68	165	0.0088	0.15	0.00014
2016	Q2	EV_HC1	90	79	179	0.0046	0.15	< 0.00010
2016	Q2	EV_MC2	100	77	98	0.018	0.42	< 0.00010
2016	Q4	EV_MC2	100	66	122	0.023	0.23	< 0.00010
2016	Q1	FR_FRCP1	100	60	254	< 0.0030	< 0.0030	0.00027
2016	Q2	FR_FRCP1	100	80	147	< 0.0030	0.11	0.00018
2016	Q3	FR_FRCP1	100	67	198	< 0.0030	0.014	0.0002
2016	Q4	FR_FRCP1	100	63	193	0.0046	0.015	0.00019
2016	Q2	GH_ERC	100	77	146	0.0045	0.31	< 0.00010
2016	Q2	GH_FR1	90	74	160	< 0.0030	0.09	0.00017
2016	Q2	LC_LCDSSLCC	100	67	153	< 0.0030	0.029	0.00024
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	100	40	211	0.0012	0.0081	0.00032
2017	Q2	CM_MC2	90	50	197	0.0057	0.11	0.00028
2017	Q2	CM_MC2	100	76	194	0.0047	0.095	0.00028
2017	Q3	CM_MC2	70	33	180	0.0019	0.018	0.00031
2017	Q4	CM_MC2	80	41	196	< 0.003	0.01	0.00027
2017	Q2	EV_HC1	100	72	201	0.0078	0.072	< 0.0001
2017	Q1	EV_MC2	100	94	176	< 0.003	0.022	0.00023
2017	Q1	FR_FRCP1	100	67	251	< 0.001	0.005	0.00023
2017	Q2	FR_FRCP1	100	41	169	0.013	0.36	0.00021
2017	Q3	FR_FRCP1	100	75	196	0.0011	0.0082	< 0.0002
2017	Q4	FR_FRCP1	100	54	146	< 0.003	< 0.003	0.00024
2017	Q3	GH_FR1	100	91	191	0.0017	0.007	0.00016
2017	Q1	LC_LCDSSLCC	100	92	196	< 0.003	0.0086	0.00021

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: *C. dubia* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	ANTIMONY-T-mg/l	ARSENIC-D-mg/l	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00010	< 0.00010	0.077	0.077	< 0.00010
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00010	< 0.00010	0.077	0.077	< 0.00010
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00010	< 0.00010	0.075	0.078	< 0.00010
2015	Q2	Reference (FR_UFR1)	< 0.00010	0.00012	0.00014	0.042	0.043	< 0.00010
2015	Q3	Reference (FR_UFR1)	< 0.00010	0.00011	0.00012	0.076	0.076	< 0.00010
2015	Q4	Reference (FR_UFR1)	< 0.00010	< 0.00010	0.0001	0.074	0.075	< 0.00010
2015	Q2	Reference (GH_ER2)	< 0.00010	0.00011	0.00016	0.046	0.048	< 0.00010
2015	Q4	Reference (GH_ER2)	< 0.00010	< 0.00010	< 0.00010	0.047	0.049	< 0.00010
2016	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00010	< 0.00010	0.074	0.073	< 0.00010
2016	Q2	Reference (FR_UFR1)	< 0.00010	0.00011	0.00014	0.04	0.042	< 0.00010
2016	Q3	Reference (FR_UFR1)	< 0.00010	< 0.00010	0.0001	0.074	0.077	< 0.00020
2016	Q4	Reference (FR_UFR1)	< 0.00010	< 0.00010	0.00015	0.069	0.064	< 0.00020
2016	Q2	Reference (GH_ER2)	< 0.00010	0.00011	0.00024	0.042	0.044	< 0.00010
2016	Q4	Reference (GH_ER2)	< 0.00010	< 0.00010	< 0.00010	0.042	0.038	< 0.00020
2017	Q2	Reference (CM_MC1)	< 0.0001	0.00022	0.0002	0.048	0.046	< 0.00002
2017	Q3	Reference (CM_MC1)	< 0.0001	0.00022	0.00024	0.05	0.046	< 0.00002
2017	Q4	Reference (CM_MC1)	< 0.0001	0.00016	0.00019	0.051	0.051	< 0.00002
2017	Q1	Reference (FR_UFR1)	0.00026	< 0.0001	0.00012	0.073	0.073	< 0.00002
2017	Q2	Reference (FR_UFR1)	< 0.0001	0.00015	0.00019	0.053	0.051	< 0.00002
2017	Q3	Reference (FR_UFR1)	0.00011	< 0.0001	0.00013	0.068	0.069	< 0.00002
2017	Q4	Reference (FR_UFR1)	< 0.0001	< 0.0001	0.00011	0.072	0.072	< 0.00002
2017	Q2	Reference (GH_ER2)	< 0.0001	< 0.0001	0.00014	0.05	0.051	< 0.00002
2017	Q3	Reference (GH_ER2)	0.00019	0.00011	0.00012	0.043	0.043	< 0.00002
2017	Q4	Reference (GH_ER2)	< 0.0001	< 0.0001	0.00011	0.049	0.048	< 0.00002
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.00019	0.00017	0.00022	0.072	0.072	< 0.00010
2015	Q3	CM_MC2	0.00021	0.00019	0.00021	0.069	0.069	< 0.00010
2015	Q1	EV_HC1	0.0001	0.00013	0.00014	0.041	0.042	0.0001
2015	Q2	EV_HC1	0.0001	0.00013	0.00016	0.025	0.025	0.0001
2015	Q3	EV_HC1	0.00011	0.00017	0.00024	0.058	0.059	< 0.00010
2015	Q4	EV_HC1	0.00012	0.00014	0.00015	0.06	0.063	< 0.00010
2015	Q1	EV_MC2	< 0.00010	0.00015	0.00018	0.11	0.11	< 0.00010
2015	Q2	EV_MC2	0.00011	0.00018	0.00033	0.062	0.067	< 0.00010
2015	Q3	EV_MC2	0.00044	0.00016	0.00023	0.1	0.1	< 0.00010
2015	Q4	EV_MC2	0.00038	0.00014	0.00019	0.11	0.11	< 0.00010
2015	Q2	FR_FRCP1	0.00022	< 0.00010	0.00015	0.064	0.065	< 0.00010
2015	Q3	FR_FRCP1	0.00033	0.0001	0.00019	0.076	0.076	< 0.00010
2015	Q1	GH_ERC	0.00012	< 0.00010	0.00015	0.055	0.056	< 0.00010
2015	Q2	GH_ERC	< 0.00010	< 0.00010	0.00017	0.05	0.051	< 0.00010
2015	Q3	GH_ERC	< 0.00010	< 0.00010	0.00017	0.046	0.049	< 0.00010
2015	Q4	GH_ERC	< 0.00010	< 0.00010	< 0.00010	0.058	0.06	< 0.00010
2015	Q1	GH_FR1	0.00014	< 0.00010	0.00014	0.12	0.13	< 0.00010
2015	Q2	GH_FR1	0.00017	0.0001	0.00014	0.085	0.087	< 0.00010
2015	Q3	GH_FR1	0.00025	0.00014	0.0002	0.098	0.10	< 0.00010
2015	Q4	GH_FR1	0.00015	< 0.00010	0.00014	0.12	0.12	< 0.00010
2015	Q1	LC_LCDSSLCC	0.00022	0.00011	0.00013	0.096	0.093	< 0.00010
2015	Q3	LC_LCDSSLCC	0.00026	< 0.00010	0.00011	0.06	0.063	< 0.00010
2015	Q4	LC_LCDSSLCC	< 0.00050	< 0.00050	< 0.00050	0.085	0.091	< 0.00050
2016	Q1	EV_HC1	< 0.00010	0.00015	0.00016	0.067	0.065	< 0.00010
2016	Q3	EV_HC1	< 0.00010	0.00016	0.00021	0.065	0.066	< 0.00020
2016	Q4	EV_HC1	0.0001	0.00015	0.00019	0.06	0.06	< 0.00020
2016	Q1	EV_MC2	0.00025	0.00013	0.00016	0.11	0.11	< 0.00010
2016	Q3	EV_MC2	0.00022	0.00018	0.00018	0.1	0.1	< 0.00020
2016	Q1	GH_ERC	< 0.00010	< 0.00010	< 0.00010	0.067	0.066	< 0.00010
2016	Q3	GH_ERC	< 0.00010	< 0.00010	0.00011	0.049	0.05	< 0.00020
2016	Q4	GH_ERC	< 0.00010	< 0.00010	0.00012	0.055	0.051	< 0.00020
2016	Q1	GH_FR1	0.00014	< 0.00010	< 0.00010	0.12	0.11	< 0.00010
2016	Q3	GH_FR1	0.00014	< 0.00010	0.00012	0.1	0.1	< 0.00020
2016	Q4	GH_FR1	0.00034	< 0.0001	0.00014	0.1	0.097	< 0.00002
2016	Q1	LC_LCDSSLCC	0.00025	< 0.00010	0.00013	0.086	0.089	< 0.00010
2016	Q3	LC_LCDSSLCC	0.00024	< 0.00010	0.00011	0.072	0.066	< 0.00020
2016	Q4	LC_LCDSSLCC	0.00026	< 0.00010	0.0002	0.055	0.053	< 0.00020
2017	Q1	EV_HC1	< 0.0001	0.00014	0.00017	0.065	0.066	< 0.00002
2017	Q3	EV_HC1	< 0.0001	0.0002	0.0002	0.061	0.057	< 0.00002
2017	Q4	EV_HC1	< 0.0001	0.00016	0.00018	0.063	0.063	< 0.00002
2017	Q2	EV_MC2	0.00012	0.00021	0.00029	0.091	0.091	< 0.00002
2017	Q3	EV_MC2	0.0002	0.00017	0.00018	0.11	0.098	< 0.00002
2017	Q4	EV_MC2	0.00012	0.00017	0.00018	0.094	0.12	< 0.00002
2017	Q1	GH_ERC	< 0.0001	< 0.0001	< 0.0001	0.062	0.064	< 0.00002
2017	Q2	GH_ERC	< 0.0001	< 0.0001	0.00017	0.057	0.063	< 0.00002
2017	Q3	GH_ERC	0.00016	0.00011	0.00015	0.047	0.048	< 0.00002
2017	Q4	GH_ERC	< 0.0001	< 0.0001	< 0.0001	0.056	0.054	< 0.00002
2017	Q1	GH_FR1	0.00011	< 0.0001	0.00011	0.12	0.12	< 0.00002
2017	Q2	GH_FR1	0.00027	0.00015	0.00038	0.081	0.095	< 0.00002
2017	Q4	GH_FR1	0.00015	< 0.0001	< 0.0001	0.11	0.11	< 0.00002
2017	Q2	LC_LCDSSLCC	0.00028	0.00012	0.00015	0.073	0.07	< 0.00002
2017	Q3	LC_LCDSSLCC	0.00024	< 0.0001	0.00012	0.062	0.059	< 0.00002
2017	Q4	LC_LCDSSLCC	0.00029	0.00014	0.00018	0.074	0.075	< 0.00002
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.00013	0.00017	0.00031	0.044	0.046	< 0.00010
2015	Q4	CM_MC2	0.00013	0.00018	0.00022	0.09	0.092	< 0.00010
2015	Q1	FR_FRCP1	0.00051	< 0.00020	0.00022	0.036	0.037	< 0.00020
2015	Q4	FR_FRCP1	0.00026	< 0.00010	< 0.00010	0.08	0.078	< 0.00010
2015	Q2	LC_LCDSSLCC	0.00017	0.00011	0.00014	0.041	0.042	< 0.00010
2016	Q1	CM_MC2	0.00018	0.00015	0.00021	0.077	0.075	< 0.00010
2016	Q2	CM_MC2	0.00015	0.00017	0.00029	0.05	0.052	< 0.00010
2016	Q3	CM_MC2	0.00025	0.00019	0.0002	0.077	0.075	< 0.00020
2016	Q4	CM_MC2	0.00016	0.00017	0.00026	0.054	0.057	< 0.00020
2016	Q2	EV_HC1	0.00013	0.00013	0.00024	0.038	0.04	< 0.00010
2016	Q2	EV_MC2	0.0002	0.00017	0.00037	0.058	0.063	< 0.00010
2016	Q4	EV_MC2	0.00011	0.00019	0.00027	0.074	0.081	< 0.00020
2016	Q1	FR_FRCP1	0.0003	< 0.00010	0.0001	0.075	0.075	< 0.00010
2016	Q2	FR_FRCP1	0.00025	< 0.00010	0.00016	0.065	0.068	< 0.00010
2016	Q3	FR_FRCP1	0.00022	< 0.00010	0.00012	0.071	0.073	< 0.00020
2016	Q4	FR_FRCP1	0.0002	< 0.00010	0.00018	0.072	0.067	< 0.00020
2016	Q2	GH_ERC	0.00011	< 0.00010	0.0003	0.051	0.053	< 0.00010
2016	Q2	GH_FR1	0.00023	0.00011	0.00017	0.079	0.078	< 0.00010
2016	Q2	LC_LCDSSLCC	0.00033	0.00012	0.00015	0.037	0.038	< 0.00010
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.00066	0.00016	0.00021	0.072	0.075	< 0.00002
2017	Q2	CM_MC2	0.00025	0.00016	0.00027	0.067	0.063	< 0.00002
2017	Q2	CM_MC2	0.00035	0.00016	0.00027	0.067	0.08	< 0.00002
2017	Q3	CM_MC2	0.00036	0.00018	0.00024	0.058	0.059	< 0.00002
2017	Q4	CM_MC2	0.0003	0.00017	0.00018	0.073	0.074	< 0.00002
2017	Q2	EV_HC1	0.00011	0.00018	0.00028	0.05	0.051	< 0.00002
2017	Q1	EV_MC2	0.00022	0.00012	0.00017	0.12	0.12	< 0.00002
2017	Q1	FR_FRCP1	0.00066	< 0.0001	0.00013	0.072	0.077	< 0.00002
2017	Q2	FR_FRCP1	0.00025	0.00013	0.00038	0.076	0.081	< 0.00002
2017	Q3	FR_FRCP1	0.00027	< 0.0001	0.00012	0.069	0.069	< 0.00002
2017	Q4	FR_FRCP1	0.00026	< 0.0001	0.00012	0.07	0.073	< 0.00002
2017	Q3	GH_FR1	0.00023	< 0.0001	0.00012	0.1	0.1	< 0.00002
2017	Q1	LC_LCDSSLCC	0.00024	< 0.0001	0.0001	0.084	0.084	< 0.00002

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: *C. dubia* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	BERYLLIUM-T-mg/l	BISMUTH-D-mg/l	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q2	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q3	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q4	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q2	Reference (GH_ER2)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q4	Reference (GH_ER2)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q1	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q2	Reference (FR_UFR1)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q3	Reference (FR_UFR1)	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q4	Reference (FR_UFR1)	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q2	Reference (GH_ER2)	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q4	Reference (GH_ER2)	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2017	Q2	Reference (CM_MC1)	< 0.0002	< 0.0005	< 0.0005	0.013	0.013	< 0.05
2017	Q3	Reference (CM_MC1)	< 0.0002	< 0.0005	< 0.0005	0.018	0.013	< 0.05
2017	Q4	Reference (CM_MC1)	< 0.0002	< 0.0005	< 0.0005	0.013	0.014	< 0.05
2017	Q1	Reference (FR_UFR1)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q2	Reference (FR_UFR1)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	Reference (FR_UFR1)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q4	Reference (FR_UFR1)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q2	Reference (GH_ER2)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	Reference (GH_ER2)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q4	Reference (GH_ER2)	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.024	0.025	< 0.10
2015	Q3	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.027	0.029	< 0.10
2015	Q1	EV_HC1	0.0001	0.0005	0.0005	0.01	0.01	0.05
2015	Q2	EV_HC1	0.0001	0.0005	0.0005	0.01	0.01	0.05
2015	Q3	EV_HC1	< 0.00010	< 0.00050	< 0.00050	< 0.010	0.011	< 0.050
2015	Q4	EV_HC1	< 0.00010	< 0.00050	< 0.00050	< 0.010	0.01	< 0.25
2015	Q1	EV_MC2	< 0.00010	< 0.00050	< 0.00050	0.014	0.016	< 0.050
2015	Q2	EV_MC2	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q3	EV_MC2	< 0.00010	< 0.00050	< 0.00050	0.016	0.018	< 0.10
2015	Q4	EV_MC2	< 0.00010	< 0.00050	< 0.00050	0.016	0.016	< 0.25
2015	Q2	FR_FRCP1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q3	FR_FRCP1	< 0.00010	< 0.00050	< 0.00050	0.013	0.014	< 0.10
2015	Q1	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q2	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q3	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q4	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q1	GH_FR1	< 0.00010	< 0.00050	< 0.00050	0.012	< 0.010	< 0.10
2015	Q2	GH_FR1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2015	Q3	GH_FR1	< 0.00010	< 0.00050	< 0.00050	0.01	0.011	< 0.050
2015	Q4	GH_FR1	< 0.00010	< 0.00050	< 0.00050	< 0.010	0.011	< 0.25
2015	Q1	LC_LCDSSLCC	< 0.00010	< 0.00050	< 0.00050	0.013	0.014	< 0.10
2015	Q3	LC_LCDSSLCC	< 0.00010	< 0.00050	< 0.00050	0.012	0.013	< 0.10
2015	Q4	LC_LCDSSLCC	< 0.00050	< 0.00025	< 0.00025	< 0.050	< 0.050	< 0.050
2016	Q1	EV_HC1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.25
2016	Q3	EV_HC1	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q4	EV_HC1	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.25
2016	Q1	EV_MC2	< 0.00010	< 0.00050	< 0.00050	0.013	0.013	< 0.25
2016	Q3	EV_MC2	< 0.00020	< 0.00050	< 0.00050	0.017	0.018	< 0.25
2016	Q1	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q3	GH_ERC	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q4	GH_ERC	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q1	GH_FR1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.25
2016	Q3	GH_FR1	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.25
2016	Q4	GH_FR1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.25
2016	Q1	LC_LCDSSLCC	< 0.00010	< 0.00050	< 0.00050	0.012	0.013	< 0.25
2016	Q3	LC_LCDSSLCC	< 0.00020	< 0.00050	< 0.00050	0.013	0.012	< 0.25
2016	Q4	LC_LCDSSLCC	< 0.00020	< 0.00050	< 0.00050	< 0.010	0.01	< 0.25
2017	Q1	EV_HC1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	EV_HC1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q4	EV_HC1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q2	EV_MC2	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	EV_MC2	< 0.0002	< 0.0005	< 0.0005	0.012	0.012	< 0.05
2017	Q4	EV_MC2	< 0.0002	< 0.0005	< 0.0005	0.014	0.014	< 0.05
2017	Q1	GH_ERC	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q2	GH_ERC	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	GH_ERC	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q4	GH_ERC	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q1	GH_FR1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.25
2017	Q2	GH_FR1	0.00038	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.25
2017	Q4	GH_FR1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q2	LC_LCDSSLCC	< 0.0002	< 0.0005	< 0.0005	0.014	0.014	< 0.05
2017	Q3	LC_LCDSSLCC	< 0.0002	< 0.0005	< 0.0005	0.013	0.013	< 0.05
2017	Q4	LC_LCDSSLCC	< 0.0002	< 0.0005	< 0.0005	0.013	0.014	< 0.05
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.014	0.015	< 0.050
2015	Q4	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.026	0.027	< 0.25
2015	Q1	FR_FRCP1	< 0.00020	< 0.0010	< 0.0010	< 0.020	< 0.020	< 1
2015	Q4	FR_FRCP1	< 0.00010	< 0.00050	< 0.00050	0.011	0.016	< 0.25
2015	Q2	LC_LCDSSLCC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q1	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.026	0.026	< 0.25
2016	Q2	CM_MC2	< 0.00010	< 0.00050	< 0.00050	0.016	0.017	< 0.050
2016	Q3	CM_MC2	< 0.00020	< 0.00050	< 0.00050	0.028	0.029	< 0.25
2016	Q4	CM_MC2	< 0.00020	< 0.00050	< 0.00050	0.018	0.02	< 0.050
2016	Q2	EV_HC1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q2	EV_MC2	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q4	EV_MC2	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q1	FR_FRCP1	< 0.00010	< 0.00050	< 0.00050	0.01	0.011	< 0.50
2016	Q2	FR_FRCP1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q3	FR_FRCP1	< 0.00020	< 0.00050	< 0.00050	< 0.010	0.011	< 0.25
2016	Q4	FR_FRCP1	< 0.00020	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.25
2016	Q2	GH_ERC	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q2	GH_FR1	< 0.00010	< 0.00050	< 0.00050	< 0.010	< 0.010	< 0.050
2016	Q2	LC_LCDSSLCC	< 0.00010	< 0.00050	< 0.00050	< 0.010	0.011	< 0.050
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	< 0.0002	< 0.0005	< 0.0005	0.029	0.031	< 0.05
2017	Q2	CM_MC2	< 0.0002	< 0.0005	< 0.0005	0.027	0.027	< 0.05
2017	Q2	CM_MC2	< 0.0002	< 0.0005	< 0.0005	0.032	0.039	< 0.05
2017	Q3	CM_MC2	< 0.0002	< 0.0005	< 0.0005	0.031	0.031	< 0.05
2017	Q4	CM_MC2	< 0.0002	< 0.0005	< 0.0005	0.036	0.038	0.065
2017	Q2	EV_HC1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q1	EV_MC2	< 0.0002	< 0.0005	< 0.0005	0.012	0.012	< 0.05
2017	Q1	FR_FRCP1	< 0.0002	< 0.0005	< 0.0005	0.01	0.011	< 0.25
2017	Q2	FR_FRCP1	0.00031	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q3	FR_FRCP1	< 0.0002	< 0.0005	< 0.0005	< 0.01	0.01	< 0.05
2017	Q4	FR_FRCP1	< 0.0002	< 0.0005	< 0.0005	0.011	0.011	< 0.25
2017	Q3	GH_FR1	< 0.0002	< 0.0005	< 0.0005	< 0.01	< 0.01	< 0.05
2017	Q1	LC_LCDSSLCC	< 0.0002	< 0.0005	< 0.0005	0.013	0.014	< 0.25

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent.</

## Appendix D: Concentration-Response Analysis

**Table D-1: *C. dubia* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.000010	0.000011	56	0.84	< 1.0	0.00017
2015	Q1	Reference (FR_UFR1)	< 0.000010	0.000011	56	0.84	< 1.0	0.00017
2015	Q1	Reference (FR_UFR1)	0.000011	< 0.000010	57	< 0.50	< 1.0	0.00013
2015	Q2	Reference (FR_UFR1)	0.000074	0.000013	38	1.8	< 1.0	0.00014
2015	Q3	Reference (FR_UFR1)	0.000057	0.000083	55	0.75	1.0	0.00013
2015	Q4	Reference (FR_UFR1)	< 0.000050	0.000083	56	0.6	< 1.0	0.00011
2015	Q2	Reference (GH_ER2)	< 0.000050	0.000016	48	0.84	1.0	0.00022
2015	Q4	Reference (GH_ER2)	0.000053	0.000069	51	0.61	1.2	0.00022
2016	Q1	Reference (FR_UFR1)	0.000054	0.000062	58	< 0.50	1.1	0.00012
2016	Q2	Reference (FR_UFR1)	0.000062	0.000016	37	2.5	< 0.10	0.00011
2016	Q3	Reference (FR_UFR1)	0.000055	0.000011	51	0.86	0.13	< 0.00010
2016	Q4	Reference (FR_UFR1)	0.000057	0.000058	48	1.1	0.18	< 0.00010
2016	Q2	Reference (GH_ER2)	0.000076	0.000025	48	1.4	0.61	0.00017
2016	Q4	Reference (GH_ER2)	< 0.000050	0.000079	48	0.64	0.36	0.00021
2017	Q2	Reference (CM_MC1)	0.000012	0.000015	36	1.8	< 0.5	0.00012
2017	Q3	Reference (CM_MC1)	0.00001	0.000015	36	1.2	< 0.5	< 0.0001
2017	Q4	Reference (CM_MC1)	0.000068	0.000083	41	1.6	< 0.5	0.00018
2017	Q1	Reference (FR_UFR1)	0.00001	0.000011	52	0.96	< 0.5	< 0.0001
2017	Q2	Reference (FR_UFR1)	0.000016	0.000023	31	3.3	< 0.5	0.00022
2017	Q3	Reference (FR_UFR1)	0.000008	0.000012	45	1.8	< 0.5	< 0.0001
2017	Q4	Reference (FR_UFR1)	0.000069	0.00001	50	1.1	< 0.5	< 0.0001
2017	Q2	Reference (GH_ER2)	0.000098	0.000019	51	0.83	0.27	0.00021
2017	Q3	Reference (GH_ER2)	0.000081	0.000078	40	0.79	< 0.5	0.00019
2017	Q4	Reference (GH_ER2)	0.000056	0.000074	47	0.81	< 0.5	0.00022
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.000022	0.000023	106	0.93	3.4	0.00019
2015	Q3	CM_MC2	0.000099	0.000018	104	0.86	2.1	0.00019
2015	Q1	EV_HC1	0.000017	0.000016	60	0.82	1.5	0.00014
2015	Q2	EV_HC1	0.000013	0.000021	47	1.1	1.3	0.00013
2015	Q3	EV_HC1	0.000017	0.000025	75	1.1	1.4	0.00015
2015	Q4	EV_HC1	0.000013	0.000018	93	0.63	1.8	0.00013
2015	Q1	EV_MC2	0.000055	0.000044	91	1.7	11	0.00012
2015	Q2	EV_MC2	0.000018	0.000064	44	1.9	2.9	0.0002
2015	Q3	EV_MC2	0.000049	0.000056	87	1.0	9.6	0.00013
2015	Q4	EV_MC2	0.000037	0.000047	102	0.6	8.7	0.00012
2015	Q2	FR_FRCP1	0.00003	0.00005	73	1.6	1.2	< 0.00010
2015	Q3	FR_FRCP1	0.000038	0.000047	109	0.93	1.5	0.0001
2015	Q1	GH_ERC	< 0.000010	< 0.000010	55	0.64	< 1	0.00029
2015	Q2	GH_ERC	0.000007	0.000022	53	0.96	< 1	0.00017
2015	Q3	GH_ERC	0.000059	0.000016	49	0.75	< 1	0.00019
2015	Q4	GH_ERC	< 0.000050	0.000073	58	< 0.50	1.2	0.00022
2015	Q1	GH_FR1	0.000021	0.000024	114	1.1	2.6	0.00021
2015	Q2	GH_FR1	0.000021	0.000035	81	1.4	1.4	< 0.00010
2015	Q3	GH_FR1	0.000019	0.000021	90	0.87	1.6	0.00012
2015	Q4	GH_FR1	0.000015	0.000024	106	< 0.50	1.7	0.00012
2015	Q1	LC_LCDSSLCC	0.000086	0.00011	123	1.1	2.7	0.00016
2015	Q3	LC_LCDSSLCC	0.00025	0.00026	92	0.83	2.0	0.00011
2015	Q4	LC_LCDSSLCC	0.00024	0.00026	117	0.74	2.2	< 0.00050
2016	Q1	EV_HC1	0.000017	0.000019	95	0.65	2.1	0.00016
2016	Q3	EV_HC1	0.000016	0.000027	81	0.95	1.1	0.00016
2016	Q4	EV_HC1	0.000019	0.000024	82	1.4	1.3	0.00014
2016	Q1	EV_MC2	0.000035	0.000036	94	0.85	9.2	0.00013
2016	Q3	EV_MC2	0.000066	0.000069	111	0.83	13	0.00012
2016	Q1	GH_ERC	< 0.000050	0.000065	67	< 0.50	1.3	0.00024
2016	Q3	GH_ERC	< 0.000050	0.000053	45	0.58	0.37	0.0002
2016	Q4	GH_ERC	< 0.000050	< 0.000050	51	< 0.50	0.44	0.0002
2016	Q1	GH_FR1	0.000014	0.000018	119	0.51	2.5	0.00012
2016	Q3	GH_FR1	0.000015	0.000016	89	0.8	1.5	< 0.00010
2016	Q4	GH_FR1	0.000017	0.000021	94	0.75	1.5	0.0001
2016	Q1	LC_LCDSSLCC	0.000083	0.000076	134	< 0.50	17	0.00014
2016	Q3	LC_LCDSSLCC	0.00017	0.00016	91	< 0.50	4.7	0.00012
2016	Q4	LC_LCDSSLCC	0.00014	0.00015	83	0.91	6.8	0.0001
2017	Q1	EV_HC1	0.000014	0.000021	89	0.72	1.3	0.00015
2017	Q3	EV_HC1	0.000019	0.000022	83	0.97	0.81	0.00011
2017	Q4	EV_HC1	0.000096	0.000019	82	1.0	0.8	< 0.0001
2017	Q2	EV_MC2	0.00003	0.000063	48	2.9	4.3	< 0.0001
2017	Q3	EV_MC2	0.000031	0.000039	78	1.3	4.9	< 0.0001
2017	Q4	EV_MC2	< 0.000005	0.000034	87	1.0	6.1	0.00011
2017	Q1	GH_ERC	< 0.000005	0.000071	56	< 0.5	0.38	0.00026
2017	Q2	GH_ERC	0.000089	0.000019	56	0.79	0.5	0.00023
2017	Q3	GH_ERC	0.000073	0.000013	42	0.89	< 0.5	0.00015
2017	Q4	GH_ERC	0.000058	0.000075	48	1.1	< 0.5	0.00022
2017	Q1	GH_FR1	0.000014	0.000018	115	0.57	1.8	< 0.0001
2017	Q2	GH_FR1	0.000035	0.000083	92	3.4	1.7	< 0.0001
2017	Q4	GH_FR1	0.000015	0.000019	102	1.6	1.2	< 0.0001
2017	Q2	LC_LCDSSLCC	0.00015	0.00017	108	1.2	8.0	< 0.0001
2017	Q3	LC_LCDSSLCC	0.00025	0.0002	92	1.8	5.5	< 0.0001
2017	Q4	LC_LCDSSLCC	0.00015	0.00016	111	0.97	8.0	< 0.0001
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.000036	0.00006	60	1.5	1.2	0.0002
2015	Q4	CM_MC2	0.000075	0.000093	115	0.56	3.2	0.00019
2015	Q1	FR_FRCP1	< 0.000020	0.000053	337	1.4	2.6	< 0.00020
2015	Q4	FR_FRCP1	0.00004	0.000055	130	0.65	2.2	< 0.00010
2015	Q2	LC_LCDSSLCC	0.00014	0.00014	68	1.2	1.4	0.00014
2016	Q1	CM_MC2	0.000016	0.000018	117	0.58	4.9	0.00018
2016	Q2	CM_MC2	0.000069	0.00011	67	1.9	1.5	0.00016
2016	Q3	CM_MC2	0.000075	0.000086	105	0.99	3.4	0.00011
2016	Q4	CM_MC2	0.000013	0.000016	79	2.3	2.1	0.00017
2016	Q2	EV_HC1	0.000027	0.000047	72	1.9	0.79	0.00011
2016	Q2	EV_MC2	0.000038	0.000078	37	2.6	1.2	0.00014
2016	Q4	EV_MC2	0.000025	0.000039	48	2.8	2.9	0.00012
2016	Q1	FR_FRCP1	0.000036	0.000048	221	0.8	3.5	< 0.00010
2016	Q2	FR_FRCP1	0.000031	0.000052	73	2.0	0.51	0.0001
2016	Q3	FR_FRCP1	0.000024	0.000042	103	0.99	1.5	< 0.00010
2016	Q4	FR_FRCP1	0.000045	0.000051	97	0.9	1.3	< 0.00010
2016	Q2	GH_ERC	0.000011	0.000035	53	1.3	0.79	0.00019
2016	Q2	GH_FR1	0.000025	0.000035	71	2.0	0.99	< 0.00010
2016	Q2	LC_LCDSSLCC	0.0002	0.00022	72	1.6	2.8	0.00014
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.000038	0.000039	128	0.85	3.9	0.00012
2017	Q2	CM_MC2	0.000045	0.000072	85	1.4	2.5	< 0.0001
2017	Q2	CM_MC2	0.000043	0.00007	115	1.4	2.7	0.00013
2017	Q3	CM_MC2	0.000068	0.000017	96	0.97	1.0	0.00017
2017	Q4	CM_MC2	0.000092	0.000011	124	0.97	5.9	< 0.0001
2017	Q2	EV_HC1	0.000025	0.000043	71	2.6	0.79	< 0.0001
2017	Q1	EV_MC2	0.000029	0.000035	84	0.8	7.1	0.00013
2017	Q1	FR_FRCP1	0.000052	0.000062	179	1.5	< 2.5	< 0.0001
2017	Q2	FR_FRCP1	0.000061	0.00013	86	2.1	0.72	0.00011
2017	Q3	FR_FRCP1	0.000044	0.000051	100	1.6	0.87	< 0.0001
2017	Q4	FR_FRCP1	0.000012	0.000051	153	0.96	< 2.5	< 0.0001
2017	Q3	GH_FR1	0.000019	0.000019	86	1.0	1.1	< 0.0001
2017	Q1	LC_LCDSSLCC	0.0001	0.000094	125	< 0.5	13	0.00012

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.00017	< 0.00010	< 0.00010	367	< 0.00050	< 0.00050
2015	Q1	Reference (FR_UFR1)	0.00017	< 0.00010	< 0.00010	367	< 0.00050	< 0.00050
2015	Q1	Reference (FR_UFR1)	0.00015	< 0.00010	< 0.00010	353	< 0.00050	< 0.00050
2015	Q2	Reference (FR_UFR1)	0.00046	< 0.00010	< 0.00010	245	< 0.00050	< 0.00050
2015	Q3	Reference (FR_UFR1)	0.00013	< 0.00010	< 0.00010	342	< 0.00050	< 0.00050
2015	Q4	Reference (FR_UFR1)	0.00036	< 0.00010	< 0.00010	354	< 0.00050	< 0.00050
2015	Q2	Reference (GH_ER2)	0.00037	< 0.00010	< 0.00010	303	< 0.00050	< 0.00050
2015	Q4	Reference (GH_ER2)	0.00034	< 0.00010	< 0.00010	314	< 0.00050	< 0.00050
2016	Q1	Reference (FR_UFR1)	< 0.00020	< 0.00010	< 0.00010	358	< 0.00050	< 0.00050
2016	Q2	Reference (FR_UFR1)	0.00029	< 0.00010	< 0.00010	233	< 0.00050	< 0.00050
2016	Q3	Reference (FR_UFR1)	0.00018	< 0.00010	< 0.00010	338	< 0.00050	< 0.00050
2016	Q4	Reference (FR_UFR1)	0.00021	< 0.00010	< 0.00010	330	< 0.00050	< 0.00050
2016	Q2	Reference (GH_ER2)	0.00062	< 0.00010	< 0.00010	289	< 0.00050	< 0.00050
2016	Q4	Reference (GH_ER2)	0.00024	< 0.00010	< 0.00010	297	< 0.00050	< 0.00050
2017	Q2	Reference (CM_MC1)	0.00018	< 0.0001	< 0.0001	267	< 0.0002	< 0.0005
2017	Q3	Reference (CM_MC1)	0.00028	< 0.0001	< 0.0001	265	< 0.0002	< 0.0005
2017	Q4	Reference (CM_MC1)	0.00018	< 0.0001	< 0.0001	280	< 0.0005	< 0.0005
2017	Q1	Reference (FR_UFR1)	0.00011	< 0.0001	< 0.0001	341	< 0.0002	< 0.0005
2017	Q2	Reference (FR_UFR1)	0.0004	< 0.0001	< 0.0001	239	0.0004	0.00067
2017	Q3	Reference (FR_UFR1)	0.00028	< 0.0001	< 0.0001	319	< 0.0002	< 0.0005
2017	Q4	Reference (FR_UFR1)	0.00012	< 0.0001	< 0.0001	333	< 0.0005	< 0.0005
2017	Q2	Reference (GH_ER2)	0.00038	< 0.0001	< 0.0001	321	< 0.0005	< 0.0005
2017	Q3	Reference (GH_ER2)	0.00024	< 0.0001	< 0.0001	276	< 0.0002	< 0.0005
2017	Q4	Reference (GH_ER2)	0.00026	< 0.0001	< 0.0001	282	< 0.0005	< 0.0005
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.00024	0.00074	0.00079	826	< 0.00050	< 0.00050
2015	Q3	CM_MC2	0.00023	0.00026	0.00034	802	< 0.00050	< 0.00050
2015	Q1	EV_HC1	0.00018	0.0001	0.0001	453	0.0005	0.0005
2015	Q2	EV_HC1	0.00021	0.0001	0.0001	350	0.0005	0.0005
2015	Q3	EV_HC1	0.00024	< 0.00010	< 0.00010	625	< 0.00050	< 0.00050
2015	Q4	EV_HC1	0.00022	< 0.00010	< 0.00010	732	< 0.00050	< 0.00050
2015	Q1	EV_MC2	< 0.00020	< 0.00010	< 0.00010	665	0.0012	0.00076
2015	Q2	EV_MC2	0.0007	< 0.00010	0.00022	299	< 0.00050	0.00073
2015	Q3	EV_MC2	0.00019	< 0.00010	< 0.00010	686	< 0.00050	< 0.00050
2015	Q4	EV_MC2	0.00015	< 0.00010	< 0.00010	733	< 0.00050	< 0.00050
2015	Q2	FR_FRCP1	0.00028	< 0.00010	0.00012	573	< 0.00050	< 0.00050
2015	Q3	FR_FRCP1	0.00017	< 0.00010	< 0.00010	815	< 0.00050	< 0.00050
2015	Q1	GH_ERC	0.00034	< 0.00010	< 0.00010	345	< 0.00050	< 0.00050
2015	Q2	GH_ERC	0.00054	< 0.00010	< 0.00010	338	< 0.00050	< 0.00050
2015	Q3	GH_ERC	0.00037	< 0.00010	< 0.00010	284	< 0.00050	< 0.00050
2015	Q4	GH_ERC	0.00026	< 0.00010	< 0.00010	355	< 0.00050	< 0.00050
2015	Q1	GH_FR1	0.00015	< 0.00010	< 0.00010	851	< 0.00050	< 0.00050
2015	Q2	GH_FR1	0.0002	< 0.00010	< 0.00010	614	< 0.00050	< 0.00050
2015	Q3	GH_FR1	0.00015	< 0.00010	< 0.00010	657	< 0.00050	< 0.00050
2015	Q4	GH_FR1	0.00013	< 0.00010	< 0.00010	760	< 0.00050	< 0.00050
2015	Q1	LC_LCDSSLCC	0.00021	< 0.00010	< 0.00010	940	< 0.00050	< 0.00050
2015	Q3	LC_LCDSSLCC	0.0002	< 0.00010	< 0.00010	660	< 0.00050	< 0.00050
2015	Q4	LC_LCDSSLCC	< 0.00050	< 0.00050	< 0.00050	770	< 0.0010	< 0.0025
2016	Q1	EV_HC1	< 0.00020	< 0.00010	< 0.00010	745	< 0.00050	< 0.00050
2016	Q3	EV_HC1	0.00025	< 0.00010	< 0.00010	652	< 0.00050	< 0.00050
2016	Q4	EV_HC1	0.00023	< 0.00010	< 0.00010	668	< 0.00050	< 0.00050
2016	Q1	EV_MC2	0.00018	< 0.00010	< 0.00010	700	< 0.00050	< 0.00050
2016	Q3	EV_MC2	0.00015	< 0.00010	< 0.00010	793	< 0.00050	< 0.00050
2016	Q1	GH_ERC	< 0.00030	< 0.00010	< 0.00010	419	< 0.00050	< 0.00050
2016	Q3	GH_ERC	0.00027	< 0.00010	< 0.00010	317	< 0.00050	< 0.00050
2016	Q4	GH_ERC	0.00035	< 0.00010	< 0.00010	327	< 0.00050	0.00054
2016	Q1	GH_FR1	0.00013	< 0.00010	< 0.00010	885	< 0.00050	< 0.00050
2016	Q3	GH_FR1	0.00017	< 0.00010	< 0.00010	732	< 0.00050	< 0.00050
2016	Q4	GH_FR1	0.00019	< 0.0001	< 0.0001	735	< 0.0005	< 0.0005
2016	Q1	LC_LCDSSLCC	< 0.00020	< 0.00010	< 0.00010	1010	< 0.00050	< 0.00050
2016	Q3	LC_LCDSSLCC	0.00027	< 0.00010	< 0.00010	754	< 0.00050	< 0.00050
2016	Q4	LC_LCDSSLCC	0.00019	< 0.00010	< 0.00010	700	< 0.00050	< 0.00050
2017	Q1	EV_HC1	0.00023	< 0.0001	< 0.0001	704	< 0.0005	< 0.0005
2017	Q3	EV_HC1	0.00022	< 0.0001	< 0.0001	610	< 0.0005	< 0.0005
2017	Q4	EV_HC1	0.00018	< 0.0001	< 0.0001	660	< 0.0005	< 0.0005
2017	Q2	EV_MC2	0.00025	0.00011	0.00025	402	0.00031	0.00074
2017	Q3	EV_MC2	0.00015	< 0.0001	< 0.0001	531	< 0.0005	< 0.0005
2017	Q4	EV_MC2	0.00019	< 0.0001	< 0.0001	565	< 0.0005	< 0.0005
2017	Q1	GH_ERC	0.00027	< 0.0001	< 0.0001	354	< 0.0005	< 0.0005
2017	Q2	GH_ERC	0.0005	< 0.0001	< 0.0001	368	< 0.0005	< 0.0005
2017	Q3	GH_ERC	0.00029	< 0.0001	< 0.0001	295	< 0.0002	< 0.0005
2017	Q4	GH_ERC	0.00025	< 0.0001	< 0.0001	303	< 0.0005	< 0.0005
2017	Q1	GH_FR1	0.00014	< 0.0001	< 0.0001	843	< 0.0005	< 0.0005
2017	Q2	GH_FR1	0.0012	< 0.0001	0.00037	735	< 0.0005	0.0013
2017	Q4	GH_FR1	0.00015	< 0.0001	< 0.0001	749	< 0.0005	< 0.0005
2017	Q2	LC_LCDSSLCC	0.00016	< 0.0001	< 0.0001	889	< 0.0002	< 0.0005
2017	Q3	LC_LCDSSLCC	0.00017	< 0.0001	< 0.0001	796	0.00021	< 0.0005
2017	Q4	LC_LCDSSLCC	0.00022	< 0.0001	< 0.0001	777	< 0.0005	< 0.0005
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.00058	0.00037	0.00061	484	< 0.00050	0.00053
2015	Q4	CM_MC2	0.0002	< 0.00010	< 0.00010	876	< 0.00050	< 0.00050
2015	Q1	FR_FRCP1	< 0.00020	< 0.00020	< 0.00020	2680	< 0.00050	< 0.0010
2015	Q4	FR_FRCP1	0.00027	< 0.00010	< 0.00010	1030	< 0.00050	< 0.00050
2015	Q2	LC_LCDSSLCC	0.00019	< 0.00010	< 0.00010	535	< 0.00050	< 0.00050
2016	Q1	CM_MC2	< 0.00030	0.00072	0.00081	927	< 0.00050	< 0.00050
2016	Q2	CM_MC2	0.00058	0.00077	0.0013	549	< 0.00050	0.00079
2016	Q3	CM_MC2	0.00018	0.00026	0.00034	901	< 0.00050	< 0.00050
2016	Q4	CM_MC2	0.00035	0.00065	0.0011	622	< 0.00050	< 0.00050
2016	Q2	EV_HC1	0.00031	< 0.00010	< 0.00010	547	< 0.00050	< 0.00050
2016	Q2	EV_MC2	0.00076	< 0.00010	0.00027	266	< 0.00050	0.001
2016	Q4	EV_MC2	0.00045	< 0.00010	0.00013	359	< 0.00050	0.00065
2016	Q1	FR_FRCP1	< 0.00010	< 0.00010	< 0.00010	1720	< 0.00050	< 0.00050
2016	Q2	FR_FRCP1	0.00027	< 0.00010	0.00011	555	< 0.00050	0.00054
2016	Q3	FR_FRCP1	0.00012	< 0.00010	< 0.00010	874	< 0.00050	< 0.00050
2016	Q4	FR_FRCP1	0.00015	< 0.00010	< 0.00010	810	< 0.00050	< 0.00050
2016	Q2	GH_ERC	0.00085	< 0.00010	0.00015	342	< 0.00050	0.00065
2016	Q2	GH_FR1	0.00029	< 0.00010	< 0.00010	573	< 0.00050	< 0.00050
2016	Q2	LC_LCDSSLCC	0.00021	< 0.00010	< 0.00010	557	< 0.00050	< 0.00050
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.00021	0.0022	0.0024	999	< 0.0002	< 0.0005
2017	Q2	CM_MC2	0.00028	0.005	0.0052	756	< 0.0002	0.00068
2017	Q2	CM_MC2	0.00031	0.0044	0.0056	783	< 0.0002	< 0.0005
2017	Q3	CM_MC2	0.00026	0.0029	0.0035	840	< 0.0002	< 0.0005
2017	Q4	CM_MC2	0.00017	0.00058	0.00074	952	< 0.0005	< 0.0005
2017	Q2	EV_HC1	0.00025	< 0.0001	< 0.0001	630	0.0002	0.00055
2017	Q1	EV_MC2	0.00023	< 0.0001	< 0.0001	615	< 0.0005	< 0.0005
2017	Q1	FR_FRCP1	0.00078	< 0.0001	< 0.0001	1430	< 0.0002	< 0.0005
2017	Q2	FR_FRCP1	0.00082	< 0.0001	0.00027	725	0.00034	0.0011
2017	Q3	FR_FRCP1	0.00012	< 0.0001	< 0.0001	857	< 0.0002	< 0.0005
2017	Q4	FR_FRCP1	< 0.0001	< 0.0001	< 0.0001	1110	< 0.0005	< 0.0005
2017	Q3	GH_FR1	0.00016	< 0.0001	< 0.0001	742	< 0.0002	< 0.0005
2017	Q1	LC_LCDSSLCC	0.00021	< 0.0001	< 0.0001	954	< 0.0005	< 0.0005

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: *C. dubia* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.14	197	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	Reference (FR_UFR1)	0.14	197	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	Reference (FR_UFR1)	0.14	197	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q2	Reference (FR_UFR1)	0.15	129	< 0.010	0.052	< 0.000050	< 0.000050
2015	Q3	Reference (FR_UFR1)	0.15	188	< 0.010	< 0.010	0.000055	< 0.000050
2015	Q4	Reference (FR_UFR1)	0.16	190	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q2	Reference (GH_ER2)	0.15	160	< 0.010	0.066	< 0.000050	< 0.000050
2015	Q4	Reference (GH_ER2)	0.16	170	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q1	Reference (FR_UFR1)	0.16	202	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q2	Reference (FR_UFR1)	0.15	126	< 0.010	0.075	< 0.000050	0.00006
2016	Q3	Reference (FR_UFR1)	0.17	177	< 0.010	0.013	< 0.000050	< 0.000050
2016	Q4	Reference (FR_UFR1)	0.16	177	< 0.010	0.022	< 0.000050	< 0.000050
2016	Q2	Reference (GH_ER2)	0.16	163	< 0.010	0.23	< 0.000050	0.00013
2016	Q4	Reference (GH_ER2)	0.17	163	< 0.010	0.013	< 0.000050	< 0.000050
2017	Q2	Reference (CM_MC1)	0.052	134	< 0.01	0.021	< 0.00005	< 0.00005
2017	Q3	Reference (CM_MC1)	0.054	138	< 0.01	0.033	< 0.00005	< 0.00005
2017	Q4	Reference (CM_MC1)	0.055	144	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q1	Reference (FR_UFR1)	0.14	185	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q2	Reference (FR_UFR1)	0.11	121	0.054	0.13	< 0.00005	0.000092
2017	Q3	Reference (FR_UFR1)	0.14	159	< 0.01	0.011	< 0.00005	< 0.00005
2017	Q4	Reference (FR_UFR1)	0.11	185	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q2	Reference (GH_ER2)	0.16	177	< 0.01	0.074	< 0.00005	0.000061
2017	Q3	Reference (GH_ER2)	0.14	137	< 0.01	0.02	< 0.00005	< 0.00005
2017	Q4	Reference (GH_ER2)	0.13	161	< 0.01	< 0.01	< 0.00005	< 0.00005
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.14	445	< 0.010	0.031	< 0.000050	< 0.000050
2015	Q3	CM_MC2	0.12	458	< 0.010	0.022	< 0.000050	< 0.000050
2015	Q1	EV_HC1	0.15	274	0.01	0.013	0.00005	0.00005
2015	Q2	EV_HC1	0.13	205	0.01	0.051	0.00005	0.000056
2015	Q3	EV_HC1	0.21	373	< 0.010	0.027	< 0.000050	< 0.000050
2015	Q4	EV_HC1	0.2	431	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	EV_MC2	0.15	381	< 0.010	0.024	< 0.000050	< 0.000050
2015	Q2	EV_MC2	0.12	159	< 0.010	0.39	< 0.000050	0.00028
2015	Q3	EV_MC2	0.18	384	< 0.010	0.018	< 0.000050	< 0.000050
2015	Q4	EV_MC2	0.16	415	< 0.010	0.014	< 0.000050	< 0.000050
2015	Q2	FR_FRCP1	0.2	302	< 0.010	0.11	< 0.000050	0.00014
2015	Q3	FR_FRCP1	0.2	471	< 0.010	0.033	< 0.000050	< 0.000050
2015	Q1	GH_ERC	0.15	191	< 0.010	0.036	< 0.000050	0.0002
2015	Q2	GH_ERC	0.15	179	< 0.010	0.15	< 0.000050	0.00011
2015	Q3	GH_ERC	0.16	160	< 0.010	0.088	< 0.000050	0.00007
2015	Q4	GH_ERC	0.16	190	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	GH_FR1	0.18	475	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q2	GH_FR1	0.17	332	< 0.010	0.07	< 0.000050	0.000063
2015	Q3	GH_FR1	0.18	374	< 0.010	0.016	< 0.000050	< 0.000050
2015	Q4	GH_FR1	0.16	436	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	LC_LCDSSLCC	0.24	536	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q3	LC_LCDSSLCC	0.24	355	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q4	LC_LCDSSLCC	0.18	499	< 0.050	< 0.050	< 0.00025	< 0.00025
2016	Q1	EV_HC1	0.21	443	< 0.010	< 0.020	< 0.000050	< 0.000050
2016	Q3	EV_HC1	0.23	368	< 0.010	0.063	< 0.000050	0.000076
2016	Q4	EV_HC1	0.2	386	< 0.010	0.058	< 0.000050	< 0.000050
2016	Q1	EV_MC2	0.15	395	< 0.010	0.038	< 0.000050	0.000053
2016	Q3	EV_MC2	0.17	435	< 0.010	0.01	< 0.000050	< 0.000050
2016	Q1	GH_ERC	0.16	231	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q3	GH_ERC	0.18	161	< 0.010	0.024	< 0.000050	< 0.000050
2016	Q4	GH_ERC	0.16	186	< 0.010	0.028	< 0.000050	< 0.000050
2016	Q1	GH_FR1	0.18	507	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q3	GH_FR1	0.2	379	< 0.010	0.016	< 0.000050	< 0.000050
2016	Q4	GH_FR1	0.16	411	< 0.01	0.022	< 0.00005	< 0.00005
2016	Q1	LC_LCDSSLCC	0.24	572	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q3	LC_LCDSSLCC	0.25	403	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q4	LC_LCDSSLCC	0.21	384	< 0.010	< 0.010	< 0.000050	< 0.000050
2017	Q1	EV_HC1	0.22	411	< 0.01	0.017	< 0.00005	< 0.00005
2017	Q3	EV_HC1	0.21	416	< 0.01	0.011	< 0.00005	< 0.00005
2017	Q4	EV_HC1	0.17	388	< 0.01	0.012	< 0.00005	< 0.00005
2017	Q2	EV_MC2	0.099	199	0.021	0.15	< 0.00005	0.00016
2017	Q3	EV_MC2	0.16	350	< 0.01	0.012	< 0.00005	< 0.00005
2017	Q4	EV_MC2	0.12	262	< 0.01	0.016	< 0.00005	< 0.00005
2017	Q1	GH_ERC	0.14	190	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q2	GH_ERC	0.16	187	< 0.01	0.13	< 0.00005	0.00008
2017	Q3	GH_ERC	0.14	149	< 0.01	0.061	< 0.00005	< 0.00005
2017	Q4	GH_ERC	0.12	174	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q1	GH_FR1	0.14	479	< 0.01	0.011	< 0.00005	< 0.00005
2017	Q2	GH_FR1	0.13	404	0.013	0.55	< 0.00005	0.00043
2017	Q4	GH_FR1	0.13	476	< 0.01	< 0.01	< 0.00005	< 0.00005
2017	Q2	LC_LCDSSLCC	0.2	477	< 0.01	0.033	< 0.00005	< 0.00005
2017	Q3	LC_LCDSSLCC	0.2	397	< 0.01	< 0.01	0.000097	< 0.00005
2017	Q4	LC_LCDSSLCC	0.18	471	< 0.01	< 0.01	< 0.00005	< 0.00005
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.1	248	< 0.010	0.3	< 0.000050	0.00017
2015	Q4	CM_MC2	0.11	505	< 0.010	< 0.010	< 0.000050	< 0.000050
2015	Q1	FR_FRCP1	0.45	1880	< 0.020	< 0.020	< 0.00010	< 0.00010
2015	Q4	FR_FRCP1	0.17	597	< 0.010	0.019	< 0.000050	< 0.000050
2015	Q2	LC_LCDSSLCC	0.22	269	< 0.010	0.018	< 0.000050	< 0.000050
2016	Q1	CM_MC2	0.14	500	< 0.010	0.011	< 0.000050	< 0.000050
2016	Q2	CM_MC2	0.1	283	< 0.010	0.39	< 0.000050	0.00021
2016	Q3	CM_MC2	0.12	465	< 0.010	< 0.010	< 0.000050	< 0.000050
2016	Q4	CM_MC2	0.11	328	< 0.010	0.15	< 0.000050	0.000098
2016	Q2	EV_HC1	0.19	306	< 0.010	0.14	< 0.000050	0.000095
2016	Q2	EV_MC2	0.11	141	0.012	0.46	< 0.000050	0.00039
2016	Q4	EV_MC2	0.12	177	0.023	0.16	< 0.000050	0.00012
2016	Q1	FR_FRCP1	< 0.20	1120	< 0.010	< 0.020	< 0.000050	< 0.000050
2016	Q2	FR_FRCP1	0.2	305	< 0.010	0.13	< 0.000050	0.000099
2016	Q3	FR_FRCP1	0.22	455	< 0.010	0.032	< 0.000050	< 0.000050
2016	Q4	FR_FRCP1	0.19	453	< 0.010	0.027	< 0.000050	< 0.000050
2016	Q2	GH_ERC	0.16	185	< 0.010	0.38	< 0.000050	0.00022
2016	Q2	GH_FR1	0.18	312	< 0.010	0.13	< 0.000050	0.000096
2016	Q2	LC_LCDSSLCC	0.22	293	< 0.010	0.027	< 0.000050	< 0.000050
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.13	529	< 0.01	0.013	< 0.00005	< 0.00005
2017	Q2	CM_MC2	0.1	383	< 0.01	0.16	< 0.00005	0.00012
2017	Q2	CM_MC2	0.12	394	< 0.01	0.11	< 0.00005	0.000077
2017	Q3	CM_MC2	0.11	426	< 0.01	0.032	< 0.00005	< 0.00005
2017	Q4	CM_MC2	0.098	540	< 0.01	0.013	< 0.00005	< 0.00005
2017	Q2	EV_HC1	0.14	335	< 0.01	0.1	< 0.00005	0.000076
2017	Q1	EV_MC2	0.15	334	< 0.01	0.029	< 0.00005	< 0.00005
2017	Q1	FR_FRCP1	0.13	841	< 0.01	0.03	< 0.00005	< 0.00005
2017	Q2	FR_FRCP1	0.14	392	0.018	0.49	< 0.00005	0.00035
2017	Q3	FR_FRCP1	0.18	447	< 0.01	0.022	< 0.00005	< 0.00005
2017	Q4	FR_FRCP1	0.1	734	0.01	0.027	< 0.00005	< 0.00005
2017	Q3	GH_FR1	0.15	391	< 0.01	0.013	< 0.00005	< 0.00005
2017	Q1	LC_LCDSSLCC	0.21	552	< 0.01	0.025	< 0.00005	< 0.00005

**Notes:**

"D-" = dissolved concentration; "T-" = total concentration; "N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	LITHIUM-D-mg/l	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l	MANGANESE-D-mg/l	MANGANESE-T-mg/l	MERCURY-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.0019	0.0016	15	0.000054	0.00018	< 0.000010
2015	Q1	Reference (FR_UFR1)	0.0019	0.0016	15	0.000054	0.00018	< 0.000010
2015	Q1	Reference (FR_UFR1)	0.0015	0.0017	14	0.00017	0.00037	< 0.000010
2015	Q2	Reference (FR_UFR1)	< 0.0010	0.0012	9.2	0.00064	0.0025	< 0.000050
2015	Q3	Reference (FR_UFR1)	0.002	0.002	13	0.00062	0.0015	< 0.000050
2015	Q4	Reference (FR_UFR1)	0.0015	0.0015	14	0.0001	0.00031	< 0.000050
2015	Q2	Reference (GH_ER2)	0.0017	0.0016	11	0.0033	0.0059	< 0.000050
2015	Q4	Reference (GH_ER2)	0.0016	0.0018	11	0.0021	0.0027	< 0.000050
2016	Q1	Reference (FR_UFR1)	0.0014	0.0015	15	0.0002	0.00034	< 0.000050
2016	Q2	Reference (FR_UFR1)	0.0011	0.0013	9.8	0.00045	0.0021	< 0.000050
2016	Q3	Reference (FR_UFR1)	0.0017	0.0018	14	0.00027	0.0011	< 0.000050
2016	Q4	Reference (FR_UFR1)	0.0015	0.0018	12	0.00027	0.00073	< 0.000050
2016	Q2	Reference (GH_ER2)	0.002	0.0021	11	0.0018	0.012	< 0.000050
2016	Q4	Reference (GH_ER2)	0.0019	0.0017	9.6	0.0012	0.0021	< 0.000050
2017	Q2	Reference (CM_MC1)	0.0041	0.0042	10	0.00015	0.00057	< 0.000005
2017	Q3	Reference (CM_MC1)	0.0044	0.0045	9.5	< 0.0001	0.001	< 0.000005
2017	Q4	Reference (CM_MC1)	0.0045	0.0046	11	0.00012	0.00035	< 0.000005
2017	Q1	Reference (FR_UFR1)	0.0013	0.0014	14	< 0.0001	0.00027	< 0.000005
2017	Q2	Reference (FR_UFR1)	0.0011	0.0012	8.7	0.0012	0.0035	< 0.000005
2017	Q3	Reference (FR_UFR1)	0.0015	0.0015	13	0.00036	0.0011	< 0.000005
2017	Q4	Reference (FR_UFR1)	0.0019	0.0017	14	< 0.0001	0.00056	< 0.000005
2017	Q2	Reference (GH_ER2)	0.0019	0.002	12	0.00095	0.0054	< 0.000005
2017	Q3	Reference (GH_ER2)	0.0017	0.0015	9.6	0.0021	0.0031	< 0.000005
2017	Q4	Reference (GH_ER2)	0.0021	0.002	11	0.00061	0.0016	< 0.000005
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.011	0.011	46	0.0046	0.0064	< 0.000010
2015	Q3	CM_MC2	0.013	0.014	51	0.0018	0.0032	< 0.000050
2015	Q1	EV_HC1	0.0047	0.0047	31	0.001	0.0015	0.00001
2015	Q2	EV_HC1	0.0044	0.0042	21	0.00053	0.0016	0.000005
2015	Q3	EV_HC1	0.0069	0.0068	41	0.0028	0.0051	< 0.000050
2015	Q4	EV_HC1	0.0069	0.0067	50	0.0018	0.002	< 0.0000050
2015	Q1	EV_MC2	0.015	0.015	33	0.0024	0.0022	< 0.000010
2015	Q2	EV_MC2	0.0054	0.0052	13	0.0003	0.01	< 0.000050
2015	Q3	EV_MC2	0.022	0.021	35	0.00067	0.002	< 0.000050
2015	Q4	EV_MC2	0.023	0.022	39	0.0013	0.0018	< 0.0000050
2015	Q2	FR_FRCP1	0.019	0.018	29	0.0032	0.012	< 0.000050
2015	Q3	FR_FRCP1	0.03	0.031	51	0.0031	0.0069	< 0.000050
2015	Q1	GH_ERC	0.0019	0.002	13	0.00035	0.0026	< 0.000010
2015	Q2	GH_ERC	0.0022	0.0023	12	0.00072	0.0081	< 0.000050
2015	Q3	GH_ERC	0.0017	0.002	11	0.00058	0.0078	< 0.000050
2015	Q4	GH_ERC	0.002	0.0021	13	0.00063	0.0013	< 0.000050
2015	Q1	GH_FR1	0.016	0.015	49	0.0017	0.0021	< 0.000010
2015	Q2	GH_FR1	0.014	0.014	34	0.0011	0.0044	< 0.000050
2015	Q3	GH_FR1	0.015	0.015	37	0.00089	0.0023	< 0.000050
2015	Q4	GH_FR1	0.017	0.017	43	0.0011	0.0016	< 0.000050
2015	Q1	LC_LCDSSLCC	0.031	0.031	53	0.000074	0.00021	< 0.000010
2015	Q3	LC_LCDSSLCC	0.021	0.023	34	0.0002	0.00054	< 0.000050
2015	Q4	LC_LCDSSLCC	0.036	0.036	54	< 0.00050	< 0.00050	< 0.000050
2016	Q1	EV_HC1	0.0066	0.0065	51	0.0013	0.0016	< 0.0000050
2016	Q3	EV_HC1	0.0084	0.0083	44	0.0054	0.0081	< 0.000050
2016	Q4	EV_HC1	0.0077	0.0081	46	0.0021	0.0033	< 0.000005
2016	Q1	EV_MC2	0.018	0.018	37	0.0012	0.0021	< 0.0000050
2016	Q3	EV_MC2	0.031	0.033	42	0.0009	0.0014	< 0.000050
2016	Q1	GH_ERC	0.0023	0.0025	16	0.00026	0.00034	< 0.000050
2016	Q3	GH_ERC	0.0024	0.0024	11	0.00045	0.0019	< 0.000050
2016	Q4	GH_ERC	0.0026	0.0022	12	0.00044	0.0027	< 0.000050
2016	Q1	GH_FR1	0.015	0.014	52	0.001	0.0012	< 0.000050
2016	Q3	GH_FR1	0.017	0.017	40	0.00092	0.002	< 0.000050
2016	Q4	GH_FR1	0.017	0.017	44	0.00072	0.0017	< 0.000005
2016	Q1	LC_LCDSSLCC	0.037	0.038	60	0.0058	0.0064	< 0.000050
2016	Q3	LC_LCDSSLCC	0.034	0.032	37	0.0009	0.0018	< 0.000050
2016	Q4	LC_LCDSSLCC	0.027	0.026	35	0.002	0.0032	< 0.000050
2017	Q1	EV_HC1	0.0064	0.0065	47	0.0024	0.0027	< 0.000005
2017	Q3	EV_HC1	0.0071	0.0066	46	0.0054	0.0057	0.000006
2017	Q4	EV_HC1	0.0065	0.0072	44	< 0.0001	0.0057	< 0.000005
2017	Q2	EV_MC2	0.0082	0.0077	17	0.0019	0.0085	0.000012
2017	Q3	EV_MC2	0.016	0.015	31	0.0018	0.0022	< 0.000005
2017	Q4	EV_MC2	0.016	0.016	32	< 0.0001	0.002	< 0.000005
2017	Q1	GH_ERC	0.0031	0.0035	14	0.00012	0.00032	< 0.000005
2017	Q2	GH_ERC	0.0029	0.0032	15	0.00083	0.0062	< 0.000005
2017	Q3	GH_ERC	0.0025	0.0024	11	0.0011	0.004	< 0.000005
2017	Q4	GH_ERC	0.0027	0.0025	12	0.00044	0.0011	< 0.000005
2017	Q1	GH_FR1	0.016	0.016	49	0.0012	0.0015	< 0.000005
2017	Q2	GH_FR1	0.015	0.015	44	0.0032	0.014	< 0.000005
2017	Q4	GH_FR1	0.018	0.018	51	0.0013	0.0014	< 0.000005
2017	Q2	LC_LCDSSLCC	0.048	0.047	48	0.00081	0.0036	< 0.000005
2017	Q3	LC_LCDSSLCC	0.036	0.036	37	0.00066	0.00087	< 0.000005
2017	Q4	LC_LCDSSLCC	0.037	0.04	49	0.0011	0.0022	< 0.000005
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.0064	0.0067	23	0.0035	0.011	< 0.000050
2015	Q4	CM_MC2	0.011	0.012	51	0.00064	0.0012	< 0.000050
2015	Q1	FR_FRCP1	0.054	0.056	261	0.0019	0.0027	< 0.00010
2015	Q4	FR_FRCP1	0.042	0.037	65	0.0076	0.0081	< 0.000050
2015	Q2	LC_LCDSSLCC	0.016	0.016	25	0.00016	0.00051	< 0.000050
2016	Q1	CM_MC2	0.014	0.014	52	0.0045	0.0052	< 0.000050
2016	Q2	CM_MC2	0.0083	0.0085	26	0.0062	0.019	< 0.000050
2016	Q3	CM_MC2	0.016	0.017	53	0.00052	0.0013	< 0.000050
2016	Q4	CM_MC2	0.01	0.01	33	0.0062	0.014	< 0.000050
2016	Q2	EV_HC1	0.0064	0.0068	33	0.00048	0.0037	0.0000062
2016	Q2	EV_MC2	0.0052	0.0056	11	0.00014	0.013	0.000015
2016	Q4	EV_MC2	0.0064	0.0068	17	0.001	0.0044	0.000016
2016	Q1	FR_FRCP1	0.058	0.059	142	0.0068	0.0075	< 0.000050
2016	Q2	FR_FRCP1	0.016	0.018	32	0.0028	0.0097	< 0.000050
2016	Q3	FR_FRCP1	0.032	0.032	48	0.0045	0.0074	< 0.000050
2016	Q4	FR_FRCP1	0.029	0.03	45	0.0063	0.0083	< 0.000050
2016	Q2	GH_ERC	0.0021	0.0025	13	0.0013	0.018	< 0.000050
2016	Q2	GH_FR1	0.012	0.012	31	0.0015	0.0056	< 0.000050
2016	Q2	LC_LCDSSLCC	0.023	0.024	28	0.0016	0.0033	< 0.000050
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.018	0.017	55	0.011	0.013	< 0.000005
2017	Q2	CM_MC2	0.015	0.015	36	0.026	0.031	< 0.000005
2017	Q2	CM_MC2	0.017	0.02	47	0.024	0.034	< 0.000005
2017	Q3	CM_MC2	0.017	0.016	47	0.0058	0.01	< 0.000005
2017	Q4	CM_MC2	0.022	0.023	58	0.002	0.0034	< 0.000005
2017	Q2	EV_HC1	0.0068	0.0068	38	0.0014	0.0034	0.0000061
2017	Q1	EV_MC2	0.018	0.017	32	0.00068	0.002	< 0.000005
2017	Q1	FR_FRCP1	0.056	0.056	106	0.008	0.01	< 0.000005
2017	Q2	FR_FRCP1	0.032	0.03	39	0.0057	0.022	< 0.000005
2017	Q3	FR_FRCP1	0.029	0.029	54	0.0054	0.0075	< 0.000005
2017	Q4	FR_FRCP1	0.042	0.042	90	0.0073	0.011	< 0.000005
2017	Q3	GH_FR1	0.019	0.018	43	0.0017	0.0023	< 0.000005
2017	Q1	LC_LCDSSLCC	0.04	0.039	58	0.0016	0.0022	< 0.000005

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.000010	0.00053	0.00054	< 0.00050	< 0.00050	0.13
2015	Q1	Reference (FR_UFR1)	< 0.000010	0.00053	0.00054	< 0.00050	< 0.00050	0.13
2015	Q1	Reference (FR_UFR1)	< 0.000010	0.00056	0.00055	< 0.00050	< 0.00050	0.13
2015	Q2	Reference (FR_UFR1)	< 0.000050	0.00052	0.00062	< 0.00050	< 0.00050	0.066
2015	Q3	Reference (FR_UFR1)	< 0.000050	0.00068	0.00068	< 0.00050	< 0.00050	0.019
2015	Q4	Reference (FR_UFR1)	< 0.000050	0.00065	0.00059	< 0.00050	< 0.00050	0.022
2015	Q2	Reference (GH_ER2)	< 0.000050	0.00092	0.00094	< 0.00050	< 0.00050	0.086
2015	Q4	Reference (GH_ER2)	< 0.000050	0.001	0.0010	< 0.00050	< 0.00050	0.078
2016	Q1	Reference (FR_UFR1)	< 0.0000050	0.00058	0.00056	< 0.00050	< 0.00050	0.17
2016	Q2	Reference (FR_UFR1)	0.000014	0.00061	0.00062	< 0.00050	< 0.00050	0.034
2016	Q3	Reference (FR_UFR1)	< 0.0000050	0.00063	0.00063	< 0.00050	< 0.00050	0.057
2016	Q4	Reference (FR_UFR1)	0.0000056	0.00057	0.00056	< 0.00050	< 0.00050	0.1
2016	Q2	Reference (GH_ER2)	0.0000098	0.00091	0.00093	< 0.00050	0.0005	0.12
2016	Q4	Reference (GH_ER2)	< 0.000050	0.00097	0.001	< 0.00050	< 0.00050	0.071
2017	Q2	Reference (CM_MC1)	0.000011	0.00074	0.0008	< 0.0005	< 0.0005	0.012
2017	Q3	Reference (CM_MC1)	0.0000067	0.00088	0.00085	< 0.0005	< 0.0005	0.012
2017	Q4	Reference (CM_MC1)	0.0000059	0.0009	0.00087	< 0.0005	< 0.0005	0.015
2017	Q1	Reference (FR_UFR1)	< 0.000005	0.00062	0.00062	< 0.0005	< 0.0005	0.22
2017	Q2	Reference (FR_UFR1)	0.0000031	0.00048	0.0005	0.00052	0.00069	0.098
2017	Q3	Reference (FR_UFR1)	< 0.000005	0.00064	0.00068	< 0.0005	< 0.0005	0.011
2017	Q4	Reference (FR_UFR1)	< 0.000005	0.00055	0.00054	< 0.0005	< 0.0005	0.0094
2017	Q2	Reference (GH_ER2)	0.0000082	0.00094	0.00095	< 0.0005	< 0.0005	0.12
2017	Q3	Reference (GH_ER2)	0.000006	0.00096	0.00098	< 0.0005	< 0.0005	0.037
2017	Q4	Reference (GH_ER2)	< 0.000005	0.0011	0.0011	< 0.0005	< 0.0005	0.037
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	< 0.000010	0.001	0.0011	0.0095	0.0097	2.4
2015	Q3	CM_MC2	< 0.000050	0.001	0.0011	0.013	0.013	2.5
2015	Q1	EV_HC1	0.00001	0.00063	0.00065	0.0006	0.00064	0.8
2015	Q2	EV_HC1	0.00005	0.0005	0.00048	0.00075	0.00083	0.57
2015	Q3	EV_HC1	< 0.000050	0.00092	0.00092	0.00079	0.00079	0.87
2015	Q4	EV_HC1	< 0.0000050	0.00097	0.00098	0.00066	0.00069	1.2
2015	Q1	EV_MC2	< 0.000010	0.00079	0.00078	0.0007	0.00052	3.2
2015	Q2	EV_MC2	< 0.000050	0.00059	0.00054	0.00077	0.0014	0.81
2015	Q3	EV_MC2	< 0.000050	0.0022	0.0022	0.0047	0.0048	5.7
2015	Q4	EV_MC2	< 0.0000050	0.002	0.0021	0.0039	0.0041	5.9
2015	Q2	FR_FRCP1	< 0.000050	0.0013	0.0013	0.002	0.0024	7.4
2015	Q3	FR_FRCP1	< 0.000050	0.0015	0.0015	0.0041	0.0043	8.2
2015	Q1	GH_ERC	< 0.000010	0.00092	0.00099	< 0.00050	< 0.00050	0.44
2015	Q2	GH_ERC	< 0.000050	0.00095	0.00097	< 0.00050	< 0.00050	0.31
2015	Q3	GH_ERC	< 0.000050	0.00095	0.001	< 0.00050	< 0.00050	0.17
2015	Q4	GH_ERC	< 0.000050	0.00099	0.0011	< 0.00050	< 0.00050	0.46
2015	Q1	GH_FR1	< 0.000010	0.00095	0.00098	0.0022	0.0023	13
2015	Q2	GH_FR1	< 0.000050	0.0011	0.0011	0.0019	0.002	7.5
2015	Q3	GH_FR1	< 0.000050	0.00099	0.0010	0.0016	0.0017	9.1
2015	Q4	GH_FR1	< 0.000050	0.0009	0.00099	0.0012	0.0012	10
2015	Q1	LC_LCDSSLCC	< 0.000010	0.0017	0.0017	0.0036	0.0036	15
2015	Q3	LC_LCDSSLCC	< 0.000050	0.0014	0.0015	0.0047	0.005	7.2
2015	Q4	LC_LCDSSLCC	< 0.000050	0.0017	0.0016	0.0065	0.0071	13
2016	Q1	EV_HC1	< 0.0000050	0.00092	0.00092	0.00062	< 0.0010	1.2
2016	Q3	EV_HC1	0.000012	0.00092	0.00091	0.00074	0.0009	0.84
2016	Q4	EV_HC1	0.0000085	0.00091	0.00093	0.00073	0.00087	1.0
2016	Q1	EV_MC2	< 0.0000050	0.0015	0.0015	0.0025	0.0026	5.1
2016	Q3	EV_MC2	0.0000085	0.0012	0.0012	0.0022	0.0024	6.5
2016	Q1	GH_ERC	< 0.000050	0.00094	0.00092	< 0.00050	< 0.00050	0.76
2016	Q3	GH_ERC	< 0.0000050	0.00091	0.00087	< 0.00050	< 0.00050	0.2
2016	Q4	GH_ERC	< 0.000050	0.0011	0.001	< 0.00050	0.00086	0.28
2016	Q1	GH_FR1	< 0.000050	0.00084	0.00086	0.0014	0.0014	13
2016	Q3	GH_FR1	< 0.0000050	0.0009	0.00097	0.0015	0.0015	9.6
2016	Q4	GH_FR1	< 0.000005	0.001	0.0011	0.0019	0.002	8.8
2016	Q1	LC_LCDSSLCC	< 0.0000050	0.0016	0.0017	0.0034	0.0034	11
2016	Q3	LC_LCDSSLCC	< 0.0000050	0.0016	0.0015	0.0044	0.0046	8.6
2016	Q4	LC_LCDSSLCC	< 0.000005	0.0014	0.0015	0.004	0.0038	7.3
2017	Q1	EV_HC1	< 0.000005	0.00091	0.00093	0.00074	0.00078	1.2
2017	Q3	EV_HC1	0.000012	0.00085	0.00085	0.00078	0.00093	0.79
2017	Q4	EV_HC1	< 0.000005	0.00089	0.00087	< 0.0005	0.00078	0.86
2017	Q2	EV_MC2	0.0000032	0.00074	0.00066	0.0014	0.0019	1.1
2017	Q3	EV_MC2	0.000008	0.0012	0.0013	0.0019	0.0021	2.2
2017	Q4	EV_MC2	< 0.000005	0.00085	0.00092	< 0.0005	0.00091	2.7
2017	Q1	GH_ERC	< 0.000005	0.00099	0.00099	< 0.0005	< 0.0005	0.45
2017	Q2	GH_ERC	0.0000073	0.00097	0.0011	< 0.0005	< 0.0005	0.5
2017	Q3	GH_ERC	0.000007	0.00099	0.001	< 0.0005	< 0.0005	0.19
2017	Q4	GH_ERC	< 0.000005	0.0011	0.0011	< 0.0005	< 0.0005	0.25
2017	Q1	GH_FR1	< 0.000005	0.00081	0.00084	0.0014	0.0013	13
2017	Q2	GH_FR1	0.0000047	0.0012	0.0014	0.0031	0.0048	6.7
2017	Q4	GH_FR1	< 0.000005	0.00089	0.00092	0.0017	0.0018	11
2017	Q2	LC_LCDSSLCC	0.0000069	0.002	0.002	0.0052	0.0055	15
2017	Q3	LC_LCDSSLCC	0.000005	0.0017	0.0016	0.0061	0.0059	10
2017	Q4	LC_LCDSSLCC	< 0.000005	0.0016	0.0016	0.0053	0.0057	9.6
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.0000084	0.00076	0.00081	0.0062	0.0076	1.2
2015	Q4	CM_MC2	< 0.000050	0.00092	0.00096	0.0059	0.006	2.2
2015	Q1	FR_FRCP1	< 0.000010	0.0028	0.0029	0.031	0.032	30
2015	Q4	FR_FRCP1	< 0.000050	0.0015	0.0014	0.0068	0.0066	15
2015	Q2	LC_LCDSSLCC	< 0.000050	0.0011	0.0012	0.0036	0.0036	5.8
2016	Q1	CM_MC2	< 0.000050	0.0010	0.0010	0.0094	0.0098	2.9
2016	Q2	CM_MC2	0.000011	0.00076	0.00074	0.011	0.011	2.0
2016	Q3	CM_MC2	< 0.0000050	0.0011	0.0012	0.012	0.013	2.7
2016	Q4	CM_MC2	0.000012	0.00097	0.00098	0.0073	0.0083	1.8
2016	Q2	EV_HC1	0.0000077	0.00074	0.00077	0.00097	0.0012	0.82
2016	Q2	EV_MC2	0.000018	0.00064	0.00069	0.0014	0.0022	0.78
2016	Q4	EV_MC2	0.000025	0.0006	0.00065	0.00078	0.0012	1.2
2016	Q1	FR_FRCP1	< 0.0000050	0.0017	0.0018	0.013	0.013	28
2016	Q2	FR_FRCP1	0.000012	0.0012	0.0013	0.0021	0.003	7.4
2016	Q3	FR_FRCP1	< 0.0000050	0.0013	0.0013	0.0049	0.0052	12
2016	Q4	FR_FRCP1	< 0.000005	0.0012	0.0012	0.0045	0.0047	10
2016	Q2	GH_ERC	0.000016	0.00091	0.00092	< 0.00050	0.00067	0.41
2016	Q2	GH_FR1	0.000025	0.001	0.001	0.0019	0.0022	6.5
2016	Q2	LC_LCDSSLCC	0.0000069	0.0014	0.0014	0.0045	0.0048	6.3
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	< 0.000005	0.0014	0.0015	0.023	0.025	4.2
2017	Q2	CM_MC2	0.000011	0.0013	0.0013	0.024	0.024	2.2
2017	Q2	CM_MC2	0.000013	0.0014	0.0017	0.022	0.027	2.3
2017	Q3	CM_MC2	0.000013	0.0015	0.0015	0.028	0.029	3.1
2017	Q4	CM_MC2	< 0.000005	0.0014	0.0014	0.016	0.017	3.7
2017	Q2	EV_HC1	0.000013	0.00082	0.00086	0.001	0.0013	0.85
2017	Q1	EV_MC2	< 0.000005	0.0015	0.0015	0.0021	0.0025	3.5
2017	Q1	FR_FRCP1	< 0.000005	0.0017	0.0017	0.0097	0.01	20
2017	Q2	FR_FRCP1	0.0000038	0.0012	0.0015	0.0041	0.0056	12
2017	Q3	FR_FRCP1	< 0.000005	0.0013	0.0013	0.0045	0.005	8.9
2017	Q4	FR_FRCP1	< 0.000005	0.0013	0.0013	0.0082	0.0088	15
2017	Q3	GH_FR1	0.000005	0.00094	0.001	0.0025	0.0028	9.5
2017	Q1	LC_LCDSSLCC	< 0.000005	0.0022	0.0023	0.0039	0.0038	12

Notes:

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	NITRITE NITROGEN (NO <sub>2</sub> ), AS N-N-mg/l	NITROGEN, AMMONIA (AS N)-mg/l	ORTHO-PHOSPHATE-N-mg/l	pH, LAB-N-ph units	PHOSPHORUS-N-mg/l	POTASSIUM-T-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0032	8.4	0.0042	0.4
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0032	8.4	0.0042	0.4
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0027	8.3	0.0035	0.42
2015	Q2	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0042	8.4	0.01	0.37
2015	Q3	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0029	8.4	0.0054	0.52
2015	Q4	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0017	8.4	0.0022	0.42
2015	Q2	Reference (GH_ER2)	< 0.0010	< 0.0050	< 0.0010	8.3	0.008	0.37
2015	Q4	Reference (GH_ER2)	< 0.0010	< 0.0050	0.0015	8.3	< 0.0020	0.35
2016	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0032	8.3	0.0036	0.37
2016	Q2	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0041	8.3	0.0078	0.34
2016	Q3	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0031	8.2	0.0038	0.47
2016	Q4	Reference (FR_UFR1)	< 0.0010	< 0.0050	0.0023	8.3	0.0028	0.38
2016	Q2	Reference (GH_ER2)	< 0.0010	< 0.0050	0.0011	8.2	0.016	0.46
2016	Q4	Reference (GH_ER2)	< 0.0010	< 0.0050	< 0.0010	8.3	< 0.0020	0.36
2017	Q2	Reference (CM_MC1)	< 0.001	< 0.005	0.0029	8.2	0.0094	0.43
2017	Q3	Reference (CM_MC1)	< 0.001	0.0067	0.005	8.2	0.06	0.45
2017	Q4	Reference (CM_MC1)	< 0.001	< 0.005	0.0035	8.3	0.0045	0.49
2017	Q1	Reference (FR_UFR1)	< 0.001	< 0.005	0.0049	8.3	0.0071	0.38
2017	Q2	Reference (FR_UFR1)	< 0.001	0.011	0.0087	8.3	0.02	0.38
2017	Q3	Reference (FR_UFR1)	< 0.001	0.01	0.0027	8.4	0.0078	0.48
2017	Q4	Reference (FR_UFR1)	0.0011	< 0.005	0.0016	8.4	0.0023	0.4
2017	Q2	Reference (GH_ER2)	< 0.001	< 0.005	< 0.001	8.4	0.0058	0.41
2017	Q3	Reference (GH_ER2)	< 0.001	0.0069	0.001	8.4	0.0059	0.38
2017	Q4	Reference (GH_ER2)	< 0.001	0.0089	< 0.001	8.4	< 0.002	0.38
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.012	0.0055	0.001	8.4	0.005	1.4
2015	Q3	CM_MC2	0.0088	< 0.0050	< 0.0010	8.4	0.003	1.5
2015	Q1	EV_HC1	0.001	0.005	0.0035	7.4	0.0047	0.62
2015	Q2	EV_HC1	0.001	0.0084	0.0031	7.5	0.0081	0.55
2015	Q3	EV_HC1	0.0011	< 0.0050	0.004	8.4	0.0082	0.99
2015	Q4	EV_HC1	< 0.0050	< 0.0050	0.0058	8.4	0.0057	0.9
2015	Q1	EV_MC2	0.0013	< 0.0050	< 0.0010	8.3	0.0047	1.2
2015	Q2	EV_MC2	< 0.0010	< 0.0050	< 0.0010	8.1	0.037	0.67
2015	Q3	EV_MC2	0.0027	0.01	0.0027	8.1	0.0052	1.5
2015	Q4	EV_MC2	< 0.0050	< 0.0050	0.0035	8.2	0.0036	1.3
2015	Q2	FR_FRCP1	0.0056	0.0095	0.0014	8.4	0.018	1.2
2015	Q3	FR_FRCP1	0.0049	< 0.0050	< 0.0010	8.4	0.0027	1.8
2015	Q1	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.3	0.0043	0.37
2015	Q2	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.4	0.016	0.41
2015	Q3	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.3	0.0077	0.42
2015	Q4	GH_ERC	< 0.0010	< 0.0050	0.0018	8.3	< 0.0020	0.39
2015	Q1	GH_FR1	0.0039	< 0.0050	< 0.0010	8.3	0.0036	1.2
2015	Q2	GH_FR1	0.0028	< 0.0050	< 0.0010	8.4	0.01	1.1
2015	Q3	GH_FR1	0.0046	0.0071	< 0.0010	8.3	0.0036	1.2
2015	Q4	GH_FR1	< 0.0050	< 0.0050	< 0.0010	8.4	< 0.0020	1.2
2015	Q1	LC_LCDSSLCC	0.003	< 0.0050	< 0.0010	8.3	0.0029	1.2
2015	Q3	LC_LCDSSLCC	< 0.0020	< 0.0050	0.0018	8.4	0.0029	1.1
2015	Q4	LC_LCDSSLCC	0.003	< 0.0050	< 0.0010	8.3	< 0.0050	1.4
2016	Q1	EV_HC1	< 0.0050	< 0.0050	0.0041	8.3	0.0045	0.86
2016	Q3	EV_HC1	0.0016	0.0088	0.0064	8.3	0.012	0.98
2016	Q4	EV_HC1	< 0.0050	< 0.0050	0.0061	8.4	0.0079	1.0
2016	Q1	EV_MC2	< 0.0050	< 0.0050	< 0.0010	8.1	0.0023	1.1
2016	Q3	EV_MC2	< 0.0050	0.0073	0.004	8.1	0.0052	1.6
2016	Q1	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.2	< 0.0020	0.39
2016	Q3	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.2	0.0049	0.42
2016	Q4	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.3	< 0.0020	0.41
2016	Q1	GH_FR1	< 0.0050	< 0.0050	< 0.0010	8.3	< 0.0020	1.1
2016	Q3	GH_FR1	0.0056	< 0.0050	< 0.0010	8.3	0.0061	1.2
2016	Q4	GH_FR1	< 0.005	< 0.005	< 0.001	8.3	0.0023	1.3
2016	Q1	LC_LCDSSLCC	0.0098	< 0.0050	0.0011	8.3	< 0.0020	1.4
2016	Q3	LC_LCDSSLCC	< 0.0050	< 0.0050	0.0021	8.4	0.0027	1.4
2016	Q4	LC_LCDSSLCC	< 0.0050	< 0.0050	0.0013	8.3	< 0.0020	1.1
2017	Q1	EV_HC1	< 0.001	0.0052	0.0068	8.3	0.0077	0.92
2017	Q3	EV_HC1	< 0.001	< 0.005	0.0054	8.4	0.0072	0.87
2017	Q4	EV_HC1	< 0.001	0.024	0.0048	8.5	0.0098	0.87
2017	Q2	EV_MC2	0.0011	0.024	0.0041	8.1	0.033	0.78
2017	Q3	EV_MC2	0.0032	0.0082	< 0.001	8.4	0.0032	1.1
2017	Q4	EV_MC2	0.0017	0.025	0.0014	8.3	0.0029	1.1
2017	Q1	GH_ERC	< 0.001	< 0.005	0.001	8.2	< 0.002	0.4
2017	Q2	GH_ERC	< 0.001	< 0.005	< 0.001	8.4	0.01	0.45
2017	Q3	GH_ERC	< 0.001	0.0063	< 0.001	8.4	0.0086	0.42
2017	Q4	GH_ERC	0.0022	< 0.005	< 0.001	8.4	< 0.002	0.39
2017	Q1	GH_FR1	< 0.005	< 0.005	0.0011	8.3	0.0039	1.2
2017	Q2	GH_FR1	< 0.005	< 0.005	0.0038	8.4	0.029	1.6
2017	Q4	GH_FR1	0.0057	0.0067	< 0.001	8.2	0.0026	1.2
2017	Q2	LC_LCDSSLCC	0.004	< 0.005	0.0016	8.3	< 0.002	1.6
2017	Q3	LC_LCDSSLCC	0.0041	0.0067	0.0021	8.4	0.0052	1.2
2017	Q4	LC_LCDSSLCC	0.0013	0.0066	< 0.001	8.2	< 0.002	1.5
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.0029	< 0.0050	< 0.0010	8.4	0.017	0.98
2015	Q4	CM_MC2	< 0.0050	< 0.0050	< 0.0010	8.3	< 0.0020	1.5
2015	Q1	FR_FRCP1	< 0.020	< 0.0050	< 0.0010	8.3	0.0021	4.0
2015	Q4	FR_FRCP1	< 0.0050	< 0.0050	< 0.0010	8.3	< 0.0020	1.9
2015	Q2	LC_LCDSSLCC	0.0014	< 0.0050	0.0027	8.4	0.0056	0.82
2016	Q1	CM_MC2	0.012	< 0.0050	< 0.0010	8.3	< 0.0020	1.6
2016	Q2	CM_MC2	0.0037	0.0074	0.0028	8.2	0.022	1.1
2016	Q3	CM_MC2	< 0.0050	< 0.0050	< 0.0010	8.4	< 0.0020	1.7
2016	Q4	CM_MC2	0.01	0.0076	0.0016	8.3	0.0063	1.3
2016	Q2	EV_HC1	< 0.0010	< 0.0050	0.0054	8.3	0.01	0.87
2016	Q2	EV_MC2	< 0.0010	< 0.0050	0.013	8.1	0.039	0.64
2016	Q4	EV_MC2	0.001	< 0.0050	0.0081	8.2	0.014	0.75
2016	Q1	FR_FRCP1	< 0.010	< 0.0050	< 0.0010	8.2	< 0.0020	2.5
2016	Q2	FR_FRCP1	0.0033	0.0086	0.0029	8.3	0.013	1.2
2016	Q3	FR_FRCP1	< 0.0050	< 0.0050	0.0011	8.4	0.0027	1.6
2016	Q4	FR_FRCP1	< 0.0050	< 0.0050	< 0.0010	8.4	< 0.0020	1.4
2016	Q2	GH_ERC	< 0.0010	< 0.0050	< 0.0010	8.3	0.027	0.55
2016	Q2	GH_FR1	0.0025	< 0.0050	0.002	8.3	0.013	1.1
2016	Q2	LC_LCDSSLCC	< 0.0010	< 0.0050	< 0.0010	8.3	0.0027	0.99
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.018	0.012	0.0022	8.3	0.0043	1.9
2017	Q2	CM_MC2	0.013	0.073	< 0.001	8.2	0.018	1.4
2017	Q2	CM_MC2	0.013	0.052	< 0.001	8.3	0.0098	1.9
2017	Q3	CM_MC2	0.024	0.02	< 0.001	8.5	0.009	1.7
2017	Q4	CM_MC2	0.0099	0.0075	< 0.001	8.3	0.005	2.1
2017	Q2	EV_HC1	< 0.001	< 0.005	0.0044	8.3	0.016	1.0
2017	Q1	EV_MC2	< 0.001	0.0075	0.0044	8.2	0.0056	1.2
2017	Q1	FR_FRCP1	0.02	0.0066	< 0.001	8.3	0.0054	2.4
2017	Q2	FR_FRCP1	0.0045	0.026	0.0028	8.4	0.042	1.5
2017	Q3	FR_FRCP1	0.0041	0.0084	0.002	8.3	0.0071	1.8
2017	Q4	FR_FRCP1	0.0082	0.0051	< 0.001	8.2	< 0.002	2.1
2017	Q3	GH_FR1	0.0072	0.0074	< 0.001	8.4	0.005	1.3
2017	Q1	LC_LCDSSLCC	< 0.005	< 0.005	0.0024	8.3	0.0052	1.4

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	SELENIUM-D-mg/l	SELENIUM-T-mg/l	SILVER-D-mg/l	SILVER-T-mg/l	SODIUM-T-mg/l	STRONTIUM-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.00069	0.00073	< 0.000010	< 0.000010	0.77	0.088
2015	Q1	Reference (FR_UFR1)	0.00069	0.00073	< 0.000010	< 0.000010	0.77	0.088
2015	Q1	Reference (FR_UFR1)	0.00076	0.00073	< 0.000010	< 0.000010	0.72	0.089
2015	Q2	Reference (FR_UFR1)	0.00048	0.00049	< 0.000010	< 0.000010	0.56	0.061
2015	Q3	Reference (FR_UFR1)	0.00047	0.00043	< 0.000010	< 0.000010	0.69	0.093
2015	Q4	Reference (FR_UFR1)	0.00069	0.00062	< 0.000010	< 0.000010	0.69	0.095
2015	Q2	Reference (GH_ER2)	0.00079	0.00087	< 0.000010	< 0.000010	0.73	0.2
2015	Q4	Reference (GH_ER2)	0.00072	0.00078	< 0.000010	< 0.000010	0.67	0.21
2016	Q1	Reference (FR_UFR1)	0.0008	0.00078	< 0.000010	< 0.000010	0.68	0.089
2016	Q2	Reference (FR_UFR1)	0.00052	0.00055	< 0.000010	< 0.000010	0.63	0.063
2016	Q3	Reference (FR_UFR1)	0.00056	0.00063	< 0.000010	< 0.000010	0.68	0.095
2016	Q4	Reference (FR_UFR1)	0.00069	0.00068	< 0.000010	< 0.000010	0.7	0.093
2016	Q2	Reference (GH_ER2)	0.00083	0.00083	< 0.000010	< 0.000010	0.75	0.2
2016	Q4	Reference (GH_ER2)	0.00087	0.00083	< 0.000010	< 0.000010	0.61	0.24
2017	Q2	Reference (CM_MC1)	0.00029	0.00025	< 0.00001	< 0.00001	2.7	0.14
2017	Q3	Reference (CM_MC1)	0.00019	0.00024	< 0.00001	< 0.00001	2.0	0.14
2017	Q4	Reference (CM_MC1)	0.00019	0.00019	< 0.00001	< 0.00001	2.9	0.16
2017	Q1	Reference (FR_UFR1)	0.0012	0.0010	< 0.00001	< 0.00001	0.77	0.097
2017	Q2	Reference (FR_UFR1)	0.0007	0.0006	< 0.00001	0.00002	0.62	0.064
2017	Q3	Reference (FR_UFR1)	0.0006	0.00059	< 0.00001	< 0.00001	0.69	0.088
2017	Q4	Reference (FR_UFR1)	0.00058	0.00055	< 0.00001	< 0.00001	0.72	0.1
2017	Q2	Reference (GH_ER2)	0.00086	0.00098	< 0.00001	< 0.00001	0.73	0.21
2017	Q3	Reference (GH_ER2)	0.00067	0.00064	< 0.00001	< 0.00001	0.6	0.19
2017	Q4	Reference (GH_ER2)	0.00089	0.00087	< 0.00001	< 0.00001	0.7	0.21
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.0059	0.006	< 0.000010	< 0.000010	10	0.29
2015	Q3	CM_MC2	0.0062	0.0064	< 0.000010	< 0.000010	8.7	0.27
2015	Q1	EV_HC1	0.022	0.022	0.00001	0.00001	1.2	0.085
2015	Q2	EV_HC1	0.019	0.018	0.00001	0.00001	0.82	0.062
2015	Q3	EV_HC1	0.029	0.028	< 0.000010	< 0.000010	1.5	0.11
2015	Q4	EV_HC1	0.033	0.037	< 0.000010	< 0.000010	1.7	0.13
2015	Q1	EV_MC2	0.024	0.022	< 0.000010	< 0.000010	5.7	0.19
2015	Q2	EV_MC2	0.0052	0.005	< 0.000010	0.000017	2.1	0.1
2015	Q3	EV_MC2	0.023	0.023	< 0.000010	< 0.000010	4.6	0.21
2015	Q4	EV_MC2	0.024	0.025	< 0.000010	< 0.000010	4.8	0.23
2015	Q2	FR_FRCP1	0.03	0.03	< 0.000010	< 0.000010	1.2	0.11
2015	Q3	FR_FRCP1	0.057	0.057	< 0.000010	< 0.000010	1.6	0.13
2015	Q1	GH_ERC	0.0019	0.0019	< 0.000010	< 0.000010	0.95	0.2
2015	Q2	GH_ERC	0.0017	0.0018	< 0.000010	< 0.000010	0.97	0.21
2015	Q3	GH_ERC	0.0011	0.0012	< 0.000010	< 0.000010	0.74	0.19
2015	Q4	GH_ERC	0.0015	0.0016	< 0.000010	< 0.000010	0.94	0.22
2015	Q1	GH_FR1	0.051	0.052	< 0.000010	< 0.000010	2.4	0.16
2015	Q2	GH_FR1	0.031	0.032	< 0.000010	< 0.000010	1.7	0.12
2015	Q3	GH_FR1	0.035	0.036	< 0.000010	< 0.000010	1.8	0.13
2015	Q4	GH_FR1	0.04	0.039	< 0.000010	< 0.000010	2.2	0.14
2015	Q1	LC_LCDSSLCC	0.072	0.071	< 0.000010	< 0.000010	5.9	0.23
2015	Q3	LC_LCDSSLCC	0.037	0.04	< 0.000010	< 0.000010	3.9	0.16
2015	Q4	LC_LCDSSLCC	0.052	0.054	< 0.000050	< 0.000050	6.2	0.21
2016	Q1	EV_HC1	0.04	0.037	< 0.000010	< 0.000010	1.7	0.13
2016	Q3	EV_HC1	0.031	0.032	< 0.000010	< 0.000010	1.6	0.12
2016	Q4	EV_HC1	0.032	0.032	< 0.000010	< 0.000010	1.9	0.13
2016	Q1	EV_MC2	0.022	0.021	< 0.000010	< 0.000010	4.9	0.2
2016	Q3	EV_MC2	0.026	0.026	< 0.000010	< 0.000010	6.6	0.23
2016	Q1	GH_ERC	0.0023	0.0023	< 0.000010	< 0.000010	1.0	0.24
2016	Q3	GH_ERC	0.00098	0.0010	< 0.000010	< 0.000010	0.7	0.21
2016	Q4	GH_ERC	0.0014	0.0014	< 0.000010	< 0.000010	0.85	0.25
2016	Q1	GH_FR1	0.052	0.05	< 0.000010	< 0.000010	2.1	0.16
2016	Q3	GH_FR1	0.034	0.037	< 0.000010	< 0.000010	1.9	0.13
2016	Q4	GH_FR1	0.041	0.039	< 0.00001	< 0.00001	2.0	0.14
2016	Q1	LC_LCDSSLCC	0.036	0.035	< 0.000010	< 0.000010	6.9	0.23
2016	Q3	LC_LCDSSLCC	0.027	0.027	< 0.000010	< 0.000010	5.1	0.2
2016	Q4	LC_LCDSSLCC	0.024	0.023	< 0.000010	< 0.000010	4.2	0.18
2017	Q1	EV_HC1	0.036	0.038	< 0.00001	< 0.00001	1.7	0.13
2017	Q3	EV_HC1	0.033	0.035	< 0.00001	< 0.00001	1.4	0.12
2017	Q4	EV_HC1	0.041	0.037	< 0.00001	< 0.00001	1.5	0.13
2017	Q2	EV_MC2	0.0072	0.0064	< 0.00001	< 0.00001	3.4	0.15
2017	Q3	EV_MC2	0.012	0.013	< 0.00001	< 0.00001	4.0	0.19
2017	Q4	EV_MC2	0.019	0.018	< 0.00001	< 0.00001	4.8	0.18
2017	Q1	GH_ERC	0.0018	0.0017	< 0.00001	< 0.00001	1.0	0.21
2017	Q2	GH_ERC	0.0024	0.0023	< 0.00001	< 0.00001	1.1	0.22
2017	Q3	GH_ERC	0.0013	0.0012	< 0.00001	< 0.00001	0.72	0.19
2017	Q4	GH_ERC	0.0014	0.0012	< 0.00001	< 0.00001	0.84	0.21
2017	Q1	GH_FR1	0.057	0.051	< 0.00001	< 0.00001	2.2	0.16
2017	Q2	GH_FR1	0.043	0.041	< 0.00001	0.000021	2.2	0.13
2017	Q4	GH_FR1	0.067	0.057	< 0.00001	< 0.00001	2.3	0.16
2017	Q2	LC_LCDSSLCC	0.046	0.041	< 0.00001	< 0.00001	7.3	0.23
2017	Q3	LC_LCDSSLCC	0.041	0.036	< 0.00001	< 0.00001	5.4	0.19
2017	Q4	LC_LCDSSLCC	0.042	0.037	< 0.00001	< 0.00001	6.4	0.21
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.0043	0.0043	< 0.000010	< 0.000010	4.5	0.16
2015	Q4	CM_MC2	0.006	0.0058	< 0.000010	< 0.000010	11	0.3
2015	Q1	FR_FRCP1	0.49	0.5	< 0.000020	< 0.000020	2.1	0.22
2015	Q4	FR_FRCP1	0.078	0.076	< 0.000010	< 0.000010	2.0	0.16
2015	Q2	LC_LCDSSLCC	0.025	0.025	< 0.000010	< 0.000010	2.9	0.13
2016	Q1	CM_MC2	0.0054	0.0058	< 0.000010	< 0.000010	13	0.33
2016	Q2	CM_MC2	0.0062	0.0057	< 0.000010	< 0.000010	5.5	0.18
2016	Q3	CM_MC2	0.0059	0.006	< 0.000010	< 0.000010	11	0.32
2016	Q4	CM_MC2	0.0041	0.0044	< 0.000010	< 0.000010	6.7	0.22
2016	Q2	EV_HC1	0.031	0.031	< 0.000010	< 0.000010	1.3	0.096
2016	Q2	EV_MC2	0.0036	0.0033	< 0.000010	0.000017	1.7	0.088
2016	Q4	EV_MC2	0.0054	0.006	< 0.000010	< 0.000010	2.7	0.11
2016	Q1	FR_FRCP1	0.21	0.21	< 0.000010	< 0.000010	2.2	0.2
2016	Q2	FR_FRCP1	0.032	0.032	< 0.000010	< 0.000010	1.1	0.097
2016	Q3	FR_FRCP1	0.054	0.056	< 0.000010	< 0.000010	1.6	0.14
2016	Q4	FR_FRCP1	0.054	0.051	< 0.000010	< 0.000010	1.5	0.14
2016	Q2	GH_ERC	0.0023	0.002	< 0.000010	< 0.000010	0.94	0.21
2016	Q2	GH_FR1	0.028	0.029	< 0.000010	< 0.000010	1.4	0.11
2016	Q2	LC_LCDSSLCC	0.018	0.019	< 0.000010	< 0.000010	3.6	0.13
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	0.0079	0.0072	< 0.00001	< 0.00001	15	0.39
2017	Q2	CM_MC2	0.0056	0.0048	< 0.00001	< 0.00001	11	0.35
2017	Q2	CM_MC2	0.0058	0.0061	< 0.00001	< 0.00001	18	0.36
2017	Q3	CM_MC2	0.0078	0.0075	< 0.00001	< 0.00001	11	0.35
2017	Q4	CM_MC2	0.0092	0.0087	< 0.00001	< 0.00001	14	0.41
2017	Q2	EV_HC1	0.035	0.03	< 0.00001	< 0.00001	1.5	0.11
2017	Q1	EV_MC2	0.016	0.016	< 0.00001	< 0.00001	5.9	0.2
2017	Q1	FR_FRCP1	0.17	0.15	< 0.00001	< 0.00001	2.3	0.19
2017	Q2	FR_FRCP1	0.058	0.051	< 0.00001	0.000025	1.3	0.13
2017	Q3	FR_FRCP1	0.065	0.063	< 0.00001	< 0.00001	1.5	0.13
2017	Q4	FR_FRCP1	0.14	0.12	< 0.00001	< 0.00001	2.0	0.17
2017	Q3	GH_FR1	0.047	0.044	< 0.00001	< 0.00001	1.9	0.13
2017	Q1	LC_LCDSSLCC	0.034	0.036	< 0.00001	< 0.00001	7.4	0.23

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia 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
<b>Reference</b>									
2015	Q1	Reference (FR_UFR1)	0.091	47	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	Reference (FR_UFR1)	0.091	47	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	Reference (FR_UFR1)	0.092	46	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q2	Reference (FR_UFR1)	0.066	15	< 0.000010	0.00001	< 0.00010	< 0.00010	< 0.010
2015	Q3	Reference (FR_UFR1)	0.093	32	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q4	Reference (FR_UFR1)	0.091	48	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q2	Reference (GH_ER2)	0.21	18	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q4	Reference (GH_ER2)	0.22	22	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q1	Reference (FR_UFR1)	0.09	50	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.011
2016	Q2	Reference (FR_UFR1)	0.065	13	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q3	Reference (FR_UFR1)	0.098	35	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	Reference (FR_UFR1)	0.095	40	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q2	Reference (GH_ER2)	0.2	17	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	Reference (GH_ER2)	0.24	23	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2017	Q2	Reference (CM_MC1)	0.14	11	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q3	Reference (CM_MC1)	0.13	13	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	Reference (CM_MC1)	0.16	13	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q1	Reference (FR_UFR1)	0.097	45	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	Reference (FR_UFR1)	0.062	22	< 0.00001	< 0.00001	0.00011	< 0.0001	< 0.01
2017	Q3	Reference (FR_UFR1)	0.09	32	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	Reference (FR_UFR1)	0.095	44	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	Reference (GH_ER2)	0.21	21	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q3	Reference (GH_ER2)	0.19	15	< 0.00001	< 0.00001	0.00011	< 0.0001	< 0.01
2017	Q4	Reference (GH_ER2)	0.21	18	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
<b>Tests categorized as no adverse response</b>									
2015	Q1	CM_MC2	0.3	249	0.000014	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q3	CM_MC2	0.29	249	0.000014	0.000019	< 0.00010	< 0.00010	< 0.010
2015	Q1	EV_HC1	0.087	130	0.00001	0.00001	0.0001	0.0001	0.011
2015	Q2	EV_HC1	0.061	79	0.00001	0.00001	0.0001	0.0001	0.01
2015	Q3	EV_HC1	0.11	165	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q4	EV_HC1	0.13	218	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	EV_MC2	0.2	147	< 0.000010	< 0.000010	0.00018	< 0.00010	0.014
2015	Q2	EV_MC2	0.093	41	0.000011	0.000025	< 0.00010	< 0.00010	< 0.010
2015	Q3	EV_MC2	0.21	169	0.000013	0.000014	< 0.00010	< 0.00010	< 0.010
2015	Q4	EV_MC2	0.23	183	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q2	FR_FRCP1	0.11	126	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q3	FR_FRCP1	0.13	234	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	GH_ERC	0.21	30	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q2	GH_ERC	0.21	25	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q3	GH_ERC	0.2	20	< 0.000010	< 0.000010	< 0.00010	0.00016	< 0.010
2015	Q4	GH_ERC	0.23	37	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	GH_FR1	0.16	233	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.011
2015	Q2	GH_FR1	0.12	136	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q3	GH_FR1	0.13	154	< 0.000010	< 0.000010	< 0.00010	< 0.00015	< 0.010
2015	Q4	GH_FR1	0.15	189	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	LC_LCDSSLCC	0.23	283	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.014
2015	Q3	LC_LCDSSLCC	0.17	157	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q4	LC_LCDSSLCC	0.22	237	< 0.000050	< 0.000050	< 0.00050	< 0.00050	< 0.010
2016	Q1	EV_HC1	0.13	222	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.015
2016	Q3	EV_HC1	0.12	176	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	EV_HC1	0.13	193	< 0.000010	0.00001	< 0.00010	< 0.00010	< 0.010
2016	Q1	EV_MC2	0.21	174	< 0.000010	0.00001	< 0.00010	< 0.00010	0.015
2016	Q3	EV_MC2	0.24	214	0.000011	0.000012	< 0.00010	< 0.00010	< 0.010
2016	Q1	GH_ERC	0.24	61	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.012
2016	Q3	GH_ERC	0.2	26	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	GH_ERC	0.24	32	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q1	GH_FR1	0.16	247	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.017
2016	Q3	GH_FR1	0.14	168	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	GH_FR1	0.14	196	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2016	Q1	LC_LCDSSLCC	0.24	303	< 0.000010	< 0.000010	< 0.00010	< 0.00010	0.017
2016	Q3	LC_LCDSSLCC	0.19	187	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	LC_LCDSSLCC	0.17	176	0.00001	< 0.000010	< 0.00010	< 0.00010	< 0.010
2017	Q1	EV_HC1	0.13	204	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q3	EV_HC1	0.12	161	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	EV_HC1	0.13	189	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	EV_MC2	0.14	68	< 0.00001	0.000011	< 0.0001	< 0.0001	< 0.01
2017	Q3	EV_MC2	0.18	116	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	EV_MC2	0.2	133	< 0.00001	< 0.00001	< 0.0001	0.00014	< 0.01
2017	Q1	GH_ERC	0.22	38	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	GH_ERC	0.23	36	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q3	GH_ERC	0.19	21	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	GH_ERC	0.21	23	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q1	GH_FR1	0.16	232	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	GH_FR1	0.14	170	< 0.00001	0.000025	< 0.0001	< 0.0001	< 0.01
2017	Q4	GH_FR1	0.15	232	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q2	LC_LCDSSLCC	0.22	254	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q3	LC_LCDSSLCC	0.19	206	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
2017	Q4	LC_LCDSSLCC	0.21	245	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01
<b>Test categorized as possible or likely response (2015 to 2016)</b>									
2015	Q2	CM_MC2	0.17	110	0.000011	0.000018	< 0.00010	< 0.00010	< 0.010
2015	Q4	CM_MC2	0.3	277	0.000011	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q1	FR_FRCP1	0.23	1460	0.00003	0.000032	< 0.00020	< 0.00020	0.017
2015	Q4	FR_FRCP1	0.16	327	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2015	Q2	LC_LCDSSLCC	0.13	107	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q1	CM_MC2	0.32	291	0.00001	0.000018	< 0.00010	< 0.00010	< 0.010
2016	Q2	CM_MC2	0.18	131	0.00001	0.00002	< 0.00010	< 0.00010	< 0.010
2016	Q3	CM_MC2	0.34	277	0.000017	0.000014	< 0.00010	< 0.00010	< 0.010
2016	Q4	CM_MC2	0.22	178	0.00001	0.000017	< 0.00010	< 0.00010	< 0.010
2016	Q2	EV_HC1	0.099	120	< 0.000010	0.000014	< 0.00010	< 0.00010	0.013
2016	Q2	EV_MC2	0.092	36	< 0.000010	0.000023	< 0.00010	< 0.00010	< 0.010
2016	Q4	EV_MC2	0.12	63	< 0.000010	0.000015	< 0.00010	< 0.00010	< 0.010
2016	Q1	FR_FRCP1	0.2	765	0.000016	0.000015	< 0.00010	< 0.00010	0.021
2016	Q2	FR_FRCP1	0.1	116	< 0.000010	0.000013	< 0.00010	< 0.00010	< 0.010
2016	Q3	FR_FRCP1	0.14	249	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q4	FR_FRCP1	0.14	245	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q2	GH_ERC	0.2	33	< 0.000010	0.000014	< 0.00010	< 0.00010	< 0.010
2016	Q2	GH_FR1	0.1	121	< 0.000010	< 0.000010	< 0.00010	< 0.00010	< 0.010
2016	Q2	LC_LCDSSLCC	0.13	110	0.00001	< 0.000010	< 0.00010	< 0.00010	0.011
<b>Tests categorized as possible or likely response (2017)</b>									
2017	Q1	CM_MC2	0.41	319	0.000014	0.000016	< 0.0001	< 0.0001	< 0.01
2017	Q2	CM_MC2	0.33	236	0.000014	0.000022	< 0.0001	< 0.0001	< 0.01
2017	Q2	CM_MC2	0.44	237	0.000015	0.00004	< 0.0001	< 0.0001	< 0.01
2017	Q3	CM_MC2	0.35	280	0.000017	0.000019	< 0.0001	< 0.0001	< 0.01
2017	Q4	CM_MC2	0.44	331	0.000016	0.000016	< 0.0001	< 0.0001	< 0.01
2017	Q2	EV_HC1	0.11	147	< 0.00001	0.000017	< 0.0001	< 0.0001	<

### Appendix D: Concentration-Response Analysis

**Table D-1: C. dubia 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
<b>Reference</b>										
2015	Q1	Reference (FR_UFR1)	< 0.010	229	< 0.050	0.69	< 1.0	0.13	0.00047	0.00047
2015	Q1	Reference (FR_UFR1)	< 0.010	229	< 0.050	0.69	< 1.0	0.13	0.00047	0.00047
2015	Q1	Reference (FR_UFR1)	< 0.010	222	< 0.050	< 0.50	< 1.0	0.33	0.00047	0.00047
2015	Q2	Reference (FR_UFR1)	< 0.010	147	0.1	2.1	2.4	1.5	0.00031	0.00033
2015	Q3	Reference (FR_UFR1)	< 0.010	211	0.08	1.0	1.1	0.2	0.00042	0.00042
2015	Q4	Reference (FR_UFR1)	< 0.010	215	0.095	0.6	< 1.0	0.26	0.00047	0.00044
2015	Q2	Reference (GH_ER2)	< 0.010	191	0.067	1.8	4.4	3.9	0.00079	0.00078
2015	Q4	Reference (GH_ER2)	< 0.010	171	< 0.050	< 0.50	< 1.0	0.26	0.00071	0.00072
2016	Q1	Reference (FR_UFR1)	0.011	244	< 0.050	< 0.50	< 1.0	0.17	0.0005	0.00049
2016	Q2	Reference (FR_UFR1)	< 0.010	135	0.086	2.8	1.9	1.6	0.00032	0.00033
2016	Q3	Reference (FR_UFR1)	< 0.010	222	0.077	0.92	1.2	0.22	0.00042	0.00044
2016	Q4	Reference (FR_UFR1)	< 0.010	204	0.069	1.1	< 1.0	0.85	0.00044	0.00046
2016	Q2	Reference (GH_ER2)	< 0.010	174	0.077	2.2	15	4.7	0.00076	0.00079
2016	Q4	Reference (GH_ER2)	< 0.010	167	< 0.050	0.62	< 1.0	0.38	0.00076	0.00079
2017	Q2	Reference (CM_MC1)	< 0.01	148	0.098	1.9	< 1	0.41	0.00018	0.0002
2017	Q3	Reference (CM_MC1)	< 0.01	162	0.1	1.2	< 1	0.37	0.0002	0.00019
2017	Q4	Reference (CM_MC1)	< 0.01	166	< 0.2	1.4	2.4	1.3	0.00023	0.00023
2017	Q1	Reference (FR_UFR1)	< 0.01	194	< 0.05	1.0	< 1	0.25	0.00046	0.00048
2017	Q2	Reference (FR_UFR1)	< 0.01	143	0.18	3.7	4.4	4.7	0.00035	0.00034
2017	Q3	Reference (FR_UFR1)	< 0.01	164	0.078	2.7	1.1	0.36	0.00037	0.00038
2017	Q4	Reference (FR_UFR1)	< 0.01	221	< 0.05	1.0	1.2	0.45	0.00051	0.00045
2017	Q2	Reference (GH_ER2)	< 0.01	180	0.068	1.1	6.2	3.8	0.00079	0.00079
2017	Q3	Reference (GH_ER2)	< 0.01	148	0.12	0.91	1.4	0.81	0.00053	0.00058
2017	Q4	Reference (GH_ER2)	< 0.01	174	< 0.05	0.91	< 1	0.38	0.00077	0.00072
<b>Tests categorized as no adverse response</b>										
2015	Q1	CM_MC2	< 0.010	551	< 0.050	0.82	1.7	0.53	0.0022	0.0023
2015	Q3	CM_MC2	< 0.010	626	0.1	0.75	1.2	0.61	0.0024	0.0025
2015	Q1	EV_HC1	0.011	325	0.05	0.84	1.0	0.24	0.0017	0.0017
2015	Q2	EV_HC1	0.01	233	0.13	1.4	2.6	1.2	0.0012	0.0012
2015	Q3	EV_HC1	< 0.010	479	0.073	1.6	2.3	0.77	0.0023	0.0023
2015	Q4	EV_HC1	< 0.010	529	0.096	0.74	< 1	0.29	0.0026	0.0027
2015	Q1	EV_MC2	0.013	438	0.13	1.2	1.2	0.31	0.0013	0.0012
2015	Q2	EV_MC2	< 0.010	195	0.28	2.5	23	4.7	0.00051	0.00048
2015	Q3	EV_MC2	< 0.010	477	0.16	0.83	1.2	0.34	0.0019	0.0019
2015	Q4	EV_MC2	< 0.010	492	0.14	0.7	1.0	0.36	0.0019	0.0019
2015	Q2	FR_FRCP1	< 0.010	372	< 0.050	2.2	7.7	2.0	0.0015	0.0016
2015	Q3	FR_FRCP1	< 0.010	566	0.14	0.93	2.6	0.47	0.0027	0.0028
2015	Q1	GH_ERC	< 0.010	203	< 0.050	0.5	2.6	0.41	0.00081	0.00084
2015	Q2	GH_ERC	< 0.010	203	0.12	1.3	7.0	1.6	0.00083	0.00084
2015	Q3	GH_ERC	< 0.010	179	< 0.050	0.79	5.1	1.3	0.00065	0.00071
2015	Q4	GH_ERC	< 0.010	214	< 0.050	0.52	< 1	0.26	0.00077	0.00081
2015	Q1	GH_FR1	0.011	621	< 0.050	1.1	< 1	0.18	0.0022	0.0022
2015	Q2	GH_FR1	< 0.010	398	< 0.050	1.6	3.6	2.2	0.0016	0.0016
2015	Q3	GH_FR1	< 0.010	473	< 0.050	0.86	1.2	0.33	0.0018	0.0018
2015	Q4	GH_FR1	< 0.010	520	0.091	0.57	< 1	0.3	0.0019	0.0019
2015	Q1	LC_LCDSSLCC	0.013	690	< 0.050	0.9	< 1	0.29	0.0039	0.004
2015	Q3	LC_LCDSSLCC	< 0.010	447	0.12	0.64	1.4	0.35	0.0026	0.0028
2015	Q4	LC_LCDSSLCC	< 0.010	565	< 0.050	0.99	< 1.0	0.29	0.0038	0.004
2016	Q1	EV_HC1	0.015	504	0.081	1.0	< 1.0	0.25	0.0027	0.0028
2016	Q3	EV_HC1	< 0.010	496	0.096	1.5	2.7	2.6	0.0023	0.0023
2016	Q4	EV_HC1	< 0.010	480	0.1	1.7	1.8	2.3	0.0026	0.0026
2016	Q1	EV_MC2	0.016	482	0.11	0.77	< 1.0	0.77	0.0017	0.0017
2016	Q3	EV_MC2	< 0.010	570	0.14	0.96	< 1.0	0.3	0.0015	0.0015
2016	Q1	GH_ERC	0.012	256	< 0.050	< 0.50	< 1.0	0.24	0.00099	0.00095
2016	Q3	GH_ERC	< 0.010	195	0.055	0.65	< 1.0	1.1	0.0007	0.00067
2016	Q4	GH_ERC	< 0.010	203	< 0.050	0.8	3.4	1.2	0.00089	0.00084
2016	Q1	GH_FR1	0.017	622	< 0.050	0.71	< 1.0	0.35	0.0022	0.0022
2016	Q3	GH_FR1	< 0.010	477	0.15	1.3	< 1.0	0.43	0.002	0.002
2016	Q4	GH_FR1	< 0.01	517	0.13	1.1	< 2	0.49	0.0021	0.0022
2016	Q1	LC_LCDSSLCC	0.018	713	0.07	< 0.50	< 1.0	0.35	0.0039	0.0039
2016	Q3	LC_LCDSSLCC	< 0.010	508	< 0.050	0.52	< 1.0	0.28	0.0029	0.0024
2016	Q4	LC_LCDSSLCC	< 0.010	487	0.13	0.91	< 1.0	0.39	0.0032	0.0031
2017	Q1	EV_HC1	< 0.01	492	0.081	0.89	< 1	0.4	0.0027	0.0027
2017	Q3	EV_HC1	< 0.01	436	0.069	1.0	< 1	0.31	0.0021	0.0021
2017	Q4	EV_HC1	< 0.01	474	< 0.2	0.97	< 1	0.31	0.0022	0.0025
2017	Q2	EV_MC2	< 0.01	222	0.31	3.3	20	11	0.00078	0.00073
2017	Q3	EV_MC2	< 0.01	362	0.29	1.7	1.7	0.45	0.0012	0.0012
2017	Q4	EV_MC2	< 0.01	420	< 0.2	0.9	1.6	1.2	0.001	0.0012
2017	Q1	GH_ERC	< 0.01	223	< 0.05	< 0.5	< 1	0.13	0.00085	0.00083
2017	Q2	GH_ERC	< 0.01	210	0.074	1.1	6.8	2.5	0.00094	0.00098
2017	Q3	GH_ERC	< 0.01	160	0.076	0.83	4.0	1.7	0.00058	0.00064
2017	Q4	GH_ERC	< 0.01	193	< 0.05	0.96	< 1	0.56	0.00087	0.00079
2017	Q1	GH_FR1	< 0.01	618	0.1	0.63	< 1	0.47	0.0024	0.0023
2017	Q2	GH_FR1	< 0.015	497	0.39	5.9	15	25	0.0024	0.0024
2017	Q4	GH_FR1	< 0.01	586	0.53	1.9	1.1	0.77	0.0027	0.0025
2017	Q2	LC_LCDSSLCC	< 0.01	676	0.69	1.3	2.3	1.2	0.0033	0.0036
2017	Q3	LC_LCDSSLCC	< 0.01	531	0.66	1.3	< 1	0.43	0.0028	0.0028
2017	Q4	LC_LCDSSLCC	< 0.01	651	0.51	0.94	< 1	0.28	0.0038	0.0038
<b>Test categorized as possible or likely response (2015 to 2016)</b>										
2015	Q2	CM_MC2	0.011	314	0.12	1.8	9.6	5.8	0.0011	0.0011
2015	Q4	CM_MC2	< 0.010	627	0.11	0.83	6.6	0.99	0.0022	0.0022
2015	Q1	FR_FRCP1	0.017	2580	< 0.050	1.5	< 1	0.12	0.0015	0.0016
2015	Q4	FR_FRCP1	< 0.010	765	< 0.050	0.81	< 1	0.29	0.0038	0.0037
2015	Q2	LC_LCDSSLCC	< 0.010	337	< 0.050	1.5	1.6	0.48	0.002	0.002
2016	Q1	CM_MC2	< 0.010	639	0.095	0.69	< 1.0	0.57	0.0026	0.0024
2016	Q2	CM_MC2	0.012	401	0.2	2.2	15	6.5	0.0013	0.0012
2016	Q3	CM_MC2	< 0.010	644	0.13	1.2	1.5	0.37	0.0026	0.0027
2016	Q4	CM_MC2	< 0.010	451	0.15	2.4	9.1	3.8	0.0017	0.0017
2016	Q2	EV_HC1	0.015	378	0.19	2.5	5.9	3.1	0.002	0.0021
2016	Q2	EV_MC2	0.015	165	0.2	3.3	25	11	0.00052	0.00058
2016	Q4	EV_MC2	< 0.010	228	0.2	3.4	6.8	5.5	0.00062	0.00066
2016	Q1	FR_FRCP1	0.021	1520	< 0.050	0.95	< 1.0	0.28	0.0079	0.008
2016	Q2	FR_FRCP1	< 0.010	354	0.21	2.9	7.1	1.5	0.0016	0.0017
2016	Q3	FR_FRCP1	< 0.010	611	0.17	1.3	1.4	0.36	0.003	0.003
2016	Q4	FR_FRCP1	< 0.010	608	0.14	1.1	< 1.0	0.84	0.003	0.003
2016	Q2	GH_ERC	< 0.010	191	0.19	2.2	23	5.7	0.00085	0.00085
2016	Q2	GH_FR1	< 0.010	366	0.2	2.0	7.1	3.0	0.0015	0.0015
2016	Q2	LC_LCDSSLCC	0.012	352	0.18	1.8	< 1.0	0.94	0.0022	0.0023
<b>Tests categorized as possible or likely response (2017)</b>										
2017	Q1	CM_MC2	< 0.01	733	0.08	1.0	1.1	0.55	0.0031	0.0033
2017	Q2	CM_MC2	< 0.01	541	0.3	2.3	9.0	6.9	0.0022	0.0021
2017	Q2	CM_MC2	< 0.01	544	0.24	1.6	4.4	2.3	0.0022	0.0027
2017	Q3	CM_MC2	< 0.01	558	0.27	0.99	2.4	1.0	0.0023	0.0024
2017	Q4	CM_MC2	< 0.01	793	0.27	1.1	5.2	2.2	0.0034	0.0035
2017	Q2	EV_HC1	< 0.01	398	0.22	3.1	4.2	3.4	0.0022	0.0023
2017	Q1	EV_MC2	< 0.01	429	0.11	0.73	< 1	0.7	0.0016	0.0016
2017	Q1	FR_FRCP1	< 0.01	1140	< 0.05	1.5	1.2	0.44	0.0059	0.006
2017	Q2	FR_FRCP1	< 0.01	496	0.67	3.2	17	23	0.0024	0.0025
2017	Q3	FR_FRCP1	< 0.01	587	0.85	3.4	1.8	0.47	0.0027	0.0027
2017	Q4	FR_FRCP1	< 0.01	980	0.57	0.84	< 1	0.7	0.0055	0.0054
2017	Q3	GH_FR1	< 0.01	502	0.62	0.99	1.2	0.54	0.0019	0.002
2017	Q1	LC_LCDSSLCC	< 0.01	707	0.12	0.71	1.4	0.36	0.0039	0.0041

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N

### Appendix D: Concentration-Response Analysis

**Table D-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l	ZINC-T-mg/l	ΣTU-WQGs	ΣTU-WQGs/Benchmarks
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0010	< 0.0030	< 0.0030	-	-
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0010	< 0.0030	< 0.0030	-	-
2015	Q1	Reference (FR_UFR1)	< 0.0010	< 0.0010	< 0.0030	< 0.0030	-	-
2015	Q2	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q3	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q4	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q2	Reference (GH_ER2)	< 0.00050	0.00051	< 0.0030	< 0.0030	-	-
2015	Q4	Reference (GH_ER2)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q1	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	Reference (FR_UFR1)	< 0.00050	0.00051	< 0.0030	< 0.0030	-	-
2016	Q3	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	Reference (FR_UFR1)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	Reference (GH_ER2)	< 0.00050	0.001	< 0.0030	< 0.0030	-	-
2016	Q4	Reference (GH_ER2)	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2017	Q2	Reference (CM_MC1)	< 0.0005	< 0.0005	< 0.001	< 0.003	1.3	1.2
2017	Q3	Reference (CM_MC1)	< 0.0005	< 0.0005	< 0.001	< 0.003	1.4	1.2
2017	Q4	Reference (CM_MC1)	< 0.0005	< 0.0005	< 0.003	< 0.003	1.2	1.1
2017	Q1	Reference (FR_UFR1)	< 0.0005	< 0.0005	< 0.001	< 0.003	1.6	1.1
2017	Q2	Reference (FR_UFR1)	0.00053	0.001	0.0013	< 0.003	4.0	3.6
2017	Q3	Reference (FR_UFR1)	< 0.0005	< 0.0005	< 0.001	< 0.003	1.6	1.2
2017	Q4	Reference (FR_UFR1)	< 0.0005	< 0.0005	< 0.003	< 0.003	1.4	1.1
2017	Q2	Reference (GH_ER2)	< 0.0005	0.00061	< 0.003	< 0.003	2.0	1.5
2017	Q3	Reference (GH_ER2)	< 0.0005	< 0.0005	< 0.001	< 0.003	1.6	1.2
2017	Q4	Reference (GH_ER2)	< 0.0005	< 0.0005	< 0.003	< 0.003	1.7	1.2
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	< 0.0010	< 0.0010	< 0.0030	0.0032	-	-
2015	Q3	CM_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	EV_HC1	0.001	0.001	0.003	0.003	-	-
2015	Q2	EV_HC1	0.0005	0.0005	0.003	0.003	-	-
2015	Q3	EV_HC1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q4	EV_HC1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	EV_MC2	< 0.0010	< 0.0010	0.0041	< 0.0030	-	-
2015	Q2	EV_MC2	< 0.00050	0.0016	< 0.0030	0.0041	-	-
2015	Q3	EV_MC2	< 0.00050	< 0.00050	< 0.0030	0.0031	-	-
2015	Q4	EV_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q2	FR_FRCP1	< 0.00050	0.00054	< 0.0030	< 0.0030	-	-
2015	Q3	FR_FRCP1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	GH_ERC	< 0.0010	< 0.0010	< 0.0030	0.0041	-	-
2015	Q2	GH_ERC	< 0.00050	0.0007	< 0.0030	< 0.0030	-	-
2015	Q3	GH_ERC	< 0.00050	0.00058	< 0.0030	< 0.0030	-	-
2015	Q4	GH_ERC	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	GH_FR1	< 0.0010	< 0.0010	< 0.0030	< 0.0030	-	-
2015	Q2	GH_FR1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q3	GH_FR1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q4	GH_FR1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	LC_LCDSSLCC	< 0.0010	< 0.0010	0.0038	0.0039	-	-
2015	Q3	LC_LCDSSLCC	< 0.00050	< 0.00050	0.0092	0.011	-	-
2015	Q4	LC_LCDSSLCC	< 0.0025	< 0.0025	0.0081	< 0.015	-	-
2016	Q1	EV_HC1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q3	EV_HC1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	EV_HC1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q1	EV_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q3	EV_MC2	< 0.00050	< 0.00050	< 0.0030	0.0031	-	-
2016	Q1	GH_ERC	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q3	GH_ERC	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	GH_ERC	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q1	GH_FR1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q3	GH_FR1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	GH_FR1	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-
2016	Q1	LC_LCDSSLCC	< 0.00050	< 0.00050	< 0.0030	0.0034	-	-
2016	Q3	LC_LCDSSLCC	< 0.00050	< 0.00050	0.0089	0.0075	-	-
2016	Q4	LC_LCDSSLCC	< 0.00050	< 0.00050	0.0061	0.0078	-	-
2017	Q1	EV_HC1	< 0.0005	< 0.0005	< 0.003	< 0.003	22	4.1
2017	Q3	EV_HC1	< 0.0005	< 0.0005	< 0.003	< 0.003	20	3.6
2017	Q4	EV_HC1	< 0.0005	< 0.0005	< 0.003	< 0.003	20	3.6
2017	Q2	EV_MC2	< 0.0005	0.00096	0.0011	< 0.003	6.1	2.9
2017	Q3	EV_MC2	< 0.0005	< 0.0005	< 0.003	< 0.003	9.1	2.6
2017	Q4	EV_MC2	< 0.0005	< 0.0005	< 0.003	< 0.003	11	2.7
2017	Q1	GH_ERC	< 0.0005	< 0.0005	< 0.003	< 0.003	2.3	1.4
2017	Q2	GH_ERC	< 0.0005	0.0007	< 0.003	< 0.003	3.0	1.8
2017	Q3	GH_ERC	< 0.0005	< 0.0005	< 0.001	< 0.003	2.0	1.4
2017	Q4	GH_ERC	< 0.0005	< 0.0005	< 0.003	< 0.003	1.9	1.3
2017	Q1	GH_FR1	< 0.0005	< 0.0005	< 0.003	< 0.003	32	5.4
2017	Q2	GH_FR1	< 0.0005	0.0027	< 0.003	0.0072	28	7.7
2017	Q4	GH_FR1	< 0.0005	< 0.0005	< 0.003	< 0.003	34	5.7
2017	Q2	LC_LCDSSLCC	< 0.0005	< 0.0005	0.0084	0.012	29	6.0
2017	Q3	LC_LCDSSLCC	< 0.0005	< 0.0005	0.014	0.0098	25	5.5
2017	Q4	LC_LCDSSLCC	< 0.0005	< 0.0005	0.0056	0.0076	25	5.5
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	< 0.00050	0.00088	0.0031	0.0059	-	-
2015	Q4	CM_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q1	FR_FRCP1	< 0.0020	< 0.0020	< 0.0030	< 0.0060	-	-
2015	Q4	FR_FRCP1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2015	Q2	LC_LCDSSLCC	< 0.00050	< 0.00050	0.0061	0.0066	-	-
2016	Q1	CM_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	CM_MC2	< 0.00050	0.00085	0.0076	0.013	-	-
2016	Q3	CM_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	CM_MC2	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	EV_HC1	< 0.00050	0.00077	< 0.0030	< 0.0030	-	-
2016	Q2	EV_MC2	< 0.00050	0.0019	< 0.0030	0.0047	-	-
2016	Q4	EV_MC2	< 0.00050	0.0011	< 0.0030	< 0.0030	-	-
2016	Q1	FR_FRCP1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	FR_FRCP1	< 0.00050	0.00061	< 0.0030	0.0033	-	-
2016	Q3	FR_FRCP1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q4	FR_FRCP1	< 0.00050	< 0.00050	< 0.0030	< 0.0030	-	-
2016	Q2	GH_ERC	< 0.00050	0.0014	< 0.0030	0.0035	-	-
2016	Q2	GH_FR1	< 0.00050	0.0006	< 0.0030	< 0.0030	-	-
2016	Q2	LC_LCDSSLCC	< 0.00050	< 0.00050	0.0089	0.01	-	-
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	< 0.0005	< 0.0005	0.0041	0.004	13	8.5
2017	Q2	CM_MC2	< 0.0005	0.00077	0.005	0.0071	12	8.9
2017	Q2	CM_MC2	< 0.0005	< 0.0005	0.0041	0.0059	13	9.7
2017	Q3	CM_MC2	< 0.0005	< 0.0005	< 0.001	< 0.003	15	10
2017	Q4	CM_MC2	< 0.0005	< 0.0005	< 0.003	< 0.003	11	6.3
2017	Q2	EV_HC1	< 0.0005	0.00079	< 0.001	0.0044	17	3.7
2017	Q1	EV_MC2	< 0.0005	< 0.0005	< 0.003	< 0.003	11	3.3
2017	Q1	FR_FRCP1	< 0.0005	< 0.0005	0.0023	< 0.003	88	15
2017	Q2	FR_FRCP1	< 0.0005	0.0032	0.002	0.0098	35	8.3
2017	Q3	FR_FRCP1	< 0.0005	< 0.0005	< 0.001	< 0.003	37	6.6
2017	Q4	FR_FRCP1	< 0.0005	< 0.0005	< 0.003	< 0.003	70	11
2017	Q3	GH_FR1	< 0.0005	< 0.0005	< 0.001	< 0.003	28	5.2
2017	Q1	LC_LCDSSLCC	< 0.0005	< 0.0005	0.0034	0.0042	25	5.4

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-1: C. dubia Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	PCA Factor 1 (2015 to 2017)	PCA Factor 2 (2015 to 2017)	PCA Factor 3 (2015 to 2017)	PCA Factor 1 (2017)	PCA Factor 2 (2017)	PCA Factor 3 (2017)
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	-5.6	-2.0	-5.4	-	-	-
2015	Q1	Reference (FR_UFR1)	-5.6	-2.0	-5.4	-	-	-
2015	Q1	Reference (FR_UFR1)	-5.5	-2.1	-5.1	-	-	-
2015	Q2	Reference (FR_UFR1)	-8.0	2.1	-0.3	-	-	-
2015	Q3	Reference (FR_UFR1)	-5.7	-1.8	-1.8	-	-	-
2015	Q4	Reference (FR_UFR1)	-6.0	-2.5	-2.4	-	-	-
2015	Q2	Reference (GH_ER2)	-5.3	1.2	-0.33	-	-	-
2015	Q4	Reference (GH_ER2)	-5.2	-2.0	-2.3	-	-	-
2016	Q1	Reference (FR_UFR1)	-5.8	-3.0	-2.4	-	-	-
2016	Q2	Reference (FR_UFR1)	-8.5	2.3	0.057	-	-	-
2016	Q3	Reference (FR_UFR1)	-6.1	-2.1	-0.62	-	-	-
2016	Q4	Reference (FR_UFR1)	-6.6	-0.84	-0.23	-	-	-
2016	Q2	Reference (GH_ER2)	-5.3	3.8	0.77	-	-	-
2016	Q4	Reference (GH_ER2)	-5.6	-2.0	-1.5	-	-	-
2017	Q2	Reference (CM_MC1)	-7.0	1.0	0.68	-6.7	1.1	-2.5
2017	Q3	Reference (CM_MC1)	-6.8	1.5	1.1	-6.4	1.4	-2.7
2017	Q4	Reference (CM_MC1)	-6.4	0.27	0.0077	-6.4	0.016	-2.3
2017	Q1	Reference (FR_UFR1)	-5.8	-2.6	-0.27	-6.0	-1.9	0.57
2017	Q2	Reference (FR_UFR1)	-7.8	7.5	0.2	-7.7	8.9	1.3
2017	Q3	Reference (FR_UFR1)	-6.6	-0.81	0.87	-6.3	-0.23	0.14
2017	Q4	Reference (FR_UFR1)	-6.3	-2.5	-0.84	-6.5	-2.0	0.49
2017	Q2	Reference (GH_ER2)	-5.2	0.73	0.47	-4.8	0.76	-1.1
2017	Q3	Reference (GH_ER2)	-6.0	-0.58	0.38	-6.1	-0.46	-2.0
2017	Q4	Reference (GH_ER2)	-5.4	-1.9	-0.87	-5.6	-2.1	-1.5
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	4.4	1.2	-2.5	-	-	-
2015	Q3	CM_MC2	4.2	0.026	-0.36	-	-	-
2015	Q1	EV_HC1	-2.6	-0.79	-4.1	-	-	-
2015	Q2	EV_HC1	-4.9	1.2	-0.16	-	-	-
2015	Q3	EV_HC1	-0.52	0.042	0.13	-	-	-
2015	Q4	EV_HC1	0.57	-2.7	-0.12	-	-	-
2015	Q1	EV_MC2	2.0	0.11	-4.4	-	-	-
2015	Q2	EV_MC2	-3.7	7.9	0.61	-	-	-
2015	Q3	EV_MC2	4.7	-0.93	0.094	-	-	-
2015	Q4	EV_MC2	4.6	-2.7	0.53	-	-	-
2015	Q2	FR_FRCP1	0.8	1.5	1.8	-	-	-
2015	Q3	FR_FRCP1	4.1	-1.7	0.84	-	-	-
2015	Q1	GH_ERC	-4.1	0.5	-4.5	-	-	-
2015	Q2	GH_ERC	-4.5	2.0	0.11	-	-	-
2015	Q3	GH_ERC	-5.1	1.2	-1.4	-	-	-
2015	Q4	GH_ERC	-4.4	-2.5	-2.4	-	-	-
2015	Q1	GH_FR1	2.9	-2.6	-3.6	-	-	-
2015	Q2	GH_FR1	0.54	-0.34	0.9	-	-	-
2015	Q3	GH_FR1	1.7	-1.9	-0.89	-	-	-
2015	Q4	GH_FR1	1.8	-4.0	-0.86	-	-	-
2015	Q1	LC_LCDSSLCC	5.2	-2.7	-4.1	-	-	-
2015	Q3	LC_LCDSSLCC	3.3	-2.1	-0.67	-	-	-
2015	Q4	LC_LCDSSLCC	12	14	-18	-	-	-
2016	Q1	EV_HC1	0.98	-2.6	-0.7	-	-	-
2016	Q3	EV_HC1	-0.36	0.93	2.2	-	-	-
2016	Q4	EV_HC1	0.16	-0.23	2.0	-	-	-
2016	Q1	EV_MC2	3.7	-2.3	0.16	-	-	-
2016	Q3	EV_MC2	4.2	-2.1	1.2	-	-	-
2016	Q1	GH_ERC	-3.6	-3.1	-3.0	-	-	-
2016	Q3	GH_ERC	-5.5	-1.5	-0.77	-	-	-
2016	Q4	GH_ERC	-4.7	-1.2	-0.86	-	-	-
2016	Q1	GH_FR1	2.5	-4.5	-1.7	-	-	-
2016	Q3	GH_FR1	1.4	-3.1	1.0	-	-	-
2016	Q4	GH_FR1	2.1	-2.8	0.81	-	-	-
2016	Q1	LC_LCDSSLCC	6.3	-3.9	-0.41	-	-	-
2016	Q3	LC_LCDSSLCC	4.3	-3.2	0.27	-	-	-
2016	Q4	LC_LCDSSLCC	3.8	-2.3	1.2	-	-	-
2017	Q1	EV_HC1	-0.19	-2.0	0.78	-0.63	-1.9	2.5
2017	Q3	EV_HC1	-0.53	-1.4	0.95	-0.91	-1.1	2.2
2017	Q4	EV_HC1	-0.77	-1.6	1.2	-1.1	-1.6	1.9
2017	Q2	EV_MC2	-2.1	6.3	3.8	-1.0	6.7	0.89
2017	Q3	EV_MC2	1.6	-1.5	1.9	1.3	-1.7	1.2
2017	Q4	EV_MC2	0.093	-1.1	0.88	-0.24	-1.7	0.66
2017	Q1	GH_ERC	-4.5	-3.2	-1.9	-5.0	-3.3	-0.59
2017	Q2	GH_ERC	-4.0	1.1	0.73	-3.5	1.1	-0.55
2017	Q3	GH_ERC	-5.4	0.28	1.2	-5.0	0.4	-1.6
2017	Q4	GH_ERC	-4.8	-2.1	-0.83	-5.1	-2.2	-0.96
2017	Q1	GH_FR1	1.9	-4.0	0.64	1.4	-3.6	3.0
2017	Q2	GH_FR1	3.8	9.1	2.8	5.2	11	4.6
2017	Q4	GH_FR1	1.9	-2.8	1.8	1.6	-2.7	2.7
2017	Q2	LC_LCDSSLCC	6.0	-1.4	2.6	5.8	-2.1	1.4
2017	Q3	LC_LCDSSLCC	5.0	-1.5	1.3	4.4	-2.9	2.0
2017	Q4	LC_LCDSSLCC	5.1	-1.9	1.5	4.5	-2.8	1.6
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	-0.13	5.9	1.5	-	-	-
2015	Q4	CM_MC2	3.2	-1.6	-0.68	-	-	-
2015	Q1	FR_FRCP1	15	3.5	-11	-	-	-
2015	Q4	FR_FRCP1	5.2	-3.2	0.2	-	-	-
2015	Q2	LC_LCDSSLCC	0.39	-0.74	-0.56	-	-	-
2016	Q1	CM_MC2	5.0	-0.72	-0.056	-	-	-
2016	Q2	CM_MC2	1.7	7.5	2.5	-	-	-
2016	Q3	CM_MC2	4.8	-1.4	0.58	-	-	-
2016	Q4	CM_MC2	1.8	4.0	3.3	-	-	-
2016	Q2	EV_HC1	-1.2	2.5	1.4	-	-	-
2016	Q2	EV_MC2	-3.9	9.7	1.3	-	-	-
2016	Q4	EV_MC2	-3.3	5.7	2.1	-	-	-
2016	Q1	FR_FRCP1	9.3	-4.3	-0.36	-	-	-
2016	Q2	FR_FRCP1	0.64	2.0	2.3	-	-	-
2016	Q3	FR_FRCP1	3.7	-2.7	1.9	-	-	-
2016	Q4	FR_FRCP1	3.4	-2.3	1.9	-	-	-
2016	Q2	GH_ERC	-4.0	5.5	1.1	-	-	-
2016	Q2	GH_FR1	0.16	1.4	1.8	-	-	-
2016	Q2	LC_LCDSSLCC	2.3	-0.017	0.56	-	-	-
<b>Tests categorized as possible or likely response (2017)</b>								
2017	Q1	CM_MC2	7.6	0.36	2.3	7.1	-1.1	-5.0
2017	Q2	CM_MC2	6.1	6.3	5.0	6.7	4.2	-5.5
2017	Q2	CM_MC2	7.3	5.0	4.5	7.6	2.5	-6.5
2017	Q3	CM_MC2	5.8	2.2	3.1	5.5	0.16	-6.6
2017	Q4	CM_MC2	6.4	0.3	2.3	6.0	-1.5	-4.4
2017	Q2	EV_HC1	-0.8	3.0	3.2	-0.34	3.3	1.9
2017	Q1	EV_MC2	1.9	-1.7	1.5	1.7	-2.0	1.5
2017	Q1	FR_FRCP1	7.5	-2.1	2.9	7.1	-2.4	1.8
2017	Q2	FR_FRCP1	3.7	9.8	3.4	5.0	10	3.0
2017	Q3	FR_FRCP1	3.2	-1.6	3.6	3.0	-1.5	2.3
2017	Q4	FR_FRCP1	5.7	-2.9	2.3	5.1	-3.2	2.1
2017	Q3	GH_FR1	1.8	-2.6	2.3	1.3	-2.3	2.1
2017	Q1	LC_LCDSSLCC	5.6	-3.2	1.3	5.0	-3.6	2.1

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-2: *P. subcapita* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	Mean Cell Yield (x 10 <sup>4</sup> cells/mL) (Mean)	ALKALINITY, TOTAL (As CaCO <sub>3</sub> ), 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
<b>Reference</b>									
2015	Q1	Reference (FR_UFR1)	108	149	<0.0030	0.0032	<0.00010	<0.00010	<0.00010
2015	Q1	Reference (FR_UFR1)	111	149	<0.0030	0.0032	<0.00010	<0.00010	<0.00010
2015	Q1	Reference (FR_UFR1)	106	145	<0.0030	0.0059	<0.00010	<0.00010	<0.00010
2015	Q2	Reference (FR_UFR1)	122	119	0.0092	0.083	<0.00010	<0.00010	0.00012
2015	Q3	Reference (FR_UFR1)	126	159	<0.0030	0.0078	<0.00010	<0.00010	0.00011
2015	Q4	Reference (FR_UFR1)	122	146	<0.0030	0.0046	<0.00010	<0.00010	<0.00010
2015	Q2	Reference (GH_ER2)	102	157	<0.0030	0.076	<0.00010	<0.00010	0.00011
2015	Q4	Reference (GH_ER2)	132	147	<0.0030	0.0046	<0.00010	<0.00010	<0.00010
2016	Q1	Reference (FR_UFR1)	135	138	< 0.0030	0.0048	< 0.00010	< 0.00010	< 0.00010
2016	Q2	Reference (FR_UFR1)	108	110	0.015	0.11	< 0.00010	< 0.00010	0.00011
2016	Q3	Reference (FR_UFR1)	121	160	< 0.0030	0.013	< 0.00010	< 0.00010	< 0.00010
2016	Q4	Reference (FR_UFR1)	154	141	0.011	0.051	< 0.00010	< 0.00010	< 0.00010
2016	Q2	Reference (GH_ER2)	99	143	0.0036	0.2	< 0.00010	< 0.00010	0.00011
2016	Q4	Reference (GH_ER2)	152	143	< 0.0030	0.0075	< 0.00010	< 0.00010	< 0.00010
2017	Q2	Reference (CM_MC1)	170	133	0.004	0.02	<0.0001	<0.0001	0.00022
2017	Q3	Reference (CM_MC1)	151	141	0.0026	0.021	<0.0001	<0.0001	0.00022
2017	Q4	Reference (CM_MC1)	111	134	<0.003	0.0086	<0.0001	<0.0001	0.00016
2017	Q1	Reference (FR_UFR1)	154	146	<0.001	0.0046	<0.0001	0.00026	<0.0001
2017	Q2	Reference (FR_UFR1)	141	113	0.089	0.15	<0.0001	<0.0001	0.00015
2017	Q3	Reference (FR_UFR1)	161	148	0.0015	0.0071	<0.0001	0.00011	<0.0001
2017	Q4	Reference (FR_UFR1)	108	138	<0.003	0.0037	<0.0001	<0.0001	<0.0001
2017	Q2	Reference (GH_ER2)	148	153	<0.003	0.077	<0.0001	<0.0001	<0.0001
2017	Q3	Reference (GH_ER2)	158	130	0.0027	0.012	<0.0001	0.00019	0.00011
2017	Q4	Reference (GH_ER2)	110	155	<0.003	0.0061	<0.0001	<0.0001	<0.0001
<b>Tests categorized as no adverse response</b>									
2015	Q1	CM_MC2	101	213	0.0097	0.032	0.00017	0.00019	0.00017
2015	Q2	EV_HC1	140	110	0.0032	0.05	0.0001	0.0001	0.00013
2015	Q3	EV_HC1	134	192	0.0049	0.034	<0.00010	0.00011	0.00017
2015	Q4	EV_HC1	129	195	<0.0030	0.0058	<0.00010	0.00012	0.00014
2015	Q1	EV_MC2	141	193	0.0037	0.019	<0.00010	<0.00010	0.00015
2015	Q4	EV_MC2	136	193	<0.0030	0.0056	0.00035	0.00038	0.00014
2015	Q2	FR_FRCP1	140	147	<0.0030	0.073	0.00022	0.00022	<0.00010
2015	Q3	FR_FRCP1	127	198	<0.0030	0.022	0.00027	0.00033	0.0001
2015	Q1	GH_ERC	108	155	<0.0030	0.028	<0.00010	0.00012	<0.00010
2015	Q2	GH_ERC	131	161	<0.0030	0.13	<0.00010	<0.00010	<0.00010
2015	Q3	GH_ERC	129	142	<0.0030	0.083	<0.00010	<0.00010	<0.00010
2015	Q4	GH_ERC	147	151	<0.0030	0.007	<0.00010	<0.00010	<0.00010
2015	Q1	GH_FR1	97	202	<0.0030	0.0048	0.00014	0.00014	<0.00010
2015	Q2	GH_FR1	125	167	<0.0030	0.053	0.00017	0.00017	0.0001
2015	Q4	GH_FR1	153	188	<0.0030	0.004	0.00011	0.00015	<0.00010
2015	Q1	LC_LCDSSLCC	117	195	<0.0030	0.0052	0.00022	0.00022	0.00011
2016	Q4	CM_MC2	156	165	0.0088	0.15	0.00014	0.00016	0.00017
2016	Q2	EV_HC1	114	179	0.0046	0.15	< 0.00010	0.00013	0.00013
2016	Q3	EV_HC1	121	192	0.014	0.073	< 0.00010	< 0.00010	0.00016
2016	Q4	EV_HC1	158	192	0.0054	0.076	< 0.00010	0.0001	0.00015
2016	Q1	EV_MC2	130	179	< 0.0030	0.031	0.00025	0.00025	0.00013
2016	Q2	EV_MC2	112	98	0.018	0.42	< 0.00010	0.0002	0.00017
2016	Q3	EV_MC2	120	204	< 0.0030	0.0054	0.00021	0.00022	0.00018
2016	Q4	EV_MC2	166	122	0.023	0.23	< 0.00010	0.00011	0.00019
2016	Q3	FR_FRCP1	125	198	< 0.0030	0.014	0.0002	0.00022	< 0.00010
2016	Q1	GH_ERC	130	152	< 0.0030	0.0031	< 0.00010	< 0.00010	< 0.00010
2016	Q2	GH_ERC	104	146	0.0045	0.31	< 0.00010	0.00011	< 0.00010
2016	Q3	GH_ERC	121	144	< 0.0030	0.021	< 0.00010	< 0.00010	< 0.00010
2016	Q4	GH_ERC	157	148	< 0.0030	0.019	< 0.00010	< 0.00010	< 0.00010
2016	Q3	GH_FR1	118	198	< 0.0030	0.0079	0.00013	0.00014	< 0.00010
2016	Q4	GH_FR1	159	188	<0.003	0.012	0.00015	0.00034	<0.0001
2016	Q1	LC_LCDSSLCC	130	193	< 0.0030	0.0074	0.0002	0.00025	< 0.00010
2016	Q3	LC_LCDSSLCC	120	187	< 0.0030	0.0047	0.00021	0.00024	< 0.00010
2016	Q4	LC_LCDSSLCC	156	176	< 0.0030	0.0056	0.00019	0.00026	< 0.00010
2017	Q1	CM_MC2	172	211	0.0012	0.0081	0.00032	0.00066	0.00016
2017	Q2	CM_MC2	129	197	0.0057	0.11	0.00028	0.00025	0.00016
2017	Q2	CM_MC2	152	194	0.0047	0.095	0.00028	0.00035	0.00016
2017	Q3	CM_MC2	131	180	0.0019	0.018	0.00031	0.00036	0.00018
2017	Q4	CM_MC2	105	196	<0.003	0.01	0.00027	0.0003	0.00017
2017	Q1	EV_HC1	254	197	<0.003	0.0097	<0.0001	<0.0001	0.00014
2017	Q2	EV_HC1	144	201	0.0078	0.072	<0.0001	0.00011	0.00018
2017	Q3	EV_HC1	158	182	<0.003	0.0097	<0.0001	<0.0001	0.0002
2017	Q4	EV_HC1	110	171	<0.003	0.004	<0.0001	<0.0001	0.00016
2017	Q1	EV_MC2	216	176	<0.003	0.022	0.00023	0.00022	0.00012
2017	Q2	EV_MC2	140	143	0.018	0.11	0.0001	0.00012	0.00021
2017	Q3	EV_MC2	157	167	<0.003	0.0083	0.00018	0.0002	0.00017
2017	Q4	EV_MC2	108	137	<0.003	0.011	<0.0001	0.00012	0.00017
2017	Q1	FR_FRCP1	169	251	<0.001	0.005	0.00023	0.00066	<0.0001
2017	Q2	FR_FRCP1	145	169	0.013	0.36	0.00021	0.00025	0.00013
2017	Q3	FR_FRCP1	135	196	0.0011	0.0082	0.0002	0.00027	<0.0001
2017	Q4	FR_FRCP1	98	146	<0.003	<0.003	0.00024	0.00026	<0.0001
2017	Q1	GH_ERC	175	156	<0.003	0.0065	<0.0001	<0.0001	<0.0001
2017	Q2	GH_ERC	141	157	<0.003	0.12	<0.0001	<0.0001	<0.0001
2017	Q3	GH_ERC	157	140	0.0031	0.042	<0.0001	0.00016	0.00011
2017	Q4	GH_ERC	129	145	<0.003	0.0045	<0.0001	<0.0001	<0.0001
2017	Q1	GH_FR1	139	202	<0.003	0.0085	0.00012	0.00011	<0.0001
2017	Q2	GH_FR1	144	194	0.0069	0.71	0.00022	0.00027	0.00015
2017	Q3	GH_FR1	156	191	0.0017	0.007	0.00016	0.00023	<0.0001
2017	Q4	GH_FR1	116	160	<0.003	<0.003	0.00015	0.00015	<0.0001
2017	Q1	LC_LCDSSLCC	212	196	<0.003	0.0086	0.00021	0.00024	<0.0001
2017	Q2	LC_LCDSSLCC	134	199	0.0011	0.014	0.00028	0.00028	0.00012
2017	Q3	LC_LCDSSLCC	147	192	0.0015	0.0031	0.00026	0.00024	<0.0001
2017	Q4	LC_LCDSSLCC	104	156	<0.003	0.0038	0.00026	0.00029	0.00014
<b>Test categorized as possible or likely response (2015 to 2016)</b>									
2015	Q2	CM_MC2	108	148	0.0044	0.31	0.00012	0.00013	0.00017
2015	Q3	CM_MC2	109	198	<0.0030	0.016	0.00018	0.00021	0.00019
2015	Q4	CM_MC2	115	215	<0.0030	0.0054	0.00013	0.00013	0.00018
2015	Q1	EV_HC1	27	135	0.003	0.009	0.0001	0.0001	0.00013
2015	Q2	EV_MC2	102	116	<0.0070	0.36	<0.00010	0.00011	0.00018
2015	Q3	EV_MC2	110	194	0.003	0.0085	0.00041	0.00044	0.00016
2015	Q1	FR_FRCP1	64	337	<0.0030	<0.0060	0.00048	0.00051	<0.00020
2015	Q4	FR_FRCP1	96	211	<0.0030	0.0035	0.00025	0.00026	<0.00010
2015	Q3	GH_FR1	107	182	<0.0030	0.013	0.00022	0.00025	0.00014
2015	Q2	LC_LCDSSLCC	69	150	<0.0030	0.016	0.00015	0.00017	0.00011
2015	Q3	LC_LCDSSLCC	101	181	<0.0030	0.013	0.00019	0.00026	<0.00010
2015	Q4	LC_LCDSSLCC	112	197	<0.0050	<0.015	<0.00050	<0.00050	<0.00050
2016	Q1	CM_MC2	122	206	< 0.0030	0.012	0.00018	0.00018	0.00015
2016	Q2	CM_MC2	94	152	0.0076	0.34	0.00014	0.00015	0.00017
2016	Q3	CM_MC2	108	201	< 0.0030	0.0053	<0.00010	0.00025	0.00019
2016	Q1	EV_HC1	120	191	< 0.0030	0.0096	< 0.00010	< 0.00010	0.00015
2016	Q1	FR_FRCP1	94	254	< 0.0030	< 0.0030	0.00027	0.0003	< 0.00010
2016	Q2	FR_FRCP1	79	147	< 0.0030	0.11	0.00018	0.00025	< 0.00010
2016	Q4	FR_FRCP1	141	193	0.0046	0.015	<0.0001	0.0002	< 0.00010
2016	Q1	GH_FR1	120	190	< 0.0030	0.004	0.00012	0.00014	< 0.00010
2016	Q2	GH_FR1	100	160	< 0.0030	0.09	0.00017	0.00023	0.00011
2016	Q2	LC_LCDSSLCC	91	153	< 0.0030	0.029	0.00024	0.00033	0.00012
<b>Tests categorized as possible or likely response (2017)</b>									
No tests were in this category									

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: *P. subcapita* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	ARSENIC-T-mg/l	BARIUM-D-mg/l	BARIUM-T-mg/l	BERYLLIUM-D-mg/l	BERYLLIUM-T-mg/l	BISMUTH-D-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.00010	0.077	0.077	<0.00010	<0.00010	<0.00050
2015	Q1	Reference (FR_UFR1)	<0.00010	0.077	0.077	<0.00010	<0.00010	<0.00050
2015	Q1	Reference (FR_UFR1)	<0.00010	0.075	0.078	<0.00010	<0.00010	<0.00050
2015	Q2	Reference (FR_UFR1)	0.00014	0.042	0.043	<0.00010	<0.00010	<0.00050
2015	Q3	Reference (FR_UFR1)	0.00012	0.076	0.076	<0.00010	<0.00010	<0.00050
2015	Q4	Reference (FR_UFR1)	0.0001	0.074	0.075	<0.00010	<0.00010	<0.00050
2015	Q2	Reference (GH_ER2)	0.00016	0.046	0.048	<0.00010	<0.00010	<0.00050
2015	Q4	Reference (GH_ER2)	<0.00010	0.047	0.049	<0.00010	<0.00010	<0.00050
2016	Q1	Reference (FR_UFR1)	<0.00010	0.074	0.073	<0.00010	<0.00010	<0.00050
2016	Q2	Reference (FR_UFR1)	0.00014	0.04	0.042	<0.00010	<0.00010	<0.00050
2016	Q3	Reference (FR_UFR1)	0.0001	0.074	0.077	<0.00020	<0.00020	<0.00050
2016	Q4	Reference (FR_UFR1)	0.00015	0.069	0.064	<0.00020	<0.00020	<0.00050
2016	Q2	Reference (GH_ER2)	0.00024	0.042	0.044	<0.00010	<0.00010	<0.00050
2016	Q4	Reference (GH_ER2)	<0.00010	0.042	0.038	<0.00020	<0.00020	<0.00050
2017	Q2	Reference (CM_MC1)	0.0002	0.048	0.046	<0.00002	<0.00002	<0.00005
2017	Q3	Reference (CM_MC1)	0.00024	0.05	0.046	<0.00002	<0.00002	<0.00005
2017	Q4	Reference (CM_MC1)	0.00019	0.051	0.051	<0.00002	<0.00002	<0.00005
2017	Q1	Reference (FR_UFR1)	0.00012	0.073	0.073	<0.00002	<0.00002	<0.00005
2017	Q2	Reference (FR_UFR1)	0.00019	0.053	0.051	<0.00002	<0.00002	<0.00005
2017	Q3	Reference (FR_UFR1)	0.00013	0.068	0.069	<0.00002	<0.00002	<0.00005
2017	Q4	Reference (FR_UFR1)	0.00011	0.072	0.072	<0.00002	<0.00002	<0.00005
2017	Q2	Reference (GH_ER2)	0.00014	0.05	0.051	<0.00002	<0.00002	<0.00005
2017	Q3	Reference (GH_ER2)	0.00012	0.043	0.043	<0.00002	<0.00002	<0.00005
2017	Q4	Reference (GH_ER2)	0.00011	0.049	0.048	<0.00002	<0.00002	<0.00005
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.00022	0.072	0.072	<0.00010	<0.00010	<0.00050
2015	Q2	EV_HC1	0.00016	0.025	0.025	0.0001	0.0001	0.00005
2015	Q3	EV_HC1	0.00024	0.058	0.059	<0.00010	<0.00010	<0.00050
2015	Q4	EV_HC1	0.00015	0.06	0.063	<0.00010	<0.00010	<0.00050
2015	Q1	EV_MC2	0.00018	0.11	0.11	<0.00010	<0.00010	<0.00050
2015	Q4	EV_MC2	0.00019	0.11	0.11	<0.00010	<0.00010	<0.00050
2015	Q2	FR_FRCP1	0.00015	0.064	0.065	<0.00010	<0.00010	<0.00050
2015	Q3	FR_FRCP1	0.00019	0.076	0.076	<0.00010	<0.00010	<0.00050
2015	Q1	GH_ERC	0.00015	0.055	0.056	<0.00010	<0.00010	<0.00050
2015	Q2	GH_ERC	0.00017	0.05	0.051	<0.00010	<0.00010	<0.00050
2015	Q3	GH_ERC	0.00017	0.046	0.049	<0.00010	<0.00010	<0.00050
2015	Q4	GH_ERC	<0.00010	0.058	0.06	<0.00010	<0.00010	<0.00050
2015	Q1	GH_FR1	0.00014	0.12	0.13	<0.00010	<0.00010	<0.00050
2015	Q2	GH_FR1	0.00014	0.085	0.087	<0.00010	<0.00010	<0.00050
2015	Q4	GH_FR1	0.00014	0.12	0.12	<0.00010	<0.00010	<0.00050
2015	Q1	LC_LCDSSLCC	0.00013	0.096	0.093	<0.00010	<0.00010	<0.00050
2016	Q4	CM_MC2	0.00026	0.054	0.057	<0.00020	<0.00020	<0.00050
2016	Q2	EV_HC1	0.00024	0.038	0.04	<0.00010	<0.00010	<0.00050
2016	Q3	EV_HC1	0.00021	0.065	0.066	<0.00020	<0.00020	<0.00050
2016	Q4	EV_HC1	0.00019	0.06	0.06	<0.00020	<0.00020	<0.00050
2016	Q1	EV_MC2	0.00016	0.11	0.11	<0.00010	<0.00010	<0.00050
2016	Q2	EV_MC2	0.00037	0.058	0.063	<0.00010	<0.00010	<0.00050
2016	Q3	EV_MC2	0.00018	0.1	0.1	<0.00020	<0.00020	<0.00050
2016	Q4	EV_MC2	0.00027	0.074	0.081	<0.00020	<0.00020	<0.00050
2016	Q3	FR_FRCP1	0.00012	0.071	0.073	<0.00020	<0.00020	<0.00050
2016	Q1	GH_ERC	<0.00010	0.067	0.066	<0.00010	<0.00010	<0.00050
2016	Q2	GH_ERC	0.0003	0.051	0.053	<0.00010	<0.00010	<0.00050
2016	Q3	GH_ERC	0.00011	0.049	0.05	<0.00020	<0.00020	<0.00050
2016	Q4	GH_ERC	0.00012	0.055	0.051	<0.00020	<0.00020	<0.00050
2016	Q3	GH_FR1	0.00012	0.1	0.1	<0.00020	<0.00020	<0.00050
2016	Q4	GH_FR1	0.00014	0.1	0.097	<0.0002	<0.0002	<0.0005
2016	Q1	LC_LCDSSLCC	0.00013	0.086	0.089	<0.00010	<0.00010	<0.00050
2016	Q3	LC_LCDSSLCC	0.00011	0.072	0.066	<0.00020	<0.00020	<0.00050
2016	Q4	LC_LCDSSLCC	0.0002	0.055	0.053	<0.00020	<0.00020	<0.00050
2017	Q1	CM_MC2	0.00021	0.072	0.075	<0.00002	<0.00002	<0.00005
2017	Q2	CM_MC2	0.00027	0.067	0.063	<0.00002	<0.00002	<0.00005
2017	Q2	CM_MC2	0.00027	0.067	0.08	<0.00002	<0.00002	<0.00005
2017	Q3	CM_MC2	0.00024	0.058	0.059	<0.00002	<0.00002	<0.00005
2017	Q4	CM_MC2	0.00018	0.073	0.074	<0.00002	<0.00002	<0.00005
2017	Q1	EV_HC1	0.00017	0.065	0.066	<0.00002	<0.00002	<0.00005
2017	Q2	EV_HC1	0.00028	0.05	0.051	<0.00002	<0.00002	<0.00005
2017	Q3	EV_HC1	0.0002	0.061	0.057	<0.00002	<0.00002	<0.00005
2017	Q4	EV_HC1	0.00018	0.063	0.063	<0.00002	<0.00002	<0.00005
2017	Q1	EV_MC2	0.00017	0.12	0.12	<0.00002	<0.00002	<0.00005
2017	Q2	EV_MC2	0.00029	0.091	0.091	<0.00002	<0.00002	<0.00005
2017	Q3	EV_MC2	0.00018	0.11	0.098	<0.00002	<0.00002	<0.00005
2017	Q4	EV_MC2	0.00018	0.094	0.12	<0.00002	<0.00002	<0.00005
2017	Q1	FR_FRCP1	0.00013	0.072	0.077	<0.00002	<0.00002	<0.00005
2017	Q2	FR_FRCP1	0.00038	0.076	0.081	<0.00002	0.000031	<0.00005
2017	Q3	FR_FRCP1	0.00012	0.069	0.069	<0.00002	<0.00002	<0.00005
2017	Q4	FR_FRCP1	0.00012	0.07	0.073	<0.00002	<0.00002	<0.00005
2017	Q1	GH_ERC	<0.0001	0.062	0.064	<0.00002	<0.00002	<0.00005
2017	Q2	GH_ERC	0.00017	0.057	0.063	<0.00002	<0.00002	<0.00005
2017	Q3	GH_ERC	0.00015	0.047	0.048	<0.00002	<0.00002	<0.00005
2017	Q4	GH_ERC	<0.0001	0.056	0.054	<0.00002	<0.00002	<0.00005
2017	Q1	GH_FR1	0.00011	0.12	0.12	<0.00002	<0.00002	<0.00005
2017	Q2	GH_FR1	0.00038	0.081	0.095	<0.00002	0.000038	<0.00005
2017	Q3	GH_FR1	0.00012	0.1	0.1	<0.00002	<0.00002	<0.00005
2017	Q4	GH_FR1	<0.0001	0.11	0.11	<0.00002	<0.00002	<0.00005
2017	Q1	LC_LCDSSLCC	0.0001	0.084	0.084	<0.00002	<0.00002	<0.00005
2017	Q2	LC_LCDSSLCC	0.00015	0.073	0.07	<0.00002	<0.00002	<0.00005
2017	Q3	LC_LCDSSLCC	0.00012	0.062	0.059	<0.00002	<0.00002	<0.00005
2017	Q4	LC_LCDSSLCC	0.00018	0.074	0.075	<0.00002	<0.00002	<0.00005
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.00031	0.044	0.046	<0.00010	<0.00010	<0.00050
2015	Q3	CM_MC2	0.00021	0.069	0.069	<0.00010	<0.00010	<0.00050
2015	Q4	CM_MC2	0.00022	0.09	0.092	<0.00010	<0.00010	<0.00050
2015	Q1	EV_HC1	0.00014	0.041	0.042	0.0001	0.0001	0.0005
2015	Q2	EV_MC2	0.00033	0.062	0.067	<0.00010	<0.00010	<0.00050
2015	Q3	EV_MC2	0.00023	0.1	0.1	<0.00010	<0.00010	<0.00050
2015	Q1	FR_FRCP1	0.00022	0.036	0.037	<0.00020	<0.00020	<0.0010
2015	Q4	FR_FRCP1	<0.00010	0.08	0.078	<0.00010	<0.00010	<0.00050
2015	Q3	GH_FR1	0.0002	0.098	0.10	<0.00010	<0.00010	<0.00050
2015	Q2	LC_LCDSSLCC	0.00014	0.041	0.042	<0.00010	<0.00010	<0.00050
2015	Q3	LC_LCDSSLCC	0.00011	0.06	0.063	<0.00010	<0.00010	<0.00050
2015	Q4	LC_LCDSSLCC	<0.00050	0.085	0.091	<0.00050	<0.00050	<0.00025
2016	Q1	CM_MC2	0.00021	0.077	0.075	<0.00010	<0.00010	<0.00050
2016	Q2	CM_MC2	0.00029	0.05	0.052	<0.00010	<0.00010	<0.00050
2016	Q3	CM_MC2	0.0002	0.077	0.075	<0.00020	<0.00020	<0.00050
2016	Q1	EV_HC1	0.00016	0.067	0.065	<0.00010	<0.00010	<0.00050
2016	Q1	FR_FRCP1	0.0001	0.075	0.075	<0.00010	<0.00010	<0.00050
2016	Q2	FR_FRCP1	0.00016	0.065	0.068	<0.00010	<0.00010	<0.00050
2016	Q4	FR_FRCP1	0.00018	0.072	0.067	<0.00020	<0.00020	<0.00050
2016	Q1	GH_FR1	<0.00010	0.12	0.11	<0.00010	<0.00010	<0.00050
2016	Q2	GH_FR1	0.00017	0.079	0.078	<0.00010	<0.00010	<0.00050
2016	Q2	LC_LCDSSLCC	0.00015	0.037	0.038	<0.00010	<0.00010	<0.00050
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category			-	-	-	-	-	-

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: P. subcapita Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	BISMUTH-T-mg/l	BORON-D-mg/l	BORON-T-mg/l	BROMIDE-D-mg/l	CADMIUM-D-mg/l	CADMIUM-T-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	<0.000010	0.000011
2015	Q1	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	<0.000010	0.000011
2015	Q1	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000011	<0.000010
2015	Q2	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000074	0.000013
2015	Q3	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000057	0.000083
2015	Q4	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000083
2015	Q2	Reference (GH_ER2)	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000016
2015	Q4	Reference (GH_ER2)	<0.00050	<0.010	<0.010	<0.050	0.000053	0.000069
2016	Q1	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000054	0.000062
2016	Q2	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000062	0.000016
2016	Q3	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000055	0.000011
2016	Q4	Reference (FR_UFR1)	<0.00050	<0.010	<0.010	<0.050	0.000057	0.000058
2016	Q2	Reference (GH_ER2)	<0.00050	<0.010	<0.010	<0.050	0.000076	0.000025
2016	Q4	Reference (GH_ER2)	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000079
2017	Q2	Reference (CM_MC1)	<0.00005	0.013	0.013	<0.05	0.000012	0.000015
2017	Q3	Reference (CM_MC1)	<0.00005	0.018	0.013	<0.05	0.00001	0.000015
2017	Q4	Reference (CM_MC1)	<0.00005	0.013	0.014	<0.05	0.000068	0.000083
2017	Q1	Reference (FR_UFR1)	<0.00005	<0.01	<0.01	<0.05	0.00001	0.000011
2017	Q2	Reference (FR_UFR1)	<0.00005	<0.01	<0.01	<0.05	0.000016	0.000023
2017	Q3	Reference (FR_UFR1)	<0.00005	<0.01	<0.01	<0.05	0.000008	0.000012
2017	Q4	Reference (FR_UFR1)	<0.00005	<0.01	<0.01	<0.05	0.000069	0.00001
2017	Q2	Reference (GH_ER2)	<0.00005	<0.01	<0.01	<0.05	0.000098	0.000019
2017	Q3	Reference (GH_ER2)	<0.00005	<0.01	<0.01	<0.05	0.000081	0.000078
2017	Q4	Reference (GH_ER2)	<0.00005	<0.01	<0.01	<0.05	0.000056	0.000074
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	<0.00050	0.024	0.025	<0.10	0.000022	0.000023
2015	Q2	EV_HC1	0.00005	0.01	0.01	0.05	0.000013	0.000021
2015	Q3	EV_HC1	<0.00050	<0.010	0.011	<0.050	0.000017	0.000025
2015	Q4	EV_HC1	<0.00050	<0.010	0.01	<0.25	0.000013	0.000018
2015	Q1	EV_MC2	<0.00050	0.014	0.016	<0.050	0.000055	0.000044
2015	Q4	EV_MC2	<0.00050	0.016	0.016	<0.25	0.000037	0.000047
2015	Q2	FR_FRCP1	<0.00050	<0.010	<0.010	<0.050	0.00003	0.00005
2015	Q3	FR_FRCP1	<0.00050	0.013	0.014	<0.10	0.000038	0.000047
2015	Q1	GH_ERC	<0.00050	<0.010	<0.010	<0.050	<0.000010	<0.000010
2015	Q2	GH_ERC	<0.00050	<0.010	<0.010	<0.050	0.000007	0.000022
2015	Q3	GH_ERC	<0.00050	<0.010	<0.010	<0.050	0.000059	0.000016
2015	Q4	GH_ERC	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000073
2015	Q1	GH_FR1	<0.00050	0.012	<0.010	<0.10	0.000021	0.000024
2015	Q2	GH_FR1	<0.00050	<0.010	<0.010	<0.050	0.000021	0.000035
2015	Q4	GH_FR1	<0.00050	<0.010	0.011	<0.25	0.000015	0.000024
2015	Q1	LC_LCDSSLCC	<0.00050	0.013	0.014	<0.10	0.000086	0.000011
2016	Q4	CM_MC2	<0.00050	0.018	0.02	<0.050	0.000013	0.000016
2016	Q2	EV_HC1	<0.00050	<0.010	<0.010	<0.050	0.000027	0.000047
2016	Q3	EV_HC1	<0.00050	<0.010	<0.010	<0.050	0.000016	0.000027
2016	Q4	EV_HC1	<0.00050	<0.010	<0.010	<0.25	0.000019	0.000024
2016	Q1	EV_MC2	<0.00050	0.013	0.013	<0.25	0.000035	0.000036
2016	Q2	EV_MC2	<0.00050	<0.010	<0.010	<0.050	0.000038	0.000078
2016	Q3	EV_MC2	<0.00050	0.017	0.018	<0.25	0.000066	0.000069
2016	Q4	EV_MC2	<0.00050	<0.010	<0.010	<0.050	0.000025	0.000039
2016	Q3	FR_FRCP1	<0.00050	<0.010	0.011	<0.25	0.000024	0.000042
2016	Q1	GH_ERC	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000065
2016	Q2	GH_ERC	<0.00050	<0.010	<0.010	<0.050	0.000011	0.000035
2016	Q3	GH_ERC	<0.00050	<0.010	<0.010	<0.050	<0.000050	0.000053
2016	Q4	GH_ERC	<0.00050	<0.010	<0.010	<0.050	<0.000050	<0.000050
2016	Q3	GH_FR1	<0.00050	<0.010	<0.010	<0.25	0.000015	0.000016
2016	Q4	GH_FR1	<0.00005	<0.01	<0.01	<0.25	0.000017	0.000021
2016	Q1	LC_LCDSSLCC	<0.00050	0.012	0.013	<0.25	0.000083	0.000076
2016	Q3	LC_LCDSSLCC	<0.00050	0.013	0.012	<0.25	0.000017	0.000016
2016	Q4	LC_LCDSSLCC	<0.00050	<0.010	0.01	<0.25	0.000014	0.000015
2017	Q1	CM_MC2	<0.00005	0.029	0.031	<0.05	0.000038	0.000039
2017	Q2	CM_MC2	<0.00005	0.027	0.027	<0.05	0.000045	0.000072
2017	Q2	CM_MC2	<0.00005	0.032	0.039	<0.05	0.000043	0.00007
2017	Q3	CM_MC2	<0.00005	0.031	0.031	<0.05	0.000068	0.000017
2017	Q4	CM_MC2	<0.00005	0.036	0.038	0.065	0.000092	0.000011
2017	Q1	EV_HC1	<0.00005	<0.01	<0.01	<0.05	0.000014	0.000021
2017	Q2	EV_HC1	<0.00005	<0.01	<0.01	<0.05	0.000025	0.000043
2017	Q3	EV_HC1	<0.00005	<0.01	<0.01	<0.05	0.000019	0.000022
2017	Q4	EV_HC1	<0.00005	<0.01	<0.01	<0.05	0.000096	0.000019
2017	Q1	EV_MC2	<0.00005	0.012	0.012	<0.05	0.000029	0.000035
2017	Q2	EV_MC2	<0.00005	<0.01	<0.01	<0.05	0.00003	0.000063
2017	Q3	EV_MC2	<0.00005	0.012	0.012	<0.05	0.000031	0.000039
2017	Q4	EV_MC2	<0.00005	0.014	0.014	<0.05	<0.000005	0.000034
2017	Q1	FR_FRCP1	<0.00005	0.01	0.011	<0.25	0.000052	0.000062
2017	Q2	FR_FRCP1	<0.00005	<0.01	<0.01	<0.05	0.000061	0.000013
2017	Q3	FR_FRCP1	<0.00005	<0.01	0.01	<0.05	0.000044	0.000051
2017	Q4	FR_FRCP1	<0.00005	0.011	0.011	<0.25	0.000012	0.000051
2017	Q1	GH_ERC	<0.00005	<0.01	<0.01	<0.05	<0.000005	0.000071
2017	Q2	GH_ERC	<0.00005	<0.01	<0.01	<0.05	0.000089	0.000019
2017	Q3	GH_ERC	<0.00005	<0.01	<0.01	<0.05	0.000073	0.000013
2017	Q4	GH_ERC	<0.00005	<0.01	<0.01	<0.05	0.000058	0.000075
2017	Q1	GH_FR1	<0.00005	<0.01	<0.01	<0.25	0.000014	0.000018
2017	Q2	GH_FR1	<0.00005	<0.01	<0.01	<0.25	0.000035	0.000083
2017	Q3	GH_FR1	<0.00005	<0.01	<0.01	<0.05	0.000019	0.000019
2017	Q4	GH_FR1	<0.00005	<0.01	<0.01	<0.05	0.000015	0.000019
2017	Q1	LC_LCDSSLCC	<0.00005	0.013	0.014	<0.25	0.0001	0.000094
2017	Q2	LC_LCDSSLCC	<0.00005	0.014	0.014	<0.05	0.000015	0.000017
2017	Q3	LC_LCDSSLCC	<0.00005	0.013	0.013	<0.05	0.000025	0.0002
2017	Q4	LC_LCDSSLCC	<0.00005	0.013	0.014	<0.05	0.000015	0.000016
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	<0.00050	0.014	0.015	<0.050	0.000036	0.00006
2015	Q3	CM_MC2	<0.00050	0.027	0.029	<0.10	0.000099	0.000018
2015	Q4	CM_MC2	<0.00050	0.026	0.027	<0.25	0.000075	0.000093
2015	Q1	EV_HC1	0.0005	0.01	0.01	0.05	0.000017	0.000016
2015	Q2	EV_MC2	<0.00050	<0.010	<0.010	<0.050	0.000018	0.000064
2015	Q3	EV_MC2	<0.00050	0.016	0.018	<0.10	0.000049	0.000056
2015	Q1	FR_FRCP1	<0.0010	<0.020	<0.020	<1.0	<0.000020	0.000053
2015	Q4	FR_FRCP1	<0.00050	0.011	0.016	<0.25	0.00004	0.000055
2015	Q3	GH_FR1	<0.00050	0.01	0.011	<0.050	0.000019	0.000021
2015	Q2	LC_LCDSSLCC	<0.00050	<0.010	<0.010	<0.050	0.000014	0.000014
2015	Q3	LC_LCDSSLCC	<0.00050	0.012	0.013	<0.10	0.000025	0.000026
2015	Q4	LC_LCDSSLCC	<0.00025	<0.050	<0.050	<0.050	0.000024	0.000026
2016	Q1	CM_MC2	<0.00050	0.026	0.026	<0.25	0.000016	0.000018
2016	Q2	CM_MC2	<0.00050	0.016	0.017	<0.050	0.000069	0.000011
2016	Q3	CM_MC2	<0.00050	0.028	0.029	<0.25	0.000075	0.000086
2016	Q1	EV_HC1	<0.00050	<0.010	<0.010	<0.25	0.000017	0.000019
2016	Q1	FR_FRCP1	<0.00050	0.01	0.011	<0.50	0.000036	0.000048
2016	Q2	FR_FRCP1	<0.00050	<0.010	<0.010	<0.050	0.000031	0.000052
2016	Q4	FR_FRCP1	<0.00050	<0.010	<0.010	<0.25	0.000045	0.000051
2016	Q1	GH_FR1	<0.00050	<0.010	<0.010	<0.25	0.000014	0.000018
2016	Q2	GH_FR1	<0.00050	<0.010	<0.010	<0.050	0.000025	0.000035
2016	Q2	LC_LCDSSLCC	<0.00050	<0.010	0.011	<0.050	0.0002	0.00022
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent  
**Screening**  
 Screening was not conducted for 2017 because tests with P. subcapitata did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: *P. subcapitata* Cell Yield 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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	56	0.84	<1.0	0.00017	0.00017	<0.00010
2015	Q1	Reference (FR_UFR1)	56	0.84	<1.0	0.00017	0.00017	<0.00010
2015	Q1	Reference (FR_UFR1)	57	<0.50	<1.0	0.00013	0.00015	<0.00010
2015	Q2	Reference (FR_UFR1)	38	1.8	<1.0	0.00014	0.00046	<0.00010
2015	Q3	Reference (FR_UFR1)	55	0.75	1.0	0.00013	0.00013	<0.00010
2015	Q4	Reference (FR_UFR1)	56	0.6	<1.0	0.00011	0.00036	<0.00010
2015	Q2	Reference (GH_ER2)	48	0.84	1.0	0.00022	0.00037	<0.00010
2015	Q4	Reference (GH_ER2)	51	0.61	1.2	0.00022	0.00034	<0.00010
2016	Q1	Reference (FR_UFR1)	58	<0.50	1.1	0.00012	<0.00020	<0.00010
2016	Q2	Reference (FR_UFR1)	37	2.5	<0.10	0.00011	0.00029	<0.00010
2016	Q3	Reference (FR_UFR1)	51	0.86	0.13	<0.00010	0.00018	<0.00010
2016	Q4	Reference (FR_UFR1)	48	1.1	0.18	<0.00010	0.00021	<0.00010
2016	Q2	Reference (GH_ER2)	48	1.4	0.61	0.00017	0.00062	<0.00010
2016	Q4	Reference (GH_ER2)	48	0.64	0.36	0.00021	0.00024	<0.00010
2017	Q2	Reference (CM_MC1)	36	1.8	<0.5	0.00012	0.00018	<0.00010
2017	Q3	Reference (CM_MC1)	36	1.2	<0.5	<0.0001	0.00028	<0.00010
2017	Q4	Reference (CM_MC1)	41	1.6	<0.5	0.00018	0.00018	<0.00010
2017	Q1	Reference (FR_UFR1)	52	0.96	<0.5	<0.0001	0.00011	<0.00010
2017	Q2	Reference (FR_UFR1)	31	3.3	<0.5	0.00022	0.0004	<0.00010
2017	Q3	Reference (FR_UFR1)	45	1.8	<0.5	<0.0001	0.00028	<0.00010
2017	Q4	Reference (FR_UFR1)	50	1.1	<0.5	<0.0001	0.00012	<0.00010
2017	Q2	Reference (GH_ER2)	51	0.83	0.27	0.00021	0.00038	<0.00010
2017	Q3	Reference (GH_ER2)	40	0.79	<0.5	0.00019	0.00024	<0.00010
2017	Q4	Reference (GH_ER2)	47	0.81	<0.5	0.00022	0.00026	<0.00010
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	106	0.93	3.4	0.00019	0.00024	0.00074
2015	Q2	EV_HC1	47	1.1	1.3	0.00013	0.00021	0.0001
2015	Q3	EV_HC1	75	1.1	1.4	0.00015	0.00024	<0.00010
2015	Q4	EV_HC1	93	0.63	1.8	0.00013	0.00022	<0.00010
2015	Q1	EV_MC2	91	1.7	11	0.00012	<0.00020	<0.00010
2015	Q4	EV_MC2	102	0.6	8.7	0.00012	0.00015	<0.00010
2015	Q2	FR_FRCP1	73	1.6	1.2	<0.00010	0.00028	<0.00010
2015	Q3	FR_FRCP1	109	0.93	1.5	0.0001	0.00017	<0.00010
2015	Q1	GH_ERC	55	0.64	<1.0	0.00029	0.00034	<0.00010
2015	Q2	GH_ERC	53	0.96	<1.0	0.00017	0.00054	<0.00010
2015	Q3	GH_ERC	49	0.75	<1.0	0.00019	0.00037	<0.00010
2015	Q4	GH_ERC	58	<0.50	1.2	0.00022	0.00026	<0.00010
2015	Q1	GH_FR1	114	1.1	2.6	0.00021	0.00015	<0.00010
2015	Q2	GH_FR1	81	1.4	1.4	<0.00010	0.0002	<0.00010
2015	Q4	GH_FR1	106	<0.50	1.7	0.00012	0.00013	<0.00010
2015	Q1	LC_LCDSSLCC	123	1.1	2.7	0.00016	0.00021	<0.00010
2016	Q4	CM_MC2	79	2.3	2.1	0.00017	0.00035	0.00065
2016	Q2	EV_HC1	72	1.9	0.79	0.00011	0.00031	<0.00010
2016	Q3	EV_HC1	81	0.95	1.1	0.00016	0.00025	<0.00010
2016	Q4	EV_HC1	82	1.4	1.3	0.00014	0.00023	<0.00010
2016	Q1	EV_MC2	94	0.85	9.2	0.00013	0.00018	<0.00010
2016	Q2	EV_MC2	37	2.6	1.2	0.00014	0.00076	<0.00010
2016	Q3	EV_MC2	111	0.83	13	0.00012	0.00015	<0.00010
2016	Q4	EV_MC2	48	2.8	2.9	0.00012	0.00045	<0.00010
2016	Q3	FR_FRCP1	103	0.99	1.5	<0.00010	0.00012	<0.00010
2016	Q1	GH_ERC	67	<0.50	1.3	0.00024	<0.00030	<0.00010
2016	Q2	GH_ERC	53	1.3	0.79	0.00019	0.00085	<0.00010
2016	Q3	GH_ERC	45	0.58	0.37	0.0002	0.00027	<0.00010
2016	Q4	GH_ERC	51	<0.50	0.44	0.0002	0.00035	<0.00010
2016	Q3	GH_FR1	89	0.8	1.5	<0.00010	0.00017	<0.00010
2016	Q4	GH_FR1	94	0.75	1.5	0.0001	0.00019	<0.00010
2016	Q1	LC_LCDSSLCC	134	<0.50	17	0.00014	<0.00020	<0.00010
2016	Q3	LC_LCDSSLCC	91	<0.50	4.7	0.00012	0.00027	<0.00010
2016	Q4	LC_LCDSSLCC	83	0.91	6.8	0.0001	0.00019	<0.00010
2017	Q1	CM_MC2	128	0.85	3.9	0.00012	0.00021	0.0022
2017	Q2	CM_MC2	85	1.4	2.5	<0.0001	0.00028	0.005
2017	Q2	CM_MC2	115	1.4	2.7	0.00013	0.00031	0.0044
2017	Q3	CM_MC2	96	0.97	1.0	0.00017	0.00026	0.0029
2017	Q4	CM_MC2	124	0.97	5.9	<0.0001	0.00017	0.00058
2017	Q1	EV_HC1	89	0.72	1.3	0.00015	0.00023	<0.00010
2017	Q2	EV_HC1	71	2.6	0.79	<0.0001	0.00025	<0.00010
2017	Q3	EV_HC1	83	0.97	0.81	0.00011	0.00022	<0.00010
2017	Q4	EV_HC1	82	1.0	0.8	<0.0001	0.00018	<0.00010
2017	Q1	EV_MC2	84	0.8	7.1	0.00013	0.00023	<0.00010
2017	Q2	EV_MC2	48	2.9	4.3	<0.0001	0.00025	0.00011
2017	Q3	EV_MC2	78	1.3	4.9	<0.0001	0.00015	<0.00010
2017	Q4	EV_MC2	87	1.0	6.1	0.00011	0.00019	<0.00010
2017	Q1	FR_FRCP1	179	1.5	<2.5	<0.0001	0.00078	<0.00010
2017	Q2	FR_FRCP1	86	2.1	0.72	0.00011	0.00082	<0.00010
2017	Q3	FR_FRCP1	100	1.6	0.87	<0.0001	0.00012	<0.00010
2017	Q4	FR_FRCP1	153	0.96	<2.5	<0.0001	<0.0001	<0.00010
2017	Q1	GH_ERC	56	<0.5	0.38	0.00026	0.00027	<0.00010
2017	Q2	GH_ERC	56	0.79	0.5	0.00023	0.0005	<0.00010
2017	Q3	GH_ERC	42	0.89	<0.5	0.00015	0.00029	<0.00010
2017	Q4	GH_ERC	48	1.1	<0.5	0.00022	0.00025	<0.00010
2017	Q1	GH_FR1	115	0.57	1.8	<0.0001	0.00014	<0.00010
2017	Q2	GH_FR1	92	3.4	1.7	<0.0001	0.0012	<0.00010
2017	Q3	GH_FR1	86	1.0	1.1	<0.0001	0.00016	<0.00010
2017	Q4	GH_FR1	102	1.6	1.2	<0.0001	0.00015	<0.00010
2017	Q1	LC_LCDSSLCC	125	<0.5	13	0.00012	0.00021	<0.00010
2017	Q2	LC_LCDSSLCC	108	1.2	8.0	<0.0001	0.00016	<0.00010
2017	Q3	LC_LCDSSLCC	92	1.8	5.5	<0.0001	0.00017	<0.00010
2017	Q4	LC_LCDSSLCC	111	0.97	8.0	<0.0001	0.00022	<0.00010
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	60	1.5	1.2	0.0002	0.00058	0.00037
2015	Q3	CM_MC2	104	0.86	2.1	0.00019	0.00023	0.00026
2015	Q4	CM_MC2	115	0.56	3.2	0.00019	0.0002	<0.00010
2015	Q1	EV_HC1	60	0.82	1.5	0.00014	0.00018	0.0001
2015	Q2	EV_MC2	44	1.9	2.9	0.0002	0.0007	<0.00010
2015	Q3	EV_MC2	87	1.0	9.6	0.00013	0.00019	<0.00010
2015	Q1	FR_FRCP1	337	1.4	2.6	<0.00020	<0.00020	<0.00020
2015	Q4	FR_FRCP1	130	0.65	2.2	<0.00010	0.00027	<0.00010
2015	Q3	GH_FR1	90	0.87	1.6	0.00012	0.00015	<0.00010
2015	Q2	LC_LCDSSLCC	68	1.2	1.4	0.00014	0.00019	<0.00010
2015	Q3	LC_LCDSSLCC	92	0.83	2.0	0.00011	0.0002	<0.00010
2015	Q4	LC_LCDSSLCC	117	0.74	2.2	<0.00050	<0.00050	<0.00050
2016	Q1	CM_MC2	117	0.58	4.9	0.00018	<0.00030	0.00072
2016	Q2	CM_MC2	67	1.9	1.5	0.00016	0.00058	0.00077
2016	Q3	CM_MC2	105	0.99	3.4	0.00011	0.00018	0.00026
2016	Q1	EV_HC1	95	0.65	2.1	0.00016	<0.00020	<0.00010
2016	Q1	FR_FRCP1	221	0.8	3.5	<0.00010	<0.00010	<0.00010
2016	Q2	FR_FRCP1	73	2.0	0.51	0.0001	0.00027	<0.00010
2016	Q4	FR_FRCP1	97	0.9	1.3	<0.00010	0.00015	<0.00010
2016	Q1	GH_FR1	119	0.51	2.5	0.00012	0.00013	<0.00010
2016	Q2	GH_FR1	71	2.0	0.99	<0.00010	0.00029	<0.00010
2016	Q2	LC_LCDSSLCC	72	1.6	2.8	0.00014	0.00021	<0.00010
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**  
 Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: P. subcapita Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	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 <sub>3</sub> -N-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.00010	367	<0.00050	<0.00050	0.14	197
2015	Q1	Reference (FR_UFR1)	<0.00010	367	<0.00050	<0.00050	0.14	197
2015	Q1	Reference (FR_UFR1)	<0.00010	353	<0.00050	<0.00050	0.14	197
2015	Q2	Reference (FR_UFR1)	<0.00010	245	<0.00050	<0.00050	0.15	129
2015	Q3	Reference (FR_UFR1)	<0.00010	342	<0.00050	<0.00050	0.15	188
2015	Q4	Reference (FR_UFR1)	<0.00010	354	<0.00050	<0.00050	0.16	190
2015	Q2	Reference (GH_ER2)	<0.00010	303	<0.00050	<0.00050	0.15	160
2015	Q4	Reference (GH_ER2)	<0.00010	314	<0.00050	<0.00050	0.16	170
2016	Q1	Reference (FR_UFR1)	<0.00010	358	<0.00050	<0.00050	0.16	202
2016	Q2	Reference (FR_UFR1)	<0.00010	233	<0.00050	<0.00050	0.15	126
2016	Q3	Reference (FR_UFR1)	<0.00010	338	<0.00050	<0.00050	0.17	177
2016	Q4	Reference (FR_UFR1)	<0.00010	330	<0.00050	<0.00050	0.16	177
2016	Q2	Reference (GH_ER2)	<0.00010	289	<0.00050	<0.00050	0.16	163
2016	Q4	Reference (GH_ER2)	<0.00010	297	<0.00050	<0.00050	0.17	163
2017	Q2	Reference (CM_MC1)	<0.0001	267	<0.0002	<0.0005	0.052	134
2017	Q3	Reference (CM_MC1)	<0.0001	265	<0.0002	<0.0005	0.054	138
2017	Q4	Reference (CM_MC1)	<0.0001	280	<0.0005	<0.0005	0.055	144
2017	Q1	Reference (FR_UFR1)	<0.0001	341	<0.0002	<0.0005	0.14	185
2017	Q2	Reference (FR_UFR1)	<0.0001	239	0.0004	0.00067	0.11	121
2017	Q3	Reference (FR_UFR1)	<0.0001	319	<0.0002	<0.0005	0.14	159
2017	Q4	Reference (FR_UFR1)	<0.0001	333	<0.0005	<0.0005	0.11	185
2017	Q2	Reference (GH_ER2)	<0.0001	321	<0.0005	<0.0005	0.16	177
2017	Q3	Reference (GH_ER2)	<0.0001	276	<0.0002	<0.0005	0.14	137
2017	Q4	Reference (GH_ER2)	<0.0001	282	<0.0005	<0.0005	0.13	161
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.00079	826	<0.00050	<0.00050	0.14	445
2015	Q2	EV_HC1	0.0001	350	0.0005	0.0005	0.13	205
2015	Q3	EV_HC1	<0.00010	625	<0.00050	<0.00050	0.21	373
2015	Q4	EV_HC1	<0.00010	732	<0.00050	<0.00050	0.2	431
2015	Q1	EV_MC2	<0.00010	665	0.0012	0.00076	0.15	381
2015	Q4	EV_MC2	<0.00010	733	<0.00050	<0.00050	0.16	415
2015	Q2	FR_FRCP1	0.00012	573	<0.00050	<0.00050	0.2	302
2015	Q3	FR_FRCP1	<0.00010	815	<0.00050	<0.00050	0.2	471
2015	Q1	GH_ERC	<0.00010	345	<0.00050	<0.00050	0.15	191
2015	Q2	GH_ERC	<0.00010	338	<0.00050	<0.00050	0.15	179
2015	Q3	GH_ERC	<0.00010	284	<0.00050	<0.00050	0.16	160
2015	Q4	GH_ERC	<0.00010	355	<0.00050	<0.00050	0.16	190
2015	Q1	GH_FR1	<0.00010	851	<0.00050	<0.00050	0.18	475
2015	Q2	GH_FR1	<0.00010	614	<0.00050	<0.00050	0.17	332
2015	Q4	GH_FR1	<0.00010	760	<0.00050	<0.00050	0.16	436
2015	Q1	LC_LCDSSLCC	<0.00010	940	<0.00050	<0.00050	0.24	536
2016	Q4	CM_MC2	0.0011	622	<0.00050	<0.00050	0.11	328
2016	Q2	EV_HC1	<0.00010	547	<0.00050	<0.00050	0.19	306
2016	Q3	EV_HC1	<0.00010	652	<0.00050	<0.00050	0.23	368
2016	Q4	EV_HC1	<0.00010	668	<0.00050	<0.00050	0.2	386
2016	Q1	EV_MC2	<0.00010	700	<0.00050	<0.00050	0.15	395
2016	Q2	EV_MC2	0.00027	266	<0.00050	0.001	0.11	141
2016	Q3	EV_MC2	<0.00010	793	<0.00050	<0.00050	0.17	435
2016	Q4	EV_MC2	0.00013	359	<0.00050	0.00065	0.12	177
2016	Q3	FR_FRCP1	<0.00010	874	<0.00050	<0.00050	0.22	455
2016	Q1	GH_ERC	<0.00010	419	<0.00050	<0.00050	0.16	231
2016	Q2	GH_ERC	0.00015	342	<0.00050	0.00065	0.16	185
2016	Q3	GH_ERC	<0.00010	317	<0.00050	<0.00050	0.18	161
2016	Q4	GH_ERC	<0.00010	327	<0.00050	0.00054	0.16	186
2016	Q3	GH_FR1	<0.00010	732	<0.00050	<0.00050	0.2	379
2016	Q4	GH_FR1	<0.0001	735	<0.0005	<0.0005	0.16	411
2016	Q1	LC_LCDSSLCC	<0.00010	1010	<0.00050	<0.00050	0.24	572
2016	Q3	LC_LCDSSLCC	<0.00010	754	<0.00050	<0.00050	0.25	403
2016	Q4	LC_LCDSSLCC	<0.00010	700	<0.00050	<0.00050	0.21	384
2017	Q1	CM_MC2	0.0024	999	<0.0002	<0.0005	0.13	529
2017	Q2	CM_MC2	0.0052	756	<0.0002	0.00068	0.1	383
2017	Q2	CM_MC2	0.0056	783	<0.0002	<0.0005	0.12	394
2017	Q3	CM_MC2	0.0035	840	<0.0002	<0.0005	0.11	426
2017	Q4	CM_MC2	0.00074	952	<0.0005	<0.0005	0.098	540
2017	Q1	EV_HC1	<0.0001	704	<0.0005	<0.0005	0.22	411
2017	Q2	EV_HC1	<0.0001	630	0.0002	0.00055	0.14	335
2017	Q3	EV_HC1	<0.0001	610	<0.0005	<0.0005	0.21	416
2017	Q4	EV_HC1	<0.0001	660	<0.0005	<0.0005	0.17	388
2017	Q1	EV_MC2	<0.0001	615	<0.0005	<0.0005	0.15	334
2017	Q2	EV_MC2	0.00025	402	0.00031	0.00074	0.099	199
2017	Q3	EV_MC2	<0.0001	531	<0.0005	<0.0005	0.16	350
2017	Q4	EV_MC2	<0.0001	565	<0.0005	<0.0005	0.12	262
2017	Q1	FR_FRCP1	<0.0001	1430	<0.0002	<0.0005	0.13	841
2017	Q2	FR_FRCP1	0.00027	725	0.00034	0.0011	0.14	392
2017	Q3	FR_FRCP1	<0.0001	857	<0.0002	<0.0005	0.18	447
2017	Q4	FR_FRCP1	<0.0001	1110	<0.0005	<0.0005	0.1	734
2017	Q1	GH_ERC	<0.0001	354	<0.0005	<0.0005	0.14	190
2017	Q2	GH_ERC	<0.0001	368	<0.0005	<0.0005	0.16	187
2017	Q3	GH_ERC	<0.0001	295	<0.0002	<0.0005	0.14	149
2017	Q4	GH_ERC	<0.0001	303	<0.0005	<0.0005	0.12	174
2017	Q1	GH_FR1	<0.0001	843	<0.0005	<0.0005	0.14	479
2017	Q2	GH_FR1	0.00037	735	<0.0005	0.0013	0.13	404
2017	Q3	GH_FR1	<0.0001	742	<0.0002	<0.0005	0.15	391
2017	Q4	GH_FR1	<0.0001	749	<0.0005	<0.0005	0.13	476
2017	Q1	LC_LCDSSLCC	<0.0001	954	<0.0005	<0.0005	0.21	552
2017	Q2	LC_LCDSSLCC	<0.0001	889	<0.0002	<0.0005	0.2	477
2017	Q3	LC_LCDSSLCC	<0.0001	796	0.00021	<0.0005	0.2	397
2017	Q4	LC_LCDSSLCC	<0.0001	777	<0.0005	<0.0005	0.18	471
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.00061	484	<0.00050	0.00053	0.1	248
2015	Q3	CM_MC2	0.00034	802	<0.00050	<0.00050	0.12	458
2015	Q4	CM_MC2	<0.00010	876	<0.00050	<0.00050	0.11	505
2015	Q1	EV_HC1	0.0001	453	0.0005	0.0005	0.15	274
2015	Q2	EV_MC2	0.00022	299	<0.00050	0.00073	0.12	159
2015	Q3	EV_MC2	<0.00010	686	<0.00050	<0.00050	0.18	384
2015	Q1	FR_FRCP1	<0.00020	2680	<0.00050	<0.0010	0.45	1880
2015	Q4	FR_FRCP1	<0.00010	1030	<0.00050	<0.00050	0.17	597
2015	Q3	GH_FR1	<0.00010	657	<0.00050	<0.00050	0.18	374
2015	Q2	LC_LCDSSLCC	<0.00010	535	<0.00050	<0.00050	0.22	269
2015	Q3	LC_LCDSSLCC	<0.00010	660	<0.00050	<0.00050	0.24	355
2015	Q4	LC_LCDSSLCC	<0.00050	770	<0.0010	<0.0025	0.18	499
2016	Q1	CM_MC2	0.00081	927	<0.00050	<0.00050	0.14	500
2016	Q2	CM_MC2	0.0013	549	<0.00050	0.00079	0.1	283
2016	Q3	CM_MC2	0.00034	901	<0.00050	<0.00050	0.12	465
2016	Q1	EV_HC1	<0.00010	745	<0.00050	<0.00050	0.21	443
2016	Q1	FR_FRCP1	<0.00010	1720	<0.00050	<0.00050	<0.20	1120
2016	Q2	FR_FRCP1	0.00011	555	<0.00050	0.00054	0.2	305
2016	Q4	FR_FRCP1	<0.00010	810	<0.00050	<0.00050	0.19	453
2016	Q1	GH_FR1	<0.00010	885	<0.00050	<0.00050	0.18	507
2016	Q2	GH_FR1	<0.00010	573	<0.00050	<0.00050	0.18	312
2016	Q2	LC_LCDSSLCC	<0.00010	557	<0.00050	<0.00050	0.22	293
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with P. subcapitata did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: *P. subcapitata* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l	LITHIUM-T-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.010	<0.010	<0.000050	<0.000050	0.0019	0.0016
2015	Q1	Reference (FR_UFR1)	<0.010	<0.010	<0.000050	<0.000050	0.0019	0.0016
2015	Q1	Reference (FR_UFR1)	<0.010	<0.010	<0.000050	<0.000050	0.0015	0.0017
2015	Q2	Reference (FR_UFR1)	<0.010	0.052	<0.000050	<0.000050	<0.0010	0.0012
2015	Q3	Reference (FR_UFR1)	<0.010	<0.010	0.000055	<0.000050	0.002	0.002
2015	Q4	Reference (FR_UFR1)	<0.010	<0.010	<0.000050	<0.000050	0.0015	0.0015
2015	Q2	Reference (GH_ER2)	<0.010	0.066	<0.000050	<0.000050	0.0017	0.0016
2015	Q4	Reference (GH_ER2)	<0.010	<0.010	<0.000050	<0.000050	0.0016	0.0018
2016	Q1	Reference (FR_UFR1)	<0.010	<0.010	<0.000050	<0.000050	0.0014	0.0015
2016	Q2	Reference (FR_UFR1)	<0.010	0.075	<0.000050	0.00006	0.0011	0.0013
2016	Q3	Reference (FR_UFR1)	<0.010	0.013	<0.000050	<0.000050	0.0017	0.0018
2016	Q4	Reference (FR_UFR1)	<0.010	0.022	<0.000050	<0.000050	0.0015	0.0018
2016	Q2	Reference (GH_ER2)	<0.010	0.23	<0.000050	0.00013	0.002	0.0021
2016	Q4	Reference (GH_ER2)	<0.010	0.013	<0.000050	<0.000050	0.0019	0.0017
2017	Q2	Reference (CM_MC1)	<0.01	0.021	<0.00005	<0.00005	0.0041	0.0042
2017	Q3	Reference (CM_MC1)	<0.01	0.033	<0.00005	<0.00005	0.0044	0.0045
2017	Q4	Reference (CM_MC1)	<0.01	<0.01	<0.00005	<0.00005	0.0045	0.0046
2017	Q1	Reference (FR_UFR1)	<0.01	<0.01	<0.00005	<0.00005	0.0013	0.0014
2017	Q2	Reference (FR_UFR1)	0.054	0.13	<0.00005	0.000092	0.0011	0.0012
2017	Q3	Reference (FR_UFR1)	<0.01	0.011	<0.00005	<0.00005	0.0015	0.0015
2017	Q4	Reference (FR_UFR1)	<0.01	<0.01	<0.00005	<0.00005	0.0019	0.0017
2017	Q2	Reference (GH_ER2)	<0.01	0.074	<0.00005	0.000061	0.0019	0.002
2017	Q3	Reference (GH_ER2)	<0.01	0.02	<0.00005	<0.00005	0.0017	0.0015
2017	Q4	Reference (GH_ER2)	<0.01	<0.01	<0.00005	<0.00005	0.0021	0.002
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	<0.010	0.031	<0.000050	<0.000050	0.011	0.011
2015	Q2	EV_HC1	0.01	0.051	0.00005	0.000056	0.0044	0.0042
2015	Q3	EV_HC1	<0.010	0.027	<0.000050	<0.000050	0.0069	0.0068
2015	Q4	EV_HC1	<0.010	<0.010	<0.000050	<0.000050	0.0069	0.0067
2015	Q1	EV_MC2	<0.010	0.024	<0.000050	<0.000050	0.015	0.015
2015	Q4	EV_MC2	<0.010	0.014	<0.000050	<0.000050	0.023	0.022
2015	Q2	FR_FRCP1	<0.010	0.11	<0.000050	0.00014	0.019	0.018
2015	Q3	FR_FRCP1	<0.010	0.033	<0.000050	<0.000050	0.03	0.031
2015	Q1	GH_ERC	<0.010	0.036	<0.000050	0.0002	0.0019	0.002
2015	Q2	GH_ERC	<0.010	0.15	<0.000050	0.00011	0.0022	0.0023
2015	Q3	GH_ERC	<0.010	0.088	<0.000050	0.00007	0.0017	0.002
2015	Q4	GH_ERC	<0.010	<0.010	<0.000050	<0.000050	0.002	0.0021
2015	Q1	GH_FR1	<0.010	<0.010	<0.000050	<0.000050	0.016	0.015
2015	Q2	GH_FR1	<0.010	0.07	<0.000050	0.000063	0.014	0.014
2015	Q4	GH_FR1	<0.010	<0.010	<0.000050	<0.000050	0.017	0.017
2015	Q1	LC_LCDSSLCC	<0.010	<0.010	<0.000050	<0.000050	0.031	0.031
2016	Q4	CM_MC2	<0.010	0.15	<0.000050	0.000098	0.01	0.01
2016	Q2	EV_HC1	<0.010	0.14	<0.000050	0.000095	0.0064	0.0068
2016	Q3	EV_HC1	<0.010	0.063	<0.000050	0.000076	0.0084	0.0083
2016	Q4	EV_HC1	<0.010	0.058	<0.000050	<0.000050	0.0077	0.0081
2016	Q1	EV_MC2	<0.010	0.038	<0.000050	0.000053	0.018	0.018
2016	Q2	EV_MC2	0.012	0.46	<0.000050	0.00039	0.0052	0.0056
2016	Q3	EV_MC2	<0.010	0.01	<0.000050	<0.000050	0.031	0.033
2016	Q4	EV_MC2	0.023	0.16	<0.000050	0.00012	0.0064	0.0068
2016	Q3	FR_FRCP1	<0.010	0.032	<0.000050	<0.000050	0.032	0.032
2016	Q1	GH_ERC	<0.010	<0.010	<0.000050	<0.000050	0.0023	0.0025
2016	Q2	GH_ERC	<0.010	0.38	<0.000050	0.00022	0.0021	0.0025
2016	Q3	GH_ERC	<0.010	0.024	<0.000050	<0.000050	0.0024	0.0024
2016	Q4	GH_ERC	<0.010	0.028	<0.000050	<0.000050	0.0026	0.0022
2016	Q3	GH_FR1	<0.010	0.016	<0.000050	<0.000050	0.017	0.017
2016	Q4	GH_FR1	<0.01	0.022	<0.00005	<0.00005	0.017	0.017
2016	Q1	LC_LCDSSLCC	<0.010	<0.010	<0.000050	<0.000050	0.037	0.038
2016	Q3	LC_LCDSSLCC	<0.010	<0.010	<0.000050	<0.000050	0.034	0.032
2016	Q4	LC_LCDSSLCC	<0.010	<0.010	<0.000050	<0.000050	0.027	0.026
2017	Q1	CM_MC2	<0.01	0.013	<0.00005	<0.00005	0.018	0.017
2017	Q2	CM_MC2	<0.01	0.16	<0.00005	0.00012	0.015	0.015
2017	Q2	CM_MC2	<0.01	0.11	<0.00005	0.000077	0.017	0.02
2017	Q3	CM_MC2	<0.01	0.032	<0.00005	<0.00005	0.017	0.016
2017	Q4	CM_MC2	<0.01	0.013	<0.00005	<0.00005	0.022	0.023
2017	Q1	EV_HC1	<0.01	0.017	<0.00005	<0.00005	0.0064	0.0065
2017	Q2	EV_HC1	<0.01	0.1	<0.00005	0.000076	0.0068	0.0068
2017	Q3	EV_HC1	<0.01	0.011	<0.00005	<0.00005	0.0071	0.0066
2017	Q4	EV_HC1	<0.01	0.012	<0.00005	<0.00005	0.0065	0.0072
2017	Q1	EV_MC2	<0.01	0.029	<0.00005	<0.00005	0.018	0.017
2017	Q2	EV_MC2	0.021	0.15	<0.00005	0.00016	0.0082	0.0077
2017	Q3	EV_MC2	<0.01	0.012	<0.00005	<0.00005	0.016	0.015
2017	Q4	EV_MC2	<0.01	0.016	<0.00005	<0.00005	0.016	0.016
2017	Q1	FR_FRCP1	<0.01	0.03	<0.00005	<0.00005	0.056	0.056
2017	Q2	FR_FRCP1	0.018	0.49	<0.00005	0.00035	0.032	0.03
2017	Q3	FR_FRCP1	<0.01	0.022	<0.00005	<0.00005	0.029	0.029
2017	Q4	FR_FRCP1	0.01	0.027	<0.00005	<0.00005	0.042	0.042
2017	Q1	GH_ERC	<0.01	<0.01	<0.00005	<0.00005	0.0031	0.0035
2017	Q2	GH_ERC	<0.01	0.13	<0.00005	0.00008	0.0029	0.0032
2017	Q3	GH_ERC	<0.01	0.061	<0.00005	<0.00005	0.0025	0.0024
2017	Q4	GH_ERC	<0.01	<0.01	<0.00005	<0.00005	0.0027	0.0025
2017	Q1	GH_FR1	<0.01	0.011	<0.00005	<0.00005	0.016	0.016
2017	Q2	GH_FR1	0.013	0.55	<0.00005	0.00043	0.015	0.015
2017	Q3	GH_FR1	<0.01	0.013	<0.00005	<0.00005	0.019	0.018
2017	Q4	GH_FR1	<0.01	<0.01	<0.00005	<0.00005	0.018	0.018
2017	Q1	LC_LCDSSLCC	<0.01	0.025	<0.00005	<0.00005	0.04	0.039
2017	Q2	LC_LCDSSLCC	<0.01	0.033	<0.00005	<0.00005	0.048	0.047
2017	Q3	LC_LCDSSLCC	<0.01	<0.01	0.000097	<0.00005	0.036	0.036
2017	Q4	LC_LCDSSLCC	<0.01	<0.01	<0.00005	<0.00005	0.037	0.04
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	<0.010	0.3	<0.000050	0.00017	0.0064	0.0067
2015	Q3	CM_MC2	<0.010	0.022	<0.000050	<0.000050	0.013	0.014
2015	Q4	CM_MC2	<0.010	<0.010	<0.000050	<0.000050	0.011	0.012
2015	Q1	EV_HC1	0.01	0.013	0.00005	0.00005	0.0047	0.0047
2015	Q2	EV_MC2	<0.010	0.39	<0.000050	0.00028	0.0054	0.0052
2015	Q3	EV_MC2	<0.010	0.018	<0.000050	<0.000050	0.022	0.021
2015	Q1	FR_FRCP1	<0.020	<0.020	<0.00010	<0.00010	0.054	0.056
2015	Q4	FR_FRCP1	<0.010	0.019	<0.000050	<0.000050	0.042	0.037
2015	Q3	GH_FR1	<0.010	0.016	<0.000050	<0.000050	0.015	0.015
2015	Q2	LC_LCDSSLCC	<0.010	0.018	<0.000050	<0.000050	0.016	0.016
2015	Q3	LC_LCDSSLCC	<0.010	<0.010	<0.000050	<0.000050	0.021	0.023
2015	Q4	LC_LCDSSLCC	<0.050	<0.050	<0.00025	<0.00025	0.036	0.036
2016	Q1	CM_MC2	<0.010	0.011	<0.000050	<0.000050	0.014	0.014
2016	Q2	CM_MC2	<0.010	0.39	<0.000050	0.00021	0.0083	0.0085
2016	Q3	CM_MC2	<0.010	<0.010	<0.000050	<0.000050	0.016	0.017
2016	Q1	EV_HC1	<0.010	<0.020	<0.000050	<0.000050	0.0066	0.0065
2016	Q1	FR_FRCP1	<0.010	<0.020	<0.000050	<0.000050	0.058	0.059
2016	Q2	FR_FRCP1	<0.010	0.13	<0.000050	0.000099	0.016	0.018
2016	Q4	FR_FRCP1	<0.010	0.027	<0.000050	<0.000050	0.029	0.03
2016	Q1	GH_FR1	<0.010	<0.010	<0.000050	<0.000050	0.015	0.014
2016	Q2	GH_FR1	<0.010	0.13	<0.000050	0.000096	0.012	0.012
2016	Q2	LC_LCDSSLCC	<0.010	0.027	<0.000050	<0.000050	0.023	0.024
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**  
Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

## Appendix D: Concentration-Response Analysis

**Table D-2: *P. subcapita* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	MAGNESIUM-T- mg/l	MANGANESE-D- mg/l	MANGANESE-T- mg/l	MERCURY-D-mg/l	MERCURY-T-mg/l	MOLYBDENUM-D- mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	15	0.000054	0.00018	<0.000010	<0.000010	0.00053
2015	Q1	Reference (FR_UFR1)	15	0.000054	0.00018	<0.000010	<0.000010	0.00053
2015	Q1	Reference (FR_UFR1)	14	0.00017	0.00037	<0.000010	<0.000010	0.00056
2015	Q2	Reference (FR_UFR1)	9.2	0.00064	0.0025	<0.000050	<0.000050	0.00052
2015	Q3	Reference (FR_UFR1)	13	0.00062	0.0015	<0.000050	<0.000050	0.00068
2015	Q4	Reference (FR_UFR1)	14	0.0001	0.00031	<0.000050	<0.000050	0.00065
2015	Q2	Reference (GH_ER2)	11	0.0033	0.0059	<0.000050	<0.000050	0.00092
2015	Q4	Reference (GH_ER2)	11	0.0021	0.0027	<0.000050	<0.000050	0.001
2016	Q1	Reference (FR_UFR1)	15	0.0002	0.00034	<0.000050	<0.000050	0.00058
2016	Q2	Reference (FR_UFR1)	9.8	0.00045	0.0021	<0.000050	0.000014	0.00061
2016	Q3	Reference (FR_UFR1)	14	0.00027	0.0011	<0.000050	<0.000050	0.00063
2016	Q4	Reference (FR_UFR1)	12	0.00027	0.00073	<0.000050	0.0000056	0.00057
2016	Q2	Reference (GH_ER2)	11	0.0018	0.012	<0.000050	0.0000098	0.00091
2016	Q4	Reference (GH_ER2)	9.6	0.0012	0.0021	<0.000050	<0.000050	0.00097
2017	Q2	Reference (CM_MC1)	10	0.00015	0.00057	<0.000005	0.0000011	0.00074
2017	Q3	Reference (CM_MC1)	9.5	<0.0001	0.001	<0.000005	0.0000067	0.00088
2017	Q4	Reference (CM_MC1)	11	0.00012	0.00035	<0.000005	0.0000059	0.0009
2017	Q1	Reference (FR_UFR1)	14	<0.0001	0.00027	<0.000005	<0.000005	0.00062
2017	Q2	Reference (FR_UFR1)	8.7	0.0012	0.0035	<0.000005	0.0000031	0.00048
2017	Q3	Reference (FR_UFR1)	13	0.00036	0.0011	<0.000005	<0.000005	0.00064
2017	Q4	Reference (FR_UFR1)	14	<0.0001	0.00056	<0.000005	<0.000005	0.00055
2017	Q2	Reference (GH_ER2)	12	0.00095	0.0054	<0.000005	0.0000082	0.00094
2017	Q3	Reference (GH_ER2)	9.6	0.0021	0.0031	<0.000005	0.000006	0.00096
2017	Q4	Reference (GH_ER2)	11	0.00061	0.0016	<0.000005	<0.000005	0.0011
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	46	0.0046	0.0064	<0.000010	<0.000010	0.001
2015	Q2	EV_HC1	21	0.00053	0.0016	0.000005	0.000005	0.0005
2015	Q3	EV_HC1	41	0.0028	0.0051	<0.000050	<0.000050	0.00092
2015	Q4	EV_HC1	50	0.0018	0.002	<0.0000050	<0.0000050	0.00097
2015	Q1	EV_MC2	33	0.0024	0.0022	<0.000010	<0.000010	0.00079
2015	Q4	EV_MC2	39	0.0013	0.0018	<0.0000050	<0.0000050	0.002
2015	Q2	FR_FRCP1	29	0.0032	0.012	<0.0000050	<0.0000050	0.0013
2015	Q3	FR_FRCP1	51	0.0031	0.0069	<0.0000050	<0.0000050	0.0015
2015	Q1	GH_ERC	13	0.00035	0.0026	<0.000010	<0.000010	0.00092
2015	Q2	GH_ERC	12	0.00072	0.0081	<0.0000050	<0.0000050	0.00095
2015	Q3	GH_ERC	11	0.00058	0.0078	<0.0000050	<0.0000050	0.00095
2015	Q4	GH_ERC	13	0.00063	0.0013	<0.0000050	<0.0000050	0.00099
2015	Q1	GH_FR1	49	0.0017	0.0021	<0.000010	<0.000010	0.00095
2015	Q2	GH_FR1	34	0.0011	0.0044	<0.0000050	<0.0000050	0.0011
2015	Q4	GH_FR1	43	0.0011	0.0016	<0.0000050	<0.0000050	0.0009
2015	Q1	LC_LCDSSLCC	53	0.00074	0.0021	<0.000010	<0.000010	0.0017
2016	Q4	CM_MC2	33	0.0062	0.014	<0.0000050	0.0000012	0.00097
2016	Q2	EV_HC1	33	0.00048	0.0037	0.0000062	0.0000077	0.00074
2016	Q3	EV_HC1	44	0.0054	0.0081	<0.0000050	0.0000012	0.00092
2016	Q4	EV_HC1	46	0.0021	0.0033	<0.0000050	0.0000085	0.00091
2016	Q1	EV_MC2	37	0.0012	0.0021	<0.0000050	<0.0000050	0.0015
2016	Q2	EV_MC2	11	0.00014	0.013	0.0000015	0.0000018	0.00064
2016	Q3	EV_MC2	42	0.0009	0.0014	<0.0000050	0.0000085	0.0012
2016	Q4	EV_MC2	17	0.001	0.0044	0.0000016	0.0000025	0.0006
2016	Q3	FR_FRCP1	48	0.0045	0.0074	<0.0000050	<0.0000050	0.0013
2016	Q1	GH_ERC	16	0.00026	0.00034	<0.0000050	<0.0000050	0.00094
2016	Q2	GH_ERC	13	0.0013	0.018	<0.0000050	0.0000016	0.00091
2016	Q3	GH_ERC	11	0.00045	0.0019	<0.0000050	<0.0000050	0.00091
2016	Q4	GH_ERC	12	0.00044	0.0027	<0.0000050	<0.0000050	0.0011
2016	Q3	GH_FR1	40	0.00092	0.002	<0.0000050	<0.0000050	0.0009
2016	Q4	GH_FR1	44	0.00072	0.0017	<0.0000050	<0.0000050	0.001
2016	Q1	LC_LCDSSLCC	60	0.0058	0.0064	<0.0000050	<0.0000050	0.0016
2016	Q3	LC_LCDSSLCC	37	0.0009	0.0018	<0.0000050	<0.0000050	0.0016
2016	Q4	LC_LCDSSLCC	35	0.002	0.0032	<0.0000050	<0.0000050	0.0014
2017	Q1	CM_MC2	55	0.011	0.013	<0.0000050	<0.0000050	0.0014
2017	Q2	CM_MC2	36	0.026	0.031	<0.0000050	0.0000011	0.0013
2017	Q2	CM_MC2	47	0.024	0.034	<0.0000050	0.0000013	0.0014
2017	Q3	CM_MC2	47	0.0058	0.01	<0.0000050	0.0000013	0.0015
2017	Q4	CM_MC2	58	0.002	0.0034	<0.0000050	<0.0000050	0.0014
2017	Q1	EV_HC1	47	0.0024	0.0027	<0.0000050	<0.0000050	0.00091
2017	Q2	EV_HC1	38	0.0014	0.0034	0.0000061	0.0000013	0.00082
2017	Q3	EV_HC1	46	0.0054	0.0057	0.000006	0.0000012	0.00085
2017	Q4	EV_HC1	44	<0.0001	0.0057	<0.0000050	<0.0000050	0.00089
2017	Q1	EV_MC2	32	0.00068	0.002	<0.0000050	<0.0000050	0.0015
2017	Q2	EV_MC2	17	0.0019	0.0085	0.0000012	0.0000032	0.00074
2017	Q3	EV_MC2	31	0.0018	0.0022	<0.0000050	0.000008	0.0012
2017	Q4	EV_MC2	32	<0.0001	0.002	<0.0000050	<0.0000050	0.00085
2017	Q1	FR_FRCP1	106	0.008	0.01	<0.0000050	<0.0000050	0.0017
2017	Q2	FR_FRCP1	39	0.0057	0.022	<0.0000050	0.0000038	0.0012
2017	Q3	FR_FRCP1	54	0.0054	0.0075	<0.0000050	<0.0000050	0.0013
2017	Q4	FR_FRCP1	90	0.0073	0.011	<0.0000050	<0.0000050	0.0013
2017	Q1	GH_ERC	14	0.00012	0.00032	<0.0000050	<0.0000050	0.00099
2017	Q2	GH_ERC	15	0.00083	0.0062	<0.0000050	0.0000073	0.00097
2017	Q3	GH_ERC	11	0.0011	0.004	<0.0000050	0.000007	0.00099
2017	Q4	GH_ERC	12	0.00044	0.0011	<0.0000050	<0.0000050	0.0011
2017	Q1	GH_FR1	49	0.0012	0.0015	<0.0000050	<0.0000050	0.00081
2017	Q2	GH_FR1	44	0.0032	0.014	<0.0000050	0.0000047	0.0012
2017	Q3	GH_FR1	43	0.0017	0.0023	<0.0000050	0.000005	0.00094
2017	Q4	GH_FR1	51	0.0013	0.0014	<0.0000050	<0.0000050	0.00089
2017	Q1	LC_LCDSSLCC	58	0.0016	0.0022	<0.0000050	<0.0000050	0.0022
2017	Q2	LC_LCDSSLCC	48	0.00081	0.0036	<0.0000050	0.0000069	0.002
2017	Q3	LC_LCDSSLCC	37	0.00066	0.00087	<0.0000050	0.000005	0.0017
2017	Q4	LC_LCDSSLCC	49	0.0011	0.0022	<0.0000050	<0.0000050	0.0016
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	23	0.0035	0.011	<0.0000050	0.0000084	0.00076
2015	Q3	CM_MC2	51	0.0018	0.0032	<0.0000050	<0.0000050	0.001
2015	Q4	CM_MC2	51	0.00064	0.0012	<0.0000050	<0.0000050	0.00092
2015	Q1	EV_HC1	31	0.001	0.0015	0.00001	0.00001	0.00063
2015	Q2	EV_MC2	13	0.0003	0.01	<0.0000050	<0.0000050	0.00059
2015	Q3	EV_MC2	35	0.00067	0.002	<0.0000050	<0.0000050	0.0022
2015	Q1	FR_FRCP1	261	0.0019	0.0027	<0.000010	<0.000010	0.0028
2015	Q4	FR_FRCP1	65	0.0076	0.0081	<0.0000050	<0.0000050	0.0015
2015	Q3	GH_FR1	37	0.00089	0.0023	<0.0000050	<0.0000050	0.00099
2015	Q2	LC_LCDSSLCC	25	0.00016	0.00051	<0.0000050	<0.0000050	0.0011
2015	Q3	LC_LCDSSLCC	34	0.0002	0.00054	<0.0000050	<0.0000050	0.0014
2015	Q4	LC_LCDSSLCC	54	<0.00050	<0.00050	<0.0000050	<0.0000050	0.0017
2016	Q1	CM_MC2	52	0.0045	0.0052	<0.0000050	<0.0000050	0.0010
2016	Q2	CM_MC2	26	0.0062	0.019	<0.0000050	0.0000011	0.00076
2016	Q3	CM_MC2	53	0.00052	0.0013	<0.0000050	<0.0000050	0.0011
2016	Q1	EV_HC1	51	0.0013	0.0016	<0.0000050	<0.0000050	0.00092
2016	Q1	FR_FRCP1	142	0.0068	0.0075	<0.0000050	<0.0000050	0.0017
2016	Q2	FR_FRCP1	32	0.0028	0.0097	<0.0000050	0.0000012	0.0012
2016	Q4	FR_FRCP1	45	0.0063	0.0083	<0.0000050	<0.0000050	0.0012
2016	Q1	GH_FR1	52	0.001	0.0012	<0.0000050	<0.0000050	0.00084
2016	Q2	GH_FR1	31	0.0015	0.0056	<0.0000050	0.0000025	0.001
2016	Q2	LC_LCDSSLCC	28	0.0016	0.0033	<0.0000050	0.0000069	0.0014
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								
			-	-	-	-	-	-

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent  
**Screening**  
 Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: P. subcapita Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	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)- N-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.00054	<0.00050	<0.00050	0.13	<0.0010	<0.0050
2015	Q1	Reference (FR_UFR1)	0.00054	<0.00050	<0.00050	0.13	<0.0010	<0.0050
2015	Q1	Reference (FR_UFR1)	0.00055	<0.00050	<0.00050	0.13	<0.0010	<0.0050
2015	Q2	Reference (FR_UFR1)	0.00062	<0.00050	<0.00050	0.066	<0.0010	<0.0050
2015	Q3	Reference (FR_UFR1)	0.00068	<0.00050	<0.00050	0.019	<0.0010	<0.0050
2015	Q4	Reference (FR_UFR1)	0.00059	<0.00050	<0.00050	0.022	<0.0010	<0.0050
2015	Q2	Reference (GH_ER2)	0.00094	<0.00050	<0.00050	0.086	<0.0010	<0.0050
2015	Q4	Reference (GH_ER2)	0.0010	<0.00050	<0.00050	0.078	<0.0010	<0.0050
2016	Q1	Reference (FR_UFR1)	0.00056	<0.00050	<0.00050	0.17	<0.0010	<0.0050
2016	Q2	Reference (FR_UFR1)	0.00062	<0.00050	<0.00050	0.034	<0.0010	<0.0050
2016	Q3	Reference (FR_UFR1)	0.00063	<0.00050	<0.00050	0.057	<0.0010	<0.0050
2016	Q4	Reference (FR_UFR1)	0.00056	<0.00050	<0.00050	0.1	<0.0010	<0.0050
2016	Q2	Reference (GH_ER2)	0.00093	<0.00050	0.0005	0.12	<0.0010	<0.0050
2016	Q4	Reference (GH_ER2)	0.001	<0.00050	<0.00050	0.071	<0.0010	<0.0050
2017	Q2	Reference (CM_MC1)	0.0008	<0.0005	<0.0005	0.012	<0.001	<0.005
2017	Q3	Reference (CM_MC1)	0.00085	<0.0005	<0.0005	0.012	<0.001	0.0067
2017	Q4	Reference (CM_MC1)	0.00087	<0.0005	<0.0005	0.015	<0.001	<0.005
2017	Q1	Reference (FR_UFR1)	0.00062	<0.0005	<0.0005	0.22	<0.001	<0.005
2017	Q2	Reference (FR_UFR1)	0.0005	0.00052	0.00069	0.098	<0.001	0.011
2017	Q3	Reference (FR_UFR1)	0.00068	<0.0005	<0.0005	0.11	<0.001	0.01
2017	Q4	Reference (FR_UFR1)	0.00054	<0.0005	<0.0005	0.0094	0.0011	<0.005
2017	Q2	Reference (GH_ER2)	0.00095	<0.0005	<0.0005	0.12	<0.001	<0.005
2017	Q3	Reference (GH_ER2)	0.00098	<0.0005	<0.0005	0.037	<0.001	0.0069
2017	Q4	Reference (GH_ER2)	0.0011	<0.0005	<0.0005	0.037	<0.001	0.0089
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.0011	0.0095	0.0097	2.4	0.012	0.0055
2015	Q2	EV_HC1	0.00048	0.00075	0.00083	0.57	0.001	0.0084
2015	Q3	EV_HC1	0.00092	0.00079	0.00079	0.87	0.0011	<0.0050
2015	Q4	EV_HC1	0.00098	0.00066	0.00069	1.2	<0.0050	<0.0050
2015	Q1	EV_MC2	0.00078	0.0007	0.00052	3.2	0.0013	<0.0050
2015	Q4	EV_MC2	0.0021	0.0039	0.0041	5.9	<0.0050	<0.0050
2015	Q2	FR_FRCP1	0.0013	0.002	0.0024	7.4	0.0056	0.0095
2015	Q3	FR_FRCP1	0.0015	0.0041	0.0043	8.2	0.0049	<0.0050
2015	Q1	GH_ERC	0.00099	<0.00050	<0.00050	0.44	<0.0010	<0.0050
2015	Q2	GH_ERC	0.00097	<0.00050	<0.00050	0.31	<0.0010	<0.0050
2015	Q3	GH_ERC	0.001	<0.00050	<0.00050	0.17	<0.0010	<0.0050
2015	Q4	GH_ERC	0.0011	<0.00050	<0.00050	0.46	<0.0010	<0.0050
2015	Q1	GH_FR1	0.00098	0.0022	0.0023	13	0.0039	<0.0050
2015	Q2	GH_FR1	0.0011	0.0019	0.002	7.5	0.0028	<0.0050
2015	Q4	GH_FR1	0.00099	0.0012	0.0012	10	<0.0050	<0.0050
2015	Q1	LC_LCDSSLCC	0.0017	0.0036	0.0036	15	0.003	<0.0050
2016	Q4	CM_MC2	0.00098	0.0073	0.0083	1.8	0.01	0.0076
2016	Q2	EV_HC1	0.00077	0.00097	0.0012	0.82	<0.0010	<0.0050
2016	Q3	EV_HC1	0.00091	0.00074	0.0009	0.84	0.0016	0.0088
2016	Q4	EV_HC1	0.00093	0.00073	0.00087	1.0	<0.0050	<0.0050
2016	Q1	EV_MC2	0.0015	0.0025	0.0026	5.1	<0.0050	<0.0050
2016	Q2	EV_MC2	0.00069	0.0014	0.0022	0.78	<0.0010	<0.0050
2016	Q3	EV_MC2	0.0012	0.0022	0.0024	6.5	<0.0050	0.0073
2016	Q4	EV_MC2	0.00065	0.00078	0.0012	1.2	0.001	<0.0050
2016	Q3	FR_FRCP1	0.0013	0.0049	0.0052	12	<0.0050	<0.0050
2016	Q1	GH_ERC	0.00092	<0.00050	<0.00050	0.76	<0.0010	<0.0050
2016	Q2	GH_ERC	0.00092	<0.00050	0.00067	0.41	<0.0010	<0.0050
2016	Q3	GH_ERC	0.00087	<0.00050	<0.00050	0.2	<0.0010	<0.0050
2016	Q4	GH_ERC	0.001	<0.00050	0.00086	0.28	<0.0010	<0.0050
2016	Q3	GH_FR1	0.00097	0.0015	0.0015	9.6	0.0056	<0.0050
2016	Q4	GH_FR1	0.0011	0.0019	0.002	8.8	<0.005	<0.005
2016	Q1	LC_LCDSSLCC	0.0017	0.0034	0.0034	11	0.0098	<0.0050
2016	Q3	LC_LCDSSLCC	0.0015	0.0044	0.0046	8.6	<0.0050	<0.0050
2016	Q4	LC_LCDSSLCC	0.0015	0.004	0.0038	7.3	<0.0050	<0.0050
2017	Q1	CM_MC2	0.0015	0.023	0.025	4.2	0.018	0.012
2017	Q2	CM_MC2	0.0013	0.024	0.024	2.2	0.013	0.073
2017	Q2	CM_MC2	0.0017	0.022	0.027	2.3	0.013	0.052
2017	Q3	CM_MC2	0.0015	0.028	0.029	3.1	0.024	0.02
2017	Q4	CM_MC2	0.0014	0.016	0.017	3.7	0.0099	0.0075
2017	Q1	EV_HC1	0.00093	0.00074	0.00078	1.2	<0.001	0.0052
2017	Q2	EV_HC1	0.00086	0.001	0.0013	0.85	<0.001	<0.005
2017	Q3	EV_HC1	0.00085	0.00078	0.00093	0.79	<0.001	<0.005
2017	Q4	EV_HC1	0.00087	<0.0005	0.00078	0.86	<0.001	0.024
2017	Q1	EV_MC2	0.0015	0.0021	0.0025	3.5	<0.001	0.0075
2017	Q2	EV_MC2	0.00066	0.0014	0.0019	1.1	0.0011	0.024
2017	Q3	EV_MC2	0.0013	0.0019	0.0021	2.2	0.0032	0.0082
2017	Q4	EV_MC2	0.00092	<0.0005	0.00091	2.7	0.0017	0.025
2017	Q1	FR_FRCP1	0.0017	0.0097	0.01	20	0.02	0.0066
2017	Q2	FR_FRCP1	0.0015	0.0041	0.0056	12	0.0045	0.026
2017	Q3	FR_FRCP1	0.0013	0.0045	0.005	8.9	0.0041	0.0084
2017	Q4	FR_FRCP1	0.0013	0.0082	0.0088	15	0.0082	0.0051
2017	Q1	GH_ERC	0.00099	<0.0005	<0.0005	0.45	<0.001	<0.005
2017	Q2	GH_ERC	0.0011	<0.0005	<0.0005	0.5	<0.001	<0.005
2017	Q3	GH_ERC	0.001	<0.0005	<0.0005	0.19	<0.001	0.0063
2017	Q4	GH_ERC	0.0011	<0.0005	<0.0005	0.25	0.0022	<0.005
2017	Q1	GH_FR1	0.00084	0.0014	0.0013	13	<0.005	<0.005
2017	Q2	GH_FR1	0.0014	0.0031	0.0048	6.7	<0.005	<0.005
2017	Q3	GH_FR1	0.001	0.0025	0.0028	9.5	0.0072	0.0074
2017	Q4	GH_FR1	0.00092	0.0017	0.0018	11	0.0057	0.0067
2017	Q1	LC_LCDSSLCC	0.0023	0.0039	0.0038	12	<0.005	<0.005
2017	Q2	LC_LCDSSLCC	0.002	0.0052	0.0055	15	0.004	<0.005
2017	Q3	LC_LCDSSLCC	0.0016	0.0061	0.0059	10	0.0041	0.0067
2017	Q4	LC_LCDSSLCC	0.0016	0.0053	0.0057	9.6	0.0013	0.0066
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.00081	0.0062	0.0076	1.2	0.0029	<0.0050
2015	Q3	CM_MC2	0.0011	0.013	0.013	2.5	0.0088	<0.0050
2015	Q4	CM_MC2	0.00096	0.0059	0.006	2.2	<0.0050	<0.0050
2015	Q1	EV_HC1	0.00065	0.0006	0.00064	0.8	0.001	0.005
2015	Q2	EV_MC2	0.00054	0.00077	0.0014	0.81	<0.0010	<0.0050
2015	Q3	EV_MC2	0.0022	0.0047	0.0048	5.7	0.0027	0.01
2015	Q1	FR_FRCP1	0.0029	0.031	0.032	30	<0.020	<0.0050
2015	Q4	FR_FRCP1	0.0014	0.0068	0.0066	15	<0.0050	<0.0050
2015	Q3	GH_FR1	0.0010	0.0016	0.0017	9.1	0.0046	0.0071
2015	Q2	LC_LCDSSLCC	0.0012	0.0036	0.0036	5.8	0.0014	<0.0050
2015	Q3	LC_LCDSSLCC	0.0015	0.0047	0.005	7.2	<0.0020	<0.0050
2015	Q4	LC_LCDSSLCC	0.0016	0.0065	0.0071	13	0.003	<0.0050
2016	Q1	CM_MC2	0.0010	0.0094	0.0098	2.9	0.012	<0.0050
2016	Q2	CM_MC2	0.00074	0.011	0.011	2.0	0.0037	0.0074
2016	Q3	CM_MC2	0.0012	0.012	0.013	2.7	<0.0050	<0.0050
2016	Q1	EV_HC1	0.00092	0.0062	<0.0010	1.2	<0.0050	<0.0050
2016	Q1	FR_FRCP1	0.0018	0.013	0.013	28	<0.010	<0.0050
2016	Q2	FR_FRCP1	0.0013	0.0021	0.003	7.4	0.0033	0.0086
2016	Q4	FR_FRCP1	0.0012	0.0045	0.0047	10	<0.0050	<0.0050
2016	Q1	GH_FR1	0.00086	0.0014	0.0014	13	<0.0050	<0.0050
2016	Q2	GH_FR1	0.001	0.0019	0.0022	6.5	0.0025	<0.0050
2016	Q2	LC_LCDSSLCC	0.0014	0.0045	0.0048	6.3	<0.0010	<0.0050
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with P. subcapitata did not screen in as having "possible" or "likely" responses.



**Appendix D: Concentration-Response Analysis**

**Table D-2: P. subcapita Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	0.0032	8.4	0.0042	0.4	0.00069	0.00073
2015	Q1	Reference (FR_UFR1)	0.0032	8.4	0.0042	0.4	0.00069	0.00073
2015	Q1	Reference (FR_UFR1)	0.0027	8.3	0.0035	0.42	0.00076	0.00073
2015	Q2	Reference (FR_UFR1)	0.0042	8.4	0.01	0.37	0.00048	0.00049
2015	Q3	Reference (FR_UFR1)	0.0029	8.4	0.0054	0.52	0.00047	0.00043
2015	Q4	Reference (FR_UFR1)	0.0017	8.4	0.0022	0.42	0.00069	0.00062
2015	Q2	Reference (GH_ER2)	<0.0010	8.3	0.008	0.37	0.00079	0.00087
2015	Q4	Reference (GH_ER2)	0.0015	8.3	<0.0020	0.35	0.00072	0.00078
2016	Q1	Reference (FR_UFR1)	0.0032	8.3	0.0036	0.37	0.0008	0.00078
2016	Q2	Reference (FR_UFR1)	0.0041	8.3	0.0078	0.34	0.00052	0.00055
2016	Q3	Reference (FR_UFR1)	0.0031	8.2	0.0038	0.47	0.00056	0.00063
2016	Q4	Reference (FR_UFR1)	0.0023	8.3	0.0028	0.38	0.00069	0.00068
2016	Q2	Reference (GH_ER2)	0.0011	8.2	0.016	0.46	0.00083	0.00083
2016	Q4	Reference (GH_ER2)	< 0.0010	8.3	< 0.0020	0.36	0.00087	0.00083
2017	Q2	Reference (CM_MC1)	0.0029	8.2	0.0094	0.43	0.00029	0.00025
2017	Q3	Reference (CM_MC1)	0.005	8.2	0.06	0.45	0.00019	0.00024
2017	Q4	Reference (CM_MC1)	0.0035	8.3	0.0045	0.49	0.00019	0.00019
2017	Q1	Reference (FR_UFR1)	0.0049	8.3	0.0071	0.38	0.0012	0.0010
2017	Q2	Reference (FR_UFR1)	0.0087	8.3	0.02	0.38	0.0007	0.0006
2017	Q3	Reference (FR_UFR1)	0.0027	8.4	0.0078	0.48	0.0006	0.00059
2017	Q4	Reference (FR_UFR1)	0.0016	8.4	0.0023	0.4	0.00058	0.00055
2017	Q2	Reference (GH_ER2)	<0.001	8.4	0.0058	0.41	0.00086	0.00098
2017	Q3	Reference (GH_ER2)	0.001	8.4	0.0059	0.38	0.00067	0.00064
2017	Q4	Reference (GH_ER2)	<0.001	8.4	<0.002	0.38	0.00089	0.00087
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.001	8.4	0.005	1.4	0.0059	0.006
2015	Q2	EV_HC1	0.0031	7.5	0.0081	0.55	0.019	0.018
2015	Q3	EV_HC1	0.004	8.4	0.0082	0.99	0.029	0.028
2015	Q4	EV_HC1	0.0058	8.4	0.0057	0.9	0.033	0.037
2015	Q1	EV_MC2	<0.0010	8.3	0.0047	1.2	0.024	0.022
2015	Q4	EV_MC2	0.0035	8.2	0.0036	1.3	0.024	0.025
2015	Q2	FR_FRCP1	0.0014	8.4	0.018	1.2	0.03	0.03
2015	Q3	FR_FRCP1	<0.0010	8.4	0.0027	1.8	0.057	0.057
2015	Q1	GH_ERC	<0.0010	8.3	0.0043	0.37	0.0019	0.0019
2015	Q2	GH_ERC	<0.0010	8.4	0.016	0.41	0.0017	0.0018
2015	Q3	GH_ERC	<0.0010	8.3	0.0077	0.42	0.0011	0.0012
2015	Q4	GH_ERC	0.0018	8.3	<0.0020	0.39	0.0015	0.0016
2015	Q1	GH_FR1	<0.0010	8.3	0.0036	1.2	0.051	0.052
2015	Q2	GH_FR1	<0.0010	8.4	0.01	1.1	0.031	0.032
2015	Q4	GH_FR1	<0.0010	8.4	<0.0020	1.2	0.04	0.039
2015	Q1	LC_LCDSSLCC	<0.0010	8.3	0.0029	1.2	0.072	0.071
2016	Q4	CM_MC2	0.0016	8.3	0.0063	1.3	0.0041	0.0044
2016	Q2	EV_HC1	0.0054	8.3	0.01	0.87	0.031	0.031
2016	Q3	EV_HC1	0.0064	8.3	0.012	0.98	0.031	0.032
2016	Q4	EV_HC1	0.0061	8.4	0.0079	1.0	0.032	0.032
2016	Q1	EV_MC2	< 0.0010	8.1	0.0023	1.1	0.022	0.021
2016	Q2	EV_MC2	0.013	8.1	0.039	0.64	0.0036	0.0033
2016	Q3	EV_MC2	0.004	8.1	0.0052	1.6	0.026	0.026
2016	Q4	EV_MC2	0.0081	8.2	0.014	0.75	0.0054	0.006
2016	Q3	FR_FRCP1	0.0011	8.4	0.0027	1.6	0.054	0.056
2016	Q1	GH_ERC	< 0.0010	8.2	< 0.0020	0.39	0.0023	0.0023
2016	Q2	GH_ERC	< 0.0010	8.3	0.027	0.55	0.0023	0.002
2016	Q3	GH_ERC	< 0.0010	8.2	0.0049	0.42	0.00098	0.0010
2016	Q4	GH_ERC	< 0.0010	8.3	< 0.0020	0.41	0.0014	0.0014
2016	Q3	GH_FR1	< 0.0010	8.3	0.0061	1.2	0.034	0.037
2016	Q4	GH_FR1	<0.001	8.3	0.0023	1.3	0.041	0.039
2016	Q1	LC_LCDSSLCC	0.0011	8.3	< 0.0020	1.4	0.036	0.035
2016	Q3	LC_LCDSSLCC	0.0021	8.4	0.0027	1.4	0.027	0.027
2016	Q4	LC_LCDSSLCC	0.0013	8.3	< 0.0020	1.1	0.024	0.023
2017	Q1	CM_MC2	0.0022	8.3	0.0043	1.9	0.0079	0.0072
2017	Q2	CM_MC2	<0.001	8.2	0.018	1.4	0.0056	0.0048
2017	Q2	CM_MC2	<0.001	8.3	0.0098	1.9	0.0058	0.0061
2017	Q3	CM_MC2	<0.001	8.5	0.009	1.7	0.0078	0.0075
2017	Q4	CM_MC2	<0.001	8.3	0.005	2.1	0.0092	0.0087
2017	Q1	EV_HC1	0.0068	8.3	0.0077	0.92	0.036	0.038
2017	Q2	EV_HC1	0.0044	8.3	0.016	1.0	0.035	0.03
2017	Q3	EV_HC1	0.0054	8.4	0.0072	0.87	0.033	0.035
2017	Q4	EV_HC1	0.0048	8.5	0.0098	0.87	0.041	0.037
2017	Q1	EV_MC2	0.0044	8.2	0.0056	1.2	0.016	0.016
2017	Q2	EV_MC2	0.0041	8.1	0.033	0.78	0.0072	0.0064
2017	Q3	EV_MC2	<0.001	8.4	0.0032	1.1	0.012	0.013
2017	Q4	EV_MC2	0.0014	8.3	0.0029	1.1	0.019	0.018
2017	Q1	FR_FRCP1	<0.001	8.3	0.0054	2.4	0.17	0.15
2017	Q2	FR_FRCP1	0.0028	8.4	0.042	1.5	0.058	0.051
2017	Q3	FR_FRCP1	0.002	8.3	0.0071	1.8	0.065	0.063
2017	Q4	FR_FRCP1	<0.001	8.2	<0.002	2.1	0.14	0.12
2017	Q1	GH_ERC	0.001	8.2	<0.002	0.4	0.0018	0.0017
2017	Q2	GH_ERC	<0.001	8.4	0.01	0.45	0.0024	0.0023
2017	Q3	GH_ERC	<0.001	8.4	0.0086	0.42	0.0013	0.0012
2017	Q4	GH_ERC	<0.001	8.4	<0.002	0.39	0.0014	0.0012
2017	Q1	GH_FR1	0.0011	8.3	0.0039	1.2	0.057	0.051
2017	Q2	GH_FR1	0.0038	8.4	0.029	1.6	0.043	0.041
2017	Q3	GH_FR1	<0.001	8.4	0.005	1.3	0.047	0.044
2017	Q4	GH_FR1	<0.001	8.2	0.0026	1.2	0.067	0.057
2017	Q1	LC_LCDSSLCC	0.0024	8.3	0.0052	1.4	0.034	0.036
2017	Q2	LC_LCDSSLCC	0.0016	8.3	<0.002	1.6	0.046	0.041
2017	Q3	LC_LCDSSLCC	0.0021	8.4	0.0052	1.2	0.041	0.036
2017	Q4	LC_LCDSSLCC	<0.001	8.2	<0.002	1.5	0.042	0.037
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	<0.0010	8.4	0.017	0.98	0.0043	0.0043
2015	Q3	CM_MC2	<0.0010	8.4	0.003	1.5	0.0062	0.0064
2015	Q4	CM_MC2	<0.0010	8.3	<0.0020	1.5	0.006	0.0058
2015	Q1	EV_HC1	0.0035	7.4	0.0047	0.62	0.022	0.022
2015	Q2	EV_MC2	<0.0010	8.1	0.037	0.67	0.0052	0.005
2015	Q3	EV_MC2	0.0027	8.1	0.0052	1.5	0.023	0.023
2015	Q1	FR_FRCP1	<0.0010	8.3	0.0021	4.0	0.49	0.5
2015	Q4	FR_FRCP1	<0.0010	8.3	<0.0020	1.9	0.078	0.076
2015	Q3	GH_FR1	<0.0010	8.3	0.0036	1.2	0.035	0.036
2015	Q2	LC_LCDSSLCC	0.0027	8.4	0.0056	0.82	0.025	0.025
2015	Q3	LC_LCDSSLCC	0.0018	8.4	0.0029	1.1	0.037	0.04
2015	Q4	LC_LCDSSLCC	<0.0010	8.3	<0.0050	1.4	0.052	0.054
2016	Q1	CM_MC2	< 0.0010	8.3	< 0.0020	1.6	0.0054	0.0058
2016	Q2	CM_MC2	0.0028	8.2	0.022	1.1	0.0062	0.0057
2016	Q3	CM_MC2	< 0.0010	8.4	< 0.0020	1.7	0.0059	0.006
2016	Q1	EV_HC1	0.0041	8.3	0.0045	0.86	0.04	0.037
2016	Q1	FR_FRCP1	< 0.0010	8.2	< 0.0020	2.5	0.21	0.21
2016	Q2	FR_FRCP1	0.0029	8.3	0.013	1.2	0.032	0.032
2016	Q4	FR_FRCP1	< 0.0010	8.4	< 0.0020	1.4	0.054	0.051
2016	Q1	GH_FR1	< 0.0010	8.3	< 0.0020	1.1	0.052	0.05
2016	Q2	GH_FR1	0.002	8.3	0.013	1.1	0.028	0.029
2016	Q2	LC_LCDSSLCC	< 0.0010	8.3	0.0027	0.99	0.018	0.019
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with P. subcapitata did not screen in as having "possible" or "likely" responses.

## Appendix D: Concentration-Response Analysis

**Table D-2: *P. subcapita* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	0.77	0.088	0.091	47
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	0.77	0.088	0.091	47
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	0.72	0.089	0.092	46
2015	Q2	Reference (FR_UFR1)	<0.000010	<0.000010	0.56	0.061	0.066	15
2015	Q3	Reference (FR_UFR1)	<0.000010	<0.000010	0.69	0.093	0.093	32
2015	Q4	Reference (FR_UFR1)	<0.000010	<0.000010	0.69	0.095	0.091	48
2015	Q2	Reference (GH_ER2)	<0.000010	<0.000010	0.73	0.2	0.21	18
2015	Q4	Reference (GH_ER2)	<0.000010	<0.000010	0.67	0.21	0.22	22
2016	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	0.68	0.089	0.09	50
2016	Q2	Reference (FR_UFR1)	<0.000010	<0.000010	0.63	0.063	0.065	13
2016	Q3	Reference (FR_UFR1)	<0.000010	<0.000010	0.68	0.095	0.098	35
2016	Q4	Reference (FR_UFR1)	<0.000010	<0.000010	0.7	0.093	0.095	40
2016	Q2	Reference (GH_ER2)	<0.000010	<0.000010	0.75	0.2	0.2	17
2016	Q4	Reference (GH_ER2)	<0.000010	<0.000010	0.61	0.24	0.24	23
2017	Q2	Reference (CM_MC1)	<0.00001	<0.00001	2.7	0.14	0.14	11
2017	Q3	Reference (CM_MC1)	<0.00001	<0.00001	2.0	0.14	0.13	13
2017	Q4	Reference (CM_MC1)	<0.00001	<0.00001	2.9	0.16	0.16	13
2017	Q1	Reference (FR_UFR1)	<0.00001	<0.00001	0.77	0.097	0.097	45
2017	Q2	Reference (FR_UFR1)	<0.00001	0.00002	0.62	0.064	0.062	22
2017	Q3	Reference (FR_UFR1)	<0.00001	<0.00001	0.69	0.088	0.09	32
2017	Q4	Reference (FR_UFR1)	<0.00001	<0.00001	0.72	0.1	0.095	44
2017	Q2	Reference (GH_ER2)	<0.00001	<0.00001	0.73	0.21	0.21	21
2017	Q3	Reference (GH_ER2)	<0.00001	<0.00001	0.6	0.19	0.19	15
2017	Q4	Reference (GH_ER2)	<0.00001	<0.00001	0.7	0.21	0.21	18
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	<0.000010	<0.000010	10	0.29	0.3	249
2015	Q2	EV_HC1	0.00001	0.00001	0.82	0.062	0.061	79
2015	Q3	EV_HC1	<0.000010	<0.000010	1.5	0.11	0.11	165
2015	Q4	EV_HC1	<0.000010	<0.000010	1.7	0.13	0.13	218
2015	Q1	EV_MC2	<0.000010	<0.000010	5.7	0.19	0.2	147
2015	Q4	EV_MC2	<0.000010	<0.000010	4.8	0.23	0.23	183
2015	Q2	FR_FRCP1	<0.000010	<0.000010	1.2	0.11	0.11	126
2015	Q3	FR_FRCP1	<0.000010	<0.000010	1.6	0.13	0.13	234
2015	Q1	GH_ERC	<0.000010	<0.000010	0.95	0.2	0.21	30
2015	Q2	GH_ERC	<0.000010	<0.000010	0.97	0.21	0.21	25
2015	Q3	GH_ERC	<0.000010	<0.000010	0.74	0.19	0.2	20
2015	Q4	GH_ERC	<0.000010	<0.000010	0.94	0.22	0.23	37
2015	Q1	GH_FR1	<0.000010	<0.000010	2.4	0.16	0.16	233
2015	Q2	GH_FR1	<0.000010	<0.000010	1.7	0.12	0.12	136
2015	Q4	GH_FR1	<0.000010	<0.000010	2.2	0.14	0.15	189
2015	Q1	LC_LCDSSLCC	<0.000010	<0.000010	5.9	0.23	0.23	283
2016	Q4	CM_MC2	<0.000010	<0.000010	6.7	0.22	0.22	178
2016	Q2	EV_HC1	<0.000010	<0.000010	1.3	0.096	0.099	120
2016	Q3	EV_HC1	<0.000010	<0.000010	1.6	0.12	0.12	176
2016	Q4	EV_HC1	<0.000010	<0.000010	1.9	0.13	0.13	193
2016	Q1	EV_MC2	<0.000010	<0.000010	4.9	0.2	0.21	174
2016	Q2	EV_MC2	<0.000010	0.000017	1.7	0.088	0.092	36
2016	Q3	EV_MC2	<0.000010	<0.000010	6.6	0.23	0.24	214
2016	Q4	EV_MC2	<0.000010	<0.000010	2.7	0.11	0.12	63
2016	Q3	FR_FRCP1	<0.000010	<0.000010	1.6	0.14	0.14	249
2016	Q1	GH_ERC	<0.000010	<0.000010	1.0	0.24	0.24	61
2016	Q2	GH_ERC	<0.000010	<0.000010	0.94	0.21	0.2	33
2016	Q3	GH_ERC	<0.000010	<0.000010	0.7	0.21	0.2	26
2016	Q4	GH_ERC	<0.000010	<0.000010	0.85	0.25	0.24	32
2016	Q3	GH_FR1	<0.000010	<0.000010	1.9	0.13	0.14	168
2016	Q4	GH_FR1	<0.00001	<0.00001	2.0	0.14	0.14	196
2016	Q1	LC_LCDSSLCC	<0.000010	<0.000010	6.9	0.23	0.24	303
2016	Q3	LC_LCDSSLCC	<0.000010	<0.000010	5.1	0.2	0.19	187
2016	Q4	LC_LCDSSLCC	<0.000010	<0.000010	4.2	0.18	0.17	176
2017	Q1	CM_MC2	<0.00001	<0.00001	15	0.39	0.41	319
2017	Q2	CM_MC2	<0.00001	<0.00001	11	0.35	0.33	236
2017	Q2	CM_MC2	<0.00001	<0.00001	18	0.36	0.44	237
2017	Q3	CM_MC2	<0.00001	<0.00001	11	0.35	0.35	280
2017	Q4	CM_MC2	<0.00001	<0.00001	14	0.41	0.44	331
2017	Q1	EV_HC1	<0.00001	<0.00001	1.7	0.13	0.13	204
2017	Q2	EV_HC1	<0.00001	<0.00001	1.5	0.11	0.11	147
2017	Q3	EV_HC1	<0.00001	<0.00001	1.4	0.12	0.12	161
2017	Q4	EV_HC1	<0.00001	<0.00001	1.5	0.13	0.13	189
2017	Q1	EV_MC2	<0.00001	<0.00001	5.9	0.2	0.2	148
2017	Q2	EV_MC2	<0.00001	<0.00001	3.4	0.15	0.14	68
2017	Q3	EV_MC2	<0.00001	<0.00001	4.0	0.19	0.18	116
2017	Q4	EV_MC2	<0.00001	<0.00001	4.8	0.18	0.2	133
2017	Q1	FR_FRCP1	<0.00001	<0.00001	2.3	0.19	0.2	531
2017	Q2	FR_FRCP1	<0.00001	0.000025	1.3	0.13	0.13	205
2017	Q3	FR_FRCP1	<0.00001	<0.00001	1.5	0.13	0.13	260
2017	Q4	FR_FRCP1	<0.00001	<0.00001	2.0	0.17	0.17	510
2017	Q1	GH_ERC	<0.00001	<0.00001	1.0	0.21	0.22	38
2017	Q2	GH_ERC	<0.00001	<0.00001	1.1	0.22	0.23	36
2017	Q3	GH_ERC	<0.00001	<0.00001	0.72	0.19	0.19	21
2017	Q4	GH_ERC	<0.00001	<0.00001	0.84	0.21	0.21	23
2017	Q1	GH_FR1	<0.00001	<0.00001	2.2	0.16	0.16	232
2017	Q2	GH_FR1	<0.00001	0.000021	2.2	0.13	0.14	170
2017	Q3	GH_FR1	<0.00001	<0.00001	1.9	0.13	0.13	186
2017	Q4	GH_FR1	<0.00001	<0.00001	2.3	0.16	0.15	232
2017	Q1	LC_LCDSSLCC	<0.00001	<0.00001	7.4	0.23	0.22	295
2017	Q2	LC_LCDSSLCC	<0.00001	<0.00001	7.3	0.23	0.22	254
2017	Q3	LC_LCDSSLCC	<0.00001	<0.00001	5.4	0.19	0.19	206
2017	Q4	LC_LCDSSLCC	<0.00001	<0.00001	6.4	0.21	0.21	245
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	<0.000010	<0.000010	4.5	0.16	0.17	110
2015	Q3	CM_MC2	<0.000010	<0.000010	8.7	0.27	0.29	249
2015	Q4	CM_MC2	<0.000010	<0.000010	11	0.3	0.3	277
2015	Q1	EV_HC1	0.00001	0.00001	1.2	0.085	0.087	130
2015	Q2	EV_MC2	<0.000010	0.000017	2.1	0.1	0.093	41
2015	Q3	EV_MC2	<0.000010	<0.000010	4.6	0.21	0.21	169
2015	Q1	FR_FRCP1	<0.000020	<0.000020	2.1	0.22	0.23	1460
2015	Q4	FR_FRCP1	<0.000010	<0.000010	2.0	0.16	0.16	327
2015	Q3	GH_FR1	<0.000010	<0.000010	1.8	0.13	0.13	154
2015	Q2	LC_LCDSSLCC	<0.000010	<0.000010	2.9	0.13	0.13	107
2015	Q3	LC_LCDSSLCC	<0.000010	<0.000010	3.9	0.16	0.17	157
2015	Q4	LC_LCDSSLCC	<0.000050	<0.000050	6.2	0.21	0.22	237
2016	Q1	CM_MC2	<0.000010	<0.000010	13	0.33	0.32	291
2016	Q2	CM_MC2	<0.000010	<0.000010	5.5	0.18	0.18	131
2016	Q3	CM_MC2	<0.000010	<0.000010	11	0.32	0.34	277
2016	Q1	EV_HC1	<0.000010	<0.000010	1.7	0.13	0.13	222
2016	Q1	FR_FRCP1	<0.000010	<0.000010	2.2	0.2	0.2	765
2016	Q2	FR_FRCP1	<0.000010	<0.000010	1.1	0.097	0.1	116
2016	Q4	FR_FRCP1	<0.000010	<0.000010	1.5	0.14	0.14	245
2016	Q1	GH_FR1	<0.000010	<0.000010	2.1	0.16	0.16	247
2016	Q2	GH_FR1	<0.000010	<0.000010	1.4	0.11	0.1	121
2016	Q2	LC_LCDSSLCC	<0.000010	<0.000010	3.6	0.13	0.13	110
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**  
 Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

**Appendix D: Concentration-Response Analysis**

**Table D-2: *P. subcapita* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	THALLIUM-D-mg/l	THALLIUM-T-mg/l	TIN-D-mg/l	TIN-T-mg/l	TITANIUM-D-mg/l	TITANIUM-T-mg/l
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q2	Reference (FR_UFR1)	<0.000010	0.00001	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q2	Reference (GH_ER2)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	Reference (GH_ER2)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q1	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	0.011	0.011
2016	Q2	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q3	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	Reference (FR_UFR1)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q2	Reference (GH_ER2)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	Reference (GH_ER2)	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2017	Q2	Reference (CM_MC1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	Reference (CM_MC1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	Reference (CM_MC1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	Reference (FR_UFR1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	Reference (FR_UFR1)	<0.00001	<0.00001	0.00011	<0.0001	<0.01	<0.01
2017	Q3	Reference (FR_UFR1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	Reference (FR_UFR1)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	Reference (GH_ER2)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	Reference (GH_ER2)	<0.00001	<0.00001	0.00011	<0.0001	<0.01	<0.01
2017	Q4	Reference (GH_ER2)	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	0.000014	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q2	EV_HC1	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q3	EV_HC1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	EV_HC1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	EV_MC2	<0.000010	<0.000010	0.00018	<0.00010	0.014	0.013
2015	Q4	EV_MC2	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q2	FR_FRCP1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	FR_FRCP1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q2	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	GH_ERC	<0.000010	<0.000010	<0.00010	0.00016	<0.010	<0.010
2015	Q4	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	0.011	0.011
2015	Q2	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	LC_LCDSSLCC	<0.000010	<0.000010	<0.00010	<0.00010	0.014	0.013
2016	Q4	CM_MC2	0.00001	0.000017	<0.00010	<0.00010	<0.010	<0.010
2016	Q2	EV_HC1	<0.000010	0.000014	<0.00010	<0.00010	0.013	0.015
2016	Q3	EV_HC1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	EV_HC1	<0.000010	0.00001	<0.00010	<0.00010	<0.010	<0.010
2016	Q1	EV_MC2	<0.000010	0.00001	<0.00010	<0.00010	0.015	0.016
2016	Q2	EV_MC2	<0.000010	0.000023	<0.00010	<0.00010	<0.010	0.015
2016	Q3	EV_MC2	0.000011	0.000012	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	EV_MC2	<0.000010	0.000015	<0.00010	<0.00010	<0.010	<0.010
2016	Q3	FR_FRCP1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q1	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	0.012	0.012
2016	Q2	GH_ERC	<0.000010	0.000014	<0.00010	<0.00010	<0.010	<0.010
2016	Q3	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	GH_ERC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q3	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	GH_FR1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q1	LC_LCDSSLCC	<0.000010	<0.000010	<0.00010	<0.00010	0.017	0.018
2016	Q3	LC_LCDSSLCC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	LC_LCDSSLCC	0.00001	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2017	Q1	CM_MC2	0.000014	0.000016	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	CM_MC2	0.000014	0.000022	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	CM_MC2	0.000015	0.00004	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	CM_MC2	0.000017	0.000019	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	CM_MC2	0.000016	0.000016	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	EV_HC1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	EV_HC1	<0.00001	0.000017	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	EV_HC1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	EV_HC1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	EV_MC2	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	EV_MC2	<0.00001	0.000011	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	EV_MC2	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	EV_MC2	<0.00001	<0.00001	<0.0001	0.00014	<0.01	<0.01
2017	Q1	FR_FRCP1	0.000013	0.000012	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	FR_FRCP1	0.000011	0.00003	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	FR_FRCP1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	FR_FRCP1	0.000012	0.000012	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	GH_ERC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	GH_ERC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	GH_ERC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	GH_ERC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	GH_FR1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	GH_FR1	<0.00001	0.000025	<0.0001	<0.0001	<0.01	<0.015
2017	Q3	GH_FR1	<0.00001	<0.00001	0.00011	<0.0001	<0.01	<0.01
2017	Q4	GH_FR1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q1	LC_LCDSSLCC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	LC_LCDSSLCC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q3	LC_LCDSSLCC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	LC_LCDSSLCC	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	0.000011	0.000018	<0.00010	<0.00010	<0.010	0.011
2015	Q3	CM_MC2	0.000014	0.000019	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	CM_MC2	0.000011	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	EV_HC1	0.00001	0.00001	0.0001	0.0001	0.011	0.011
2015	Q2	EV_MC2	0.000011	0.000025	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	EV_MC2	0.000013	0.000014	<0.00010	<0.00010	<0.010	<0.010
2015	Q1	FR_FRCP1	0.00003	0.000032	<0.00020	<0.00020	0.017	0.017
2015	Q4	FR_FRCP1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	GH_FR1	<0.000010	<0.000010	<0.00010	0.00015	<0.010	<0.010
2015	Q2	LC_LCDSSLCC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q3	LC_LCDSSLCC	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2015	Q4	LC_LCDSSLCC	<0.000050	<0.000050	<0.00050	<0.00050	<0.010	<0.010
2016	Q1	CM_MC2	0.00001	0.000018	<0.00010	<0.00010	<0.010	<0.010
2016	Q2	CM_MC2	0.00001	0.00002	<0.00010	<0.00010	<0.010	0.012
2016	Q3	CM_MC2	0.000017	0.000014	<0.00010	<0.00010	<0.010	<0.010
2016	Q1	EV_HC1	<0.000010	<0.000010	<0.00010	<0.00010	0.015	0.015
2016	Q1	FR_FRCP1	0.000016	0.000015	<0.00010	<0.00010	0.021	0.021
2016	Q2	FR_FRCP1	<0.000010	0.000013	<0.00010	<0.00010	<0.010	<0.010
2016	Q4	FR_FRCP1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q1	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	0.017	0.017
2016	Q2	GH_FR1	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010
2016	Q2	LC_LCDSSLCC	0.00001	<0.000010	<0.00010	<0.00010	0.011	0.012
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**  
 Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

## Appendix D: Concentration-Response Analysis

**Table D-2: *P. subcapitata* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>								
2015	Q1	Reference (FR_UFR1)	229	<0.050	0.69	<1.0	0.13	0.00047
2015	Q1	Reference (FR_UFR1)	229	<0.050	0.69	<1.0	0.13	0.00047
2015	Q1	Reference (FR_UFR1)	222	<0.050	<0.50	<1.0	0.33	0.00047
2015	Q2	Reference (FR_UFR1)	147	0.1	2.1	2.4	1.5	0.00031
2015	Q3	Reference (FR_UFR1)	211	0.08	1.0	1.1	0.2	0.00042
2015	Q4	Reference (FR_UFR1)	215	0.095	0.6	<1.0	0.26	0.00047
2015	Q2	Reference (GH_ER2)	191	0.067	1.8	4.4	3.9	0.00079
2015	Q4	Reference (GH_ER2)	171	<0.050	<0.50	<1.0	0.26	0.00071
2016	Q1	Reference (FR_UFR1)	244	< 0.050	< 0.50	< 1.0	0.17	0.0005
2016	Q2	Reference (FR_UFR1)	135	0.086	2.8	1.9	1.6	0.00032
2016	Q3	Reference (FR_UFR1)	222	0.077	0.92	1.2	0.22	0.00042
2016	Q4	Reference (FR_UFR1)	204	0.069	1.1	< 1.0	0.85	0.00044
2016	Q2	Reference (GH_ER2)	174	0.077	2.2	15	4.7	0.00076
2016	Q4	Reference (GH_ER2)	167	< 0.050	0.62	< 1.0	0.38	0.00076
2017	Q2	Reference (CM_MC1)	148	0.098	1.9	<1	0.41	0.00018
2017	Q3	Reference (CM_MC1)	162	0.1	1.2	<1	0.37	0.0002
2017	Q4	Reference (CM_MC1)	166	<0.2	1.4	2.4	1.3	0.00023
2017	Q1	Reference (FR_UFR1)	194	<0.05	1.0	<1	0.25	0.00046
2017	Q2	Reference (FR_UFR1)	143	0.18	3.7	4.4	4.7	0.00035
2017	Q3	Reference (FR_UFR1)	164	0.078	2.7	1.1	0.36	0.00037
2017	Q4	Reference (FR_UFR1)	221	<0.05	1.0	1.2	0.45	0.00051
2017	Q2	Reference (GH_ER2)	180	0.068	1.1	6.2	3.8	0.00079
2017	Q3	Reference (GH_ER2)	148	0.12	0.91	1.4	0.81	0.00053
2017	Q4	Reference (GH_ER2)	174	<0.05	0.91	<1	0.38	0.00077
<b>Tests categorized as no adverse response</b>								
2015	Q1	CM_MC2	551	<0.050	0.82	1.7	0.53	0.0022
2015	Q2	EV_HC1	233	0.13	1.4	2.6	1.2	0.0012
2015	Q3	EV_HC1	479	0.073	1.6	2.3	0.77	0.0023
2015	Q4	EV_HC1	529	0.096	0.74	<1.0	0.29	0.0026
2015	Q1	EV_MC2	438	0.13	1.2	1.2	0.31	0.0013
2015	Q4	EV_MC2	492	0.14	0.7	1.0	0.36	0.0019
2015	Q2	FR_FRCP1	372	<0.050	2.2	7.7	2.0	0.0015
2015	Q3	FR_FRCP1	566	0.14	0.93	2.6	0.47	0.0027
2015	Q1	GH_ERC	203	<0.050	0.5	2.6	0.41	0.00081
2015	Q2	GH_ERC	203	0.12	1.3	7.0	1.6	0.00083
2015	Q3	GH_ERC	179	<0.050	0.79	5.1	1.3	0.00065
2015	Q4	GH_ERC	214	<0.050	0.52	<1.0	0.26	0.00077
2015	Q1	GH_FR1	621	<0.050	1.1	<1.0	0.18	0.0022
2015	Q2	GH_FR1	398	<0.050	1.6	3.6	2.2	0.0016
2015	Q4	GH_FR1	520	0.091	0.57	<1.0	0.3	0.0019
2015	Q1	LC_LCDSSLCC	690	<0.050	0.9	<1.0	0.29	0.0039
2016	Q4	CM_MC2	451	0.15	2.4	9.1	3.8	0.0017
2016	Q2	EV_HC1	378	0.19	2.5	5.9	3.1	0.002
2016	Q3	EV_HC1	496	0.096	1.5	2.7	2.6	0.0023
2016	Q4	EV_HC1	480	0.1	1.7	1.8	2.3	0.0026
2016	Q1	EV_MC2	482	0.11	0.77	< 1.0	0.77	0.0017
2016	Q2	EV_MC2	165	0.2	3.3	25	11	0.00052
2016	Q3	EV_MC2	570	0.14	0.96	< 1.0	0.3	0.0015
2016	Q4	EV_MC2	228	0.2	3.4	6.8	5.5	0.00062
2016	Q3	FR_FRCP1	611	0.17	1.3	1.4	0.36	0.003
2016	Q1	GH_ERC	256	< 0.050	< 0.50	< 1.0	0.24	0.00099
2016	Q2	GH_ERC	191	0.19	2.2	23	5.7	0.00085
2016	Q3	GH_ERC	195	0.055	0.65	< 1.0	1.1	0.0007
2016	Q4	GH_ERC	203	< 0.050	0.8	3.4	1.2	0.00089
2016	Q3	GH_FR1	477	0.15	1.3	< 1.0	0.43	0.002
2016	Q4	GH_FR1	517	0.13	1.1	<2	0.49	0.0021
2016	Q1	LC_LCDSSLCC	713	0.07	< 0.50	< 1.0	0.35	0.0039
2016	Q3	LC_LCDSSLCC	508	< 0.050	0.52	< 1.0	0.28	0.0029
2016	Q4	LC_LCDSSLCC	487	0.13	0.91	< 1.0	0.39	0.0032
2017	Q1	CM_MC2	733	0.08	1.0	1.1	0.55	0.0031
2017	Q2	CM_MC2	541	0.3	2.3	9.0	6.9	0.0022
2017	Q2	CM_MC2	544	0.24	1.6	4.4	2.3	0.0022
2017	Q3	CM_MC2	558	0.27	0.99	2.4	1.0	0.0023
2017	Q4	CM_MC2	793	0.27	1.1	5.2	2.2	0.0034
2017	Q1	EV_HC1	492	0.081	0.89	<1	0.4	0.0027
2017	Q2	EV_HC1	398	0.22	3.1	4.2	3.4	0.0022
2017	Q3	EV_HC1	436	0.069	1.0	<1	0.31	0.0021
2017	Q4	EV_HC1	474	<0.2	0.97	<1	0.31	0.0022
2017	Q1	EV_MC2	429	0.11	0.73	<1	0.7	0.0016
2017	Q2	EV_MC2	222	0.31	3.3	20	11	0.00078
2017	Q3	EV_MC2	362	0.29	1.7	1.7	0.45	0.0012
2017	Q4	EV_MC2	420	<0.2	0.9	1.6	1.2	0.001
2017	Q1	FR_FRCP1	1140	<0.05	1.5	1.2	0.44	0.0059
2017	Q2	FR_FRCP1	496	0.67	3.2	17	23	0.0024
2017	Q3	FR_FRCP1	587	0.85	3.4	1.8	0.47	0.0027
2017	Q4	FR_FRCP1	980	0.57	0.84	<1	0.7	0.0055
2017	Q1	GH_ERC	223	<0.05	<0.5	<1	0.13	0.00085
2017	Q2	GH_ERC	210	0.074	1.1	6.8	2.5	0.00094
2017	Q3	GH_ERC	160	0.076	0.83	4.0	1.7	0.00058
2017	Q4	GH_ERC	193	<0.05	0.96	<1	0.56	0.00087
2017	Q1	GH_FR1	618	0.1	0.63	<1	0.47	0.0024
2017	Q2	GH_FR1	497	0.39	5.9	15	25	0.0024
2017	Q3	GH_FR1	502	0.62	0.99	1.2	0.54	0.0019
2017	Q4	GH_FR1	586	0.53	1.9	1.1	0.77	0.0027
2017	Q1	LC_LCDSSLCC	707	0.12	0.71	1.4	0.36	0.0039
2017	Q2	LC_LCDSSLCC	676	0.69	1.3	2.3	1.2	0.0033
2017	Q3	LC_LCDSSLCC	531	0.66	1.3	<1	0.43	0.0028
2017	Q4	LC_LCDSSLCC	651	0.51	0.94	<1	0.28	0.0038
<b>Test categorized as possible or likely response (2015 to 2016)</b>								
2015	Q2	CM_MC2	314	0.12	1.8	9.6	5.8	0.0011
2015	Q3	CM_MC2	626	0.1	0.75	1.2	0.61	0.0024
2015	Q4	CM_MC2	627	0.11	0.83	6.6	0.99	0.0022
2015	Q1	EV_HC1	325	0.05	0.84	1.0	0.24	0.0017
2015	Q2	EV_MC2	195	0.28	2.5	23	4.7	0.00051
2015	Q3	EV_MC2	477	0.16	0.83	1.2	0.34	0.0019
2015	Q1	FR_FRCP1	2580	<0.050	1.5	<1.0	0.12	0.015
2015	Q4	FR_FRCP1	765	<0.050	0.81	<1.0	0.29	0.0038
2015	Q3	GH_FR1	473	<0.050	0.86	1.2	0.33	0.0018
2015	Q2	LC_LCDSSLCC	337	<0.050	1.5	1.6	0.48	0.002
2015	Q3	LC_LCDSSLCC	447	0.12	0.64	1.4	0.35	0.0026
2015	Q4	LC_LCDSSLCC	565	<0.050	0.99	<1.0	0.29	0.0038
2016	Q1	CM_MC2	639	0.095	0.69	< 1.0	0.57	0.0026
2016	Q2	CM_MC2	401	0.2	2.2	15	6.5	0.0013
2016	Q3	CM_MC2	644	0.13	1.2	1.5	0.37	0.0026
2016	Q1	EV_HC1	504	0.081	1.0	< 1.0	0.25	0.0027
2016	Q1	FR_FRCP1	1520	< 0.050	0.95	< 1.0	0.28	0.0079
2016	Q2	FR_FRCP1	354	0.21	2.9	7.1	1.5	0.0016
2016	Q4	FR_FRCP1	608	0.14	1.1	< 1.0	0.84	0.003
2016	Q1	GH_FR1	622	< 0.050	0.71	< 1.0	0.35	0.0022
2016	Q2	GH_FR1	366	0.2	2.0	7.1	3.0	0.0015
2016	Q2	LC_LCDSSLCC	352	0.18	1.8	< 1.0	0.94	0.0022
<b>Tests categorized as possible or likely response (2017)</b>								
No tests were in this category								

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

### Appendix D: Concentration-Response Analysis

**Table D-2: *P. subcapitata* Cell Yield Paired with Water Quality**

Year	Quarter	Sample ID	URANIUM-T-mg/l	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l	ZINC-T-mg/l	ΣTU-WQGs	ΣTU-WQGs/Bench marks
<b>Reference</b>									
2015	Q1	Reference (FR_UFR1)	0.00047	<0.0010	<0.0010	<0.0030	<0.0030	-	-
2015	Q1	Reference (FR_UFR1)	0.00047	<0.0010	<0.0010	<0.0030	<0.0030	-	-
2015	Q1	Reference (FR_UFR1)	0.00047	<0.0010	<0.0010	<0.0030	<0.0030	-	-
2015	Q2	Reference (FR_UFR1)	0.00033	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q3	Reference (FR_UFR1)	0.00042	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q4	Reference (FR_UFR1)	0.00044	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q2	Reference (GH_ER2)	0.00078	<0.00050	0.00051	<0.0030	<0.0030	-	-
2015	Q4	Reference (GH_ER2)	0.00072	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	Reference (FR_UFR1)	0.00049	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	Reference (FR_UFR1)	0.00033	<0.00050	0.00051	<0.0030	<0.0030	-	-
2016	Q3	Reference (FR_UFR1)	0.00044	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q4	Reference (FR_UFR1)	0.00046	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	Reference (GH_ER2)	0.00079	<0.00050	0.001	<0.0030	<0.0030	-	-
2016	Q4	Reference (GH_ER2)	0.00079	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2017	Q2	Reference (CM_MC1)	0.0002	<0.0005	<0.0005	<0.001	<0.003	1.3	1.2
2017	Q3	Reference (CM_MC1)	0.00019	<0.0005	<0.0005	<0.001	<0.003	1.4	1.2
2017	Q4	Reference (CM_MC1)	0.00023	<0.0005	<0.0005	<0.003	<0.003	1.2	1.1
2017	Q1	Reference (FR_UFR1)	0.00048	<0.0005	<0.0005	<0.001	<0.003	1.6	1.1
2017	Q2	Reference (FR_UFR1)	0.00034	0.00053	0.001	0.0013	<0.003	4.0	3.6
2017	Q3	Reference (FR_UFR1)	0.00038	<0.0005	<0.0005	<0.001	<0.003	1.6	1.2
2017	Q4	Reference (FR_UFR1)	0.00045	<0.0005	<0.0005	<0.003	<0.003	1.4	1.1
2017	Q2	Reference (GH_ER2)	0.00079	<0.0005	0.00061	<0.003	<0.003	2.0	1.5
2017	Q3	Reference (GH_ER2)	0.00058	<0.0005	<0.0005	<0.001	<0.003	1.6	1.2
2017	Q4	Reference (GH_ER2)	0.00072	<0.0005	<0.0005	<0.003	<0.003	1.7	1.2
<b>Tests categorized as no adverse response</b>									
2015	Q1	CM_MC2	0.0023	<0.0010	<0.0010	<0.0030	0.0032	-	-
2015	Q2	EV_HC1	0.0012	0.0005	0.0005	0.003	0.003	-	-
2015	Q3	EV_HC1	0.0023	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q4	EV_HC1	0.0027	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q1	EV_MC2	0.0012	<0.0010	<0.0010	0.0041	<0.0030	-	-
2015	Q4	EV_MC2	0.0019	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q2	FR_FRCP1	0.0016	<0.00050	0.00054	<0.0030	<0.0030	-	-
2015	Q3	FR_FRCP1	0.0028	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q1	GH_ERC	0.00084	<0.0010	<0.0010	<0.0030	0.0041	-	-
2015	Q2	GH_ERC	0.00084	<0.00050	0.0007	<0.0030	<0.0030	-	-
2015	Q3	GH_ERC	0.00071	<0.00050	0.00058	<0.0030	<0.0030	-	-
2015	Q4	GH_ERC	0.00081	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q1	GH_FR1	0.0022	<0.0010	<0.0010	<0.0030	<0.0030	-	-
2015	Q2	GH_FR1	0.0016	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q4	GH_FR1	0.0019	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q1	LC_LCDSSLCC	0.004	<0.0010	<0.0010	0.0038	0.0039	-	-
2016	Q4	CM_MC2	0.0017	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	EV_HC1	0.0021	<0.00050	0.00077	<0.0030	<0.0030	-	-
2016	Q3	EV_HC1	0.0023	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q4	EV_HC1	0.0026	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	EV_MC2	0.0017	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	EV_MC2	0.00058	<0.00050	0.0019	<0.0030	0.0047	-	-
2016	Q3	EV_MC2	0.0015	<0.00050	<0.00050	<0.0030	0.0031	-	-
2016	Q4	EV_MC2	0.00066	<0.00050	0.0011	<0.0030	<0.0030	-	-
2016	Q3	FR_FRCP1	0.003	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	GH_ERC	0.00095	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	GH_ERC	0.00085	<0.00050	0.0014	<0.0030	0.0035	-	-
2016	Q3	GH_ERC	0.00067	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q4	GH_ERC	0.00084	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q3	GH_FR1	0.002	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q4	GH_FR1	0.0022	<0.0005	<0.0005	<0.003	<0.003	-	-
2016	Q1	LC_LCDSSLCC	0.0039	<0.00050	<0.00050	<0.0030	0.0034	-	-
2016	Q3	LC_LCDSSLCC	0.0024	<0.00050	<0.00050	0.0089	0.0075	-	-
2016	Q4	LC_LCDSSLCC	0.0031	<0.00050	<0.00050	0.0061	0.0078	-	-
2017	Q1	CM_MC2	0.0033	<0.0005	<0.0005	0.0041	0.004	13	8.5
2017	Q2	CM_MC2	0.0021	<0.0005	0.00077	0.005	0.0071	12	8.9
2017	Q2	CM_MC2	0.0027	<0.0005	<0.0005	0.0041	0.0059	13	9.7
2017	Q3	CM_MC2	0.0024	<0.0005	<0.0005	<0.001	<0.003	15	10
2017	Q4	CM_MC2	0.0035	<0.0005	<0.0005	<0.003	<0.003	11	6.3
2017	Q1	EV_HC1	0.0027	<0.0005	<0.0005	<0.003	<0.003	22	4.1
2017	Q2	EV_HC1	0.0023	<0.0005	0.00079	<0.001	0.0044	17	3.7
2017	Q3	EV_HC1	0.0021	<0.0005	<0.0005	<0.003	<0.003	20	3.6
2017	Q4	EV_HC1	0.0025	<0.0005	<0.0005	<0.003	<0.003	20	3.6
2017	Q1	EV_MC2	0.0016	<0.0005	<0.0005	<0.003	<0.003	11	3.3
2017	Q2	EV_MC2	0.00073	<0.0005	0.00096	0.0011	<0.003	6.1	2.9
2017	Q3	EV_MC2	0.0012	<0.0005	<0.0005	<0.003	<0.003	9.1	2.6
2017	Q4	EV_MC2	0.0012	<0.0005	<0.0005	<0.003	<0.003	11	2.7
2017	Q1	FR_FRCP1	0.006	<0.0005	<0.0005	0.0023	<0.003	88	15
2017	Q2	FR_FRCP1	0.0025	<0.0005	0.0032	0.002	0.0098	35	8.3
2017	Q3	FR_FRCP1	0.0027	<0.0005	<0.0005	<0.001	<0.003	37	6.6
2017	Q4	FR_FRCP1	0.0054	<0.0005	<0.0005	<0.003	<0.003	70	11
2017	Q1	GH_ERC	0.00083	<0.0005	<0.0005	<0.003	<0.003	2.3	1.4
2017	Q2	GH_ERC	0.00098	<0.0005	0.0007	<0.003	<0.003	3.0	1.8
2017	Q3	GH_ERC	0.00064	<0.0005	<0.0005	<0.001	<0.003	2.0	1.4
2017	Q4	GH_ERC	0.00079	<0.0005	<0.0005	<0.003	<0.003	1.9	1.3
2017	Q1	GH_FR1	0.0023	<0.0005	<0.0005	<0.003	<0.003	32	5.4
2017	Q2	GH_FR1	0.0024	<0.0005	0.0027	<0.003	0.0072	28	7.7
2017	Q3	GH_FR1	0.002	<0.0005	<0.0005	<0.001	<0.003	28	5.2
2017	Q4	GH_FR1	0.0025	<0.0005	<0.0005	<0.003	<0.003	34	5.7
2017	Q1	LC_LCDSSLCC	0.0041	<0.0005	<0.0005	0.0034	0.0042	25	5.4
2017	Q2	LC_LCDSSLCC	0.0036	<0.0005	<0.0005	0.0084	0.012	29	6.0
2017	Q3	LC_LCDSSLCC	0.0028	<0.0005	<0.0005	0.014	0.0098	25	5.5
2017	Q4	LC_LCDSSLCC	0.0038	<0.0005	<0.0005	0.0056	0.0076	25	5.5
<b>Test categorized as possible or likely response (2015 to 2016)</b>									
2015	Q2	CM_MC2	0.0011	<0.00050	0.00088	0.0031	0.0059	-	-
2015	Q3	CM_MC2	0.0025	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q4	CM_MC2	0.0022	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q1	EV_HC1	0.0017	0.001	0.001	0.003	0.003	-	-
2015	Q2	EV_MC2	0.00048	<0.00050	0.0016	<0.0030	0.0041	-	-
2015	Q3	EV_MC2	0.0019	<0.00050	<0.00050	<0.0030	0.0031	-	-
2015	Q1	FR_FRCP1	0.016	<0.0020	<0.0020	<0.0030	<0.0060	-	-
2015	Q4	FR_FRCP1	0.0037	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q3	GH_FR1	0.0018	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2015	Q2	LC_LCDSSLCC	0.002	<0.00050	<0.00050	0.0061	0.0066	-	-
2015	Q3	LC_LCDSSLCC	0.0028	<0.00050	<0.00050	0.0092	0.011	-	-
2015	Q4	LC_LCDSSLCC	0.004	<0.0025	<0.0025	0.0081	<0.015	-	-
2016	Q1	CM_MC2	0.0024	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	CM_MC2	0.0012	<0.00050	0.00085	0.0076	0.013	-	-
2016	Q3	CM_MC2	0.0027	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	EV_HC1	0.0028	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	FR_FRCP1	0.008	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	FR_FRCP1	0.0017	<0.00050	0.00061	<0.0030	0.0033	-	-
2016	Q4	FR_FRCP1	0.003	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q1	GH_FR1	0.0022	<0.00050	<0.00050	<0.0030	<0.0030	-	-
2016	Q2	GH_FR1	0.0015	<0.00050	0.0006	<0.0030	<0.0030	-	-
2016	Q2	LC_LCDSSLCC	0.0023	<0.00050	<0.00050	0.0089	0.01	-	-
<b>Tests categorized as possible or likely response (2017)</b>									
No tests were in this category									

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**

Screening was not conducted for 2017 because tests with *P. subcapitata* did not screen in as having "possible" or "likely" responses.

### Appendix D: Concentration-Response Analysis

**Table D-3: *Hyallolela* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	Mean Survival (Control Normalized)	Mean Dry Weight (Control Normalized)	ALKALINITY, TOTAL (As CaCO <sub>3</sub> ), 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
<b>Reference</b>															
2015	Q1	Reference (FR_UFR1)	72	82	139	0.0033	0.024	0.0001	0.0001	0.0001	0.00012	0.07	0.072	0.0001	0.0001
2015	Q2	Reference (FR_UFR1)	104	92	116	0.0048	0.049	0.0001	0.0001	0.00011	0.00013	0.043	0.043	0.0001	0.0001
2015	Q3	Reference (FR_UFR1)	96	70	160	0.003	0.0086	0.0001	0.00011	0.00011	0.00016	0.081	0.082	0.0001	0.0001
2015	Q4	Reference (FR_UFR1)	94	104	146	0.003	0.0056	0.0001	0.0001	0.0001	0.00011	0.073	0.074	0.0001	0.0001
2016	Q1	Reference (FR_UFR1)	100	95	141	0.0039	0.0055	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.076	0.075	< 0.0001	< 0.0001
2016	Q2	Reference (FR_UFR1)	98	105	114	0.0059	0.054	< 0.0001	< 0.0001	0.00011	0.00012	0.042	0.043	< 0.00004	< 0.00004
2016	Q3	Reference (FR_UFR1)	102	110	158	< 0.003	0.0071	< 0.0001	< 0.0001	< 0.0001	0.00011	0.075	0.077	< 0.00002	< 0.00002
2016	Q4	Reference (FR_UFR1)	96	113	141	0.0082	0.042	< 0.0001	< 0.0001	< 0.0001	0.00012	0.064	0.063	< 0.00002	< 0.00002
2017	Q3	Reference (CM_MC1)	80	65	142	0.0029	0.013	< 0.0001	0.00011	0.00021	0.00023	0.052	0.05	< 0.00002	< 0.00002
2017	Q4	Reference (CM_MC1)	98	71	136	< 0.003	0.0054	< 0.0001	< 0.0001	0.00015	0.00019	0.051	0.051	< 0.00002	< 0.00002
2017	Q1	Reference (FR_UFR1)	100	85	141	0.001	0.005	< 0.0001	0.00014	< 0.0001	0.00011	0.076	0.081	< 0.00002	< 0.00002
2017	Q2	Reference (FR_UFR1)	100	101	119	0.032	0.09	< 0.0001	0.00011	0.00014	0.00016	0.049	0.047	< 0.00002	< 0.00002
2017	Q3	Reference (FR_UFR1)	88	101	147	0.0026	0.0058	< 0.0001	0.0001	< 0.0001	0.00013	0.074	0.073	< 0.00002	< 0.00002
2017	Q4	Reference (FR_UFR1)	102	89	144	< 0.003	0.0033	< 0.0001	< 0.0001	< 0.0001	0.00011	0.073	0.074	< 0.00002	< 0.00002
2017	Q2	Reference (GH_ER2)	109	92	151	0.0032	0.14	< 0.0001	< 0.0001	0.00011	0.00019	0.048	0.048	< 0.00002	0.00002
2017	Q3	Reference (GH_ER2)	83	94	136	0.0029	0.014	< 0.0001	0.00012	0.00011	0.00012	0.047	0.046	< 0.00002	< 0.00002
2017	Q4	Reference (GH_ER2)	98	75	147	< 0.003	0.0067	< 0.0001	< 0.0001	< 0.0001	0.00012	0.048	0.048	< 0.00002	< 0.00002
<b>Tests categorized as no adverse response</b>															
2015	Q1	CM_MC2	94	73	176	0.0063	0.2	0.00013	0.00015	0.00016	0.00026	0.059	0.061	0.0001	0.0001
2015	Q2	CM_MC2	100	87	136	0.012	0.66	0.00011	0.00013	0.00016	0.00049	0.042	0.048	0.0001	0.00011
2015	Q4	CM_MC2	102	79	195	0.0031	0.05	0.00015	0.00017	0.00017	0.00023	0.074	0.074	0.0001	0.0001
2015	Q1	FR_FRCP1	94	82	226	0.003	0.024	0.00036	0.00037	0.0001	0.00013	0.087	0.089	0.0001	0.0001
2015	Q3	FR_FRCP1	88	77	207	0.003	0.0082	0.00026	0.00029	0.0001	0.00017	0.078	0.079	0.0001	0.0001
2015	Q4	FR_FRCP1	102	92	213	0.0032	0.0046	0.00025	0.00028	0.0001	0.00011	0.08	0.08	0.0001	0.0001
2015	Q1	GH_FR1	98	90	204	0.003	0.069	0.0002	0.00021	0.0001	0.00015	0.11	0.11	0.0001	0.0001
2015	Q2	GH_FR1	100	78	158	0.003	0.054	0.00015	0.00016	0.0001	0.00016	0.083	0.084	0.0001	0.0001
2015	Q3	GH_FR1	69	61	185	0.003	0.032	0.00017	0.00021	0.00011	0.00016	0.099	0.1	0.0001	0.0001
2015	Q4	GH_FR1	96	96	193	0.003	0.0037	0.00012	0.00015	0.0001	0.00012	0.11	0.11	0.0001	0.0001
2016	Q3	CM_MC2	100	113	204	< 0.003	0.0075	0.0002	0.00023	0.00019	0.0002	0.077	0.076	< 0.00002	< 0.00002
2016	Q4	CM_MC2	100	113	179	0.0055	0.088	0.00014	0.00016	0.00017	0.00023	0.054	0.056	< 0.00002	< 0.00002
2016	Q1	GH_FR1	94	87	198	< 0.003	0.0098	0.00014	0.00016	< 0.0001	0.00013	0.12	0.12	< 0.0001	< 0.0001
2016	Q4	GH_FR1	88	92	192	< 0.003	0.01	0.00016	0.00024	0.00011	0.00014	0.1	0.1	< 0.00002	< 0.00002
2017	Q2	FR_FRCP1	100	89	181	0.0069	0.19	0.00021	0.00024	0.00012	0.00025	0.07	0.071	< 0.00002	0.000023
2017	Q3	FR_FRCP1	83	108	204	0.0025	0.0062	0.00024	0.00027	< 0.0001	0.00012	0.074	0.072	< 0.00002	< 0.00002
2017	Q4	FR_FRCP1	96	76	179	< 0.003	0.019	0.00024	0.00027	< 0.0001	0.00014	0.072	0.075	< 0.00002	< 0.00002
2017	Q1	GH_FR1	104	81	204	< 0.003	0.0066	0.00011	0.00013	< 0.0001	0.00011	0.12	0.12	< 0.00002	< 0.00002
2017	Q2	GH_FR1	100	99	179	0.0049	0.33	0.00019	0.00022	0.00013	0.00029	0.081	0.086	< 0.00002	0.000026
2017	Q3	GH_FR1	78	107	191	0.0027	0.0068	0.00016	0.00019	< 0.0001	0.00012	0.11	0.1	< 0.00002	< 0.00002
2017	Q4	GH_FR1	102	76	177	< 0.003	0.0051	0.00018	0.0002	0.0001	0.00013	0.11	0.11	< 0.00002	< 0.00002
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2016)</b>															
2015	Q2	FR_FRCP1	100	72	142	0.003	0.045	0.00021	0.00022	0.0001	0.00013	0.06	0.061	0.0001	0.0001
2016	Q2	CM_MC2	94	30	146	0.0068	0.37	0.00015	0.00017	0.00017	0.0003	0.045	0.045	< 0.00004	0.000044
2016	Q1	FR_FRCP1	100	58	236	0.0032	0.0038	0.00026	0.00029	< 0.0001	0.00011	0.083	0.084	< 0.0001	< 0.0001
2016	Q2	FR_FRCP1	98	51	154	< 0.003	0.07	0.00017	0.00022	< 0.0001	0.00014	0.058	0.059	< 0.00004	< 0.00004
2016	Q3	FR_FRCP1	100	94	202	< 0.003	0.014	0.00022	0.00024	< 0.0001	0.00011	0.077	0.076	< 0.00002	< 0.00002
2016	Q4	FR_FRCP1	96	95	198	0.0038	0.024	0.00019	0.0002	< 0.0001	0.00014	0.075	0.074	< 0.00002	< 0.00002
2016	Q2	GH_FR1	98	60	166	< 0.003	0.058	0.00015	0.00018	0.0001	0.00014	0.08	0.08	< 0.00004	< 0.00004
2016	Q3	GH_FR1	98	97	198	< 0.003	0.007	0.00013	0.00015	0.0001	0.00013	0.11	0.11	< 0.00002	< 0.00002
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>															
2015	Q3	CM_MC2	67	35	210	0.003	0.01	0.0002	0.00021	0.00019	0.00023	0.077	0.078	0.0001	0.0001
2016	Q1	CM_MC2	80	58	209	< 0.003	0.02	0.00021	0.00022	0.00016	0.00019	0.077	0.076	< 0.0001	< 0.0001
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>															
2017	Q4	CM_MC2	90	43	200	< 0.003	0.0079	0.00025	0.00028	0.00017	0.00019	0.08	0.076	< 0.00002	< 0.00002
2017	Q1	FR_FRCP1	100	56	259	< 0.001	0.0035	0.00027	0.0004	< 0.0001	0.00013	0.076	0.073	< 0.00002	< 0.00002
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>															
2017	Q1	CM_MC2	67	23	208	0.0026	0.016	0.00033	0.00045	0.00015	0.0002	0.07	0.071	< 0.00002	< 0.00002
2017	Q2	CM_MC2	58	16	178	0.0048	0.2	0.00024	0.00026	0.00017	0.0003	0.058	0.06	< 0.00002	0.000023
2017	Q3	CM_MC2	0	0	188	0.003	0.034	0.00031	0.00036	0.0002	0.00025	0.064	0.065	< 0.00002	< 0.00002

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening

Concentrations of parameters in 2017 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-3: *Hyallolela* 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
<b>Reference</b>														
2015	Q1	Reference (FR_UFR1)	0.00032	0.00032	0.01	0.01	0.05	0.0000097	0.000011	52	1.3	1.0	0.00013	0.00019
2015	Q2	Reference (FR_UFR1)	0.00005	0.00005	0.01	0.01	0.05	0.0000057	0.0000086	37	1.8	1.0	0.00011	0.00026
2015	Q3	Reference (FR_UFR1)	0.00005	0.00005	0.01	0.01	0.05	0.0000081	0.000012	58	1.0	1.0	0.0001	0.00014
2015	Q4	Reference (FR_UFR1)	0.00005	0.00005	0.01	0.01	0.05	0.0000065	0.0000085	56	0.55	1.0	0.00012	0.00018
2016	Q1	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000055	0.0000082	57	0.52	0.92	0.00011	0.00018
2016	Q2	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.000006	0.000012	38	1.7	0.1	0.00013	0.0002
2016	Q3	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000078	0.0000098	52	0.84	0.13	0.0001	0.00017
2016	Q4	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000064	0.0000092	47	1.2	0.19	0.00011	0.0002
2017	Q3	Reference (CM_MC1)	< 0.00005	< 0.00005	0.016	0.015	< 0.05	0.0000093	0.000012	39	1.3	< 0.5	0.00013	0.00025
2017	Q4	Reference (CM_MC1)	< 0.00005	< 0.00005	0.013	0.014	< 0.05	0.0000073	0.0000088	42	1.3	0.51	0.00017	0.00019
2017	Q1	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000085	0.000011	49	0.72	< 0.5	0.0001	0.00013
2017	Q2	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.000012	0.000018	33	3.0	< 0.5	0.00013	0.00046
2017	Q3	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000082	0.000012	50	1.1	0.21	0.00011	0.00021
2017	Q4	Reference (FR_UFR1)	< 0.00005	< 0.00005	< 0.01	< 0.01	0.052	0.0000068	0.00001	51	0.73	< 0.5	0.0001	0.00014
2017	Q2	Reference (GH_ER2)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000081	0.000025	49	1.2	0.42	0.0002	0.00055
2017	Q3	Reference (GH_ER2)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000073	0.0000088	45	0.78	0.32	0.00022	0.00024
2017	Q4	Reference (GH_ER2)	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000053	0.000008	43	0.67	< 0.5	0.00025	0.00029
<b>Tests categorized as no adverse response</b>														
2015	Q1	CM_MC2	0.00032	0.00032	0.019	0.021	0.06	0.00002	0.000034	82	1.6	2.4	0.00015	0.00046
2015	Q2	CM_MC2	0.00005	0.00005	0.014	0.017	0.05	0.000035	0.000088	60	1.5	1.4	0.00023	0.001
2015	Q4	CM_MC2	0.00005	0.00005	0.024	0.027	0.25	0.000012	0.000019	107	1.2	3.4	0.00016	0.00026
2015	Q1	FR_FRCP1	0.00032	0.00032	0.013	0.013	0.27	0.000037	0.000074	148	1.2	2.4	0.00011	0.00017
2015	Q3	FR_FRCP1	0.00005	0.00005	0.013	0.014	0.25	0.000043	0.000052	123	0.92	1.6	0.0001	0.00014
2015	Q4	FR_FRCP1	0.00005	0.00005	0.011	0.012	0.25	0.000043	0.000058	141	0.78	2.4	0.00012	0.00016
2015	Q1	GH_FR1	0.00032	0.00032	0.01	0.01	0.1	0.000021	0.000027	113	1.5	2.7	0.00011	0.00022
2015	Q2	GH_FR1	0.00005	0.00005	0.01	0.01	0.075	0.00002	0.000028	80	1.4	1.6	0.00013	0.00024
2015	Q3	GH_FR1	0.00005	0.00005	0.01	0.011	0.067	0.000018	0.000023	92	0.89	1.5	0.00011	0.0002
2015	Q4	GH_FR1	0.00005	0.00005	0.01	0.012	0.25	0.000017	0.000019	107	0.66	2.0	0.00012	0.00017
2016	Q3	CM_MC2	< 0.00005	< 0.00005	0.028	0.03	< 0.25	0.0000066	0.0000092	116	1.0	3.4	0.00014	0.00017
2016	Q4	CM_MC2	< 0.00005	< 0.00005	0.019	0.021	< 0.1	0.000027	0.000035	85	1.6	2.0	0.00016	0.00033
2016	Q1	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000016	0.000017	120	0.65	2.6	0.00012	0.00015
2016	Q4	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000016	0.00002	100	0.84	1.6	0.00012	0.00016
2017	Q2	FR_FRCP1	< 0.00005	< 0.00005	< 0.01	0.01	< 0.05	0.000064	0.00011	87	2.2	0.67	0.0001	0.00059
2017	Q3	FR_FRCP1	< 0.00005	< 0.00005	0.011	0.011	< 0.2	0.000022	0.00005	127	1.2	1.4	0.00011	0.00017
2017	Q4	FR_FRCP1	< 0.00005	< 0.00005	0.011	0.011	0.3	0.000012	0.000056	150	1.0	< 2.5	< 0.0001	0.00015
2017	Q1	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000015	0.000018	117	0.86	1.9	0.0001	0.00013
2017	Q2	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.15	0.00003	0.000065	80	2.6	1.5	< 0.0001	0.00072
2017	Q3	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.15	0.00002	0.000019	98	0.95	1.4	0.00011	0.00015
2017	Q4	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	0.05	0.000017	0.000019	107	1.2	1.3	0.00012	0.00015
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2017)</b>														
2015	Q2	FR_FRCP1	0.00005	0.00005	0.01	0.01	0.05	0.000025	0.000039	73	1.4	1.1	0.00011	0.00019
2016	Q2	CM_MC2	< 0.00005	< 0.00005	0.017	0.017	< 0.05	0.000064	0.0001	68	1.5	1.2	0.00017	0.0006
2016	Q1	FR_FRCP1	< 0.00005	< 0.00005	0.011	0.012	< 0.3125	0.000025	0.000055	187	0.76	3.0	0.0001	0.0011
2016	Q2	FR_FRCP1	< 0.00005	0.000051	< 0.01	< 0.01	< 0.05	0.000027	0.000045	75	1.5	0.51	0.00011	0.00024
2016	Q3	FR_FRCP1	< 0.00005	< 0.00005	0.011	0.011	< 0.25	0.000021	0.000049	114	0.96	1.6	< 0.0001	0.00013
2016	Q4	FR_FRCP1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000042	0.000051	106	1.0	1.4	< 0.0001	0.00015
2016	Q2	GH_FR1	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.000022	0.000032	79	1.4	0.96	0.00011	0.00022
2016	Q3	GH_FR1	< 0.00005	< 0.00005	< 0.01	0.01	< 0.25	0.000015	0.000019	95	0.82	1.6	0.00011	0.00018
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>														
2015	Q3	CM_MC2	0.00005	0.00005	0.027	0.027	0.21	0.0000091	0.000017	121	0.99	2.8	0.00014	0.00017
2016	Q1	CM_MC2	< 0.00005	< 0.00005	0.025	0.027	< 0.25	0.000017	0.000016	118	0.7	5.0	0.00016	0.00026
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>														
2017	Q4	CM_MC2	< 0.00005	< 0.00005	0.032	0.035	0.062	0.000012	0.000014	120	1.1	4.5	0.00012	0.00018
2017	Q1	FR_FRCP1	< 0.00005	< 0.00005	0.01	0.011	< 0.25	0.000043	0.000057	197	1.2	2.8	< 0.0001	0.00027
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>														
2017	Q1	CM_MC2	< 0.00005	< 0.00005	0.032	0.033	< 0.2	0.000039	0.000044	132	0.68	3.7	0.00013	0.00022
2017	Q2	CM_MC2	< 0.00005	< 0.00005	0.025	0.027	< 0.05	0.000068	0.0001	88	1.8	1.8	0.00013	0.00052
2017	Q3	CM_MC2	< 0.00005	< 0.00005	0.032	0.032	< 0.05	0.0000055	0.000021	110	1.2	1.4	0.00015	0.00025

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening

Concentrations of parameters in 2017 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-3: *Hyallolela* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	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 <sub>3</sub> -N-mg/l	IRON-D-mg/l	IRON-T-mg/l	LEAD-D-mg/l	LEAD-T-mg/l	LITHIUM-D-mg/l
<b>Reference</b>														
2015	Q1	Reference (FR_UFR1)	0.0001	0.0001	328	0.0005	0.0005	0.14	180	0.01	0.017	0.00005	0.00005	0.0013
2015	Q2	Reference (FR_UFR1)	0.0001	0.0001	234	0.0005	0.0005	0.15	131	0.01	0.036	0.00005	0.00005	0.0011
2015	Q3	Reference (FR_UFR1)	0.0001	0.0001	348	0.0005	0.0005	0.15	199	0.01	0.011	0.00005	0.00005	0.0018
2015	Q4	Reference (FR_UFR1)	0.0001	0.0001	356	0.0005	0.0005	0.15	193	0.01	0.01	0.00005	0.00005	0.0014
2016	Q1	Reference (FR_UFR1)	< 0.0001	< 0.0001	356	< 0.0005	< 0.0005	0.15	195	< 0.01	< 0.01	< 0.00005	< 0.00005	0.0016
2016	Q2	Reference (FR_UFR1)	< 0.0001	< 0.0001	243	< 0.0005	< 0.0005	0.16	133	< 0.01	0.043	< 0.00005	0.000053	0.0012
2016	Q3	Reference (FR_UFR1)	< 0.0001	< 0.0001	341	< 0.0005	< 0.0005	0.17	181	< 0.01	0.011	< 0.00005	< 0.00005	0.0018
2016	Q4	Reference (FR_UFR1)	< 0.0001	< 0.0001	319	< 0.0005	< 0.0005	0.16	171	< 0.01	0.019	< 0.00005	< 0.00005	0.0013
2017	Q3	Reference (CM_MC1)	< 0.0001	< 0.0001	269	< 0.000425	< 0.0005	0.055	146	< 0.01	0.016	< 0.00005	< 0.00005	0.0048
2017	Q4	Reference (CM_MC1)	< 0.0001	< 0.0001	273	< 0.0005	< 0.0005	0.052	143	< 0.01	< 0.01	< 0.00005	< 0.00005	0.0046
2017	Q1	Reference (FR_UFR1)	< 0.0001	< 0.0001	338	< 0.0002	< 0.0005	0.14	182	< 0.01	< 0.01	< 0.00005	< 0.00005	0.0016
2017	Q2	Reference (FR_UFR1)	< 0.0001	< 0.0001	247	0.00031	0.00055	0.11	126	0.023	0.082	< 0.00005	0.000065	0.0011
2017	Q3	Reference (FR_UFR1)	< 0.0001	< 0.0001	333	< 0.000425	< 0.0005	0.15	178	< 0.01	0.01	< 0.00005	< 0.00005	0.0018
2017	Q4	Reference (FR_UFR1)	< 0.0001	< 0.0001	333	< 0.0005	< 0.0005	0.11	183	< 0.01	< 0.01	< 0.00005	< 0.00005	0.0017
2017	Q2	Reference (GH_ER2)	< 0.0001	0.00011	307	< 0.0005	0.00051	0.15	175	< 0.01	0.15	< 0.00005	0.00011	0.0017
2017	Q3	Reference (GH_ER2)	< 0.0001	< 0.0001	282	< 0.000425	< 0.0005	0.16	155	< 0.01	0.02	< 0.00005	< 0.00005	0.0016
2017	Q4	Reference (GH_ER2)	< 0.0001	< 0.0001	280	< 0.0005	< 0.0005	0.13	156	< 0.01	0.011	< 0.00005	< 0.00005	0.0018
<b>Tests categorized as no adverse response</b>														
2015	Q1	CM_MC2	0.00047	0.00072	599	0.0005	0.00062	0.11	333	0.01	0.21	0.00005	0.00014	0.0081
2015	Q2	CM_MC2	0.0003	0.00083	457	0.0005	0.0013	0.099	240	0.015	0.85	0.00005	0.00058	0.0062
2015	Q4	CM_MC2	0.00051	0.0006	821	0.0005	0.00059	0.11	456	0.01	0.053	0.00005	0.000063	0.012
2015	Q1	FR_FRCP1	0.00012	0.00014	1113	0.0005	0.0005	0.18	679	0.01	0.035	0.00005	0.000053	0.043
2015	Q3	FR_FRCP1	0.0001	0.0001	925	0.0005	0.0005	0.2	541	0.01	0.019	0.00005	0.00005	0.035
2015	Q4	FR_FRCP1	0.0001	0.0001	1100	0.0005	0.0005	0.18	650	0.01	0.021	0.00005	0.00005	0.04
2015	Q1	GH_FR1	0.00011	0.00017	823	0.0005	0.00051	0.15	479	0.01	0.065	0.00005	0.000063	0.014
2015	Q2	GH_FR1	0.0001	0.0001	581	0.0005	0.0005	0.17	329	0.01	0.077	0.00005	0.000071	0.015
2015	Q3	GH_FR1	0.0001	0.0001	686	0.0005	0.0005	0.18	385	0.01	0.052	0.00005	0.000062	0.015
2015	Q4	GH_FR1	0.0001	0.0001	783	0.0005	0.0005	0.16	445	0.01	0.011	0.00005	0.00005	0.016
2016	Q3	CM_MC2	0.00034	0.00043	915	< 0.0005	< 0.0005	0.12	504	< 0.01	0.012	< 0.00005	< 0.00005	0.017
2016	Q4	CM_MC2	0.00076	0.00099	669	< 0.0005	< 0.0005	0.11	358	< 0.01	0.077	< 0.00005	0.000066	0.011
2016	Q1	GH_FR1	< 0.0001	< 0.0001	891	< 0.0005	< 0.0005	0.17	505	< 0.01	0.013	< 0.00005	< 0.00005	0.015
2016	Q4	GH_FR1	< 0.0001	< 0.0001	758	< 0.0005	< 0.0005	0.17	431	< 0.01	0.018	< 0.00005	< 0.00005	0.017
2017	Q2	FR_FRCP1	< 0.0001	0.00019	724	0.00028	0.00076	0.15	390	0.012	0.25	< 0.00005	0.00019	0.03
2017	Q3	FR_FRCP1	< 0.0001	< 0.0001	993	< 0.000425	< 0.0005	0.19	584	< 0.01	0.021	< 0.00005	< 0.00005	0.037
2017	Q4	FR_FRCP1	< 0.0001	0.00011	1153	< 0.0005	< 0.0005	0.11	734	0.01	0.055	< 0.00005	0.000059	0.041
2017	Q1	GH_FR1	< 0.0001	< 0.0001	869	< 0.0005	< 0.0005	0.14	499	< 0.01	0.011	< 0.00005	< 0.00005	0.017
2017	Q2	GH_FR1	< 0.0001	0.00025	630	< 0.0005	0.00089	0.15	366	0.011	0.34	< 0.00005	0.00026	0.015
2017	Q3	GH_FR1	< 0.0001	< 0.0001	767	< 0.000425	< 0.0005	0.17	434	< 0.01	0.012	< 0.00005	< 0.00005	0.019
2017	Q4	GH_FR1	< 0.0001	< 0.0001	830	< 0.0005	< 0.0005	0.13	505	< 0.01	0.012	< 0.00005	< 0.00005	0.017
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2017)</b>														
2015	Q2	FR_FRCP1	0.0001	0.00011	568	0.0005	0.0005	0.2	308	0.01	0.064	0.00005	0.000082	0.018
2016	Q2	CM_MC2	0.0021	0.0029	537	< 0.0005	0.0007	0.1	282	< 0.01	0.4	< 0.00005	0.00024	0.009
2016	Q1	FR_FRCP1	< 0.0001	< 0.0001	1450	< 0.0005	0.00052	0.18	889	< 0.01	0.022	< 0.00005	< 0.00005	0.059
2016	Q2	FR_FRCP1	< 0.0001	0.0001	569	< 0.0005	0.00051	0.21	311	< 0.01	0.09	< 0.00005	0.000078	0.018
2016	Q3	FR_FRCP1	0.0001	0.00011	907	< 0.0005	< 0.0005	0.21	501	< 0.01	0.029	< 0.00005	< 0.00005	0.037
2016	Q4	FR_FRCP1	< 0.0001	< 0.0001	850	< 0.0005	< 0.0005	0.21	478	< 0.01	0.034	< 0.00005	< 0.00005	0.032
2016	Q2	GH_FR1	< 0.0001	< 0.0001	598	< 0.0005	< 0.0005	0.18	332	< 0.01	0.086	< 0.00005	0.000072	0.014
2016	Q3	GH_FR1	< 0.0001	< 0.0001	740	< 0.0005	< 0.0005	0.19	399	< 0.01	0.015	< 0.00005	< 0.00005	0.018
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2017)</b>														
2015	Q3	CM_MC2	0.00018	0.00021	939	0.0005	0.0005	0.12	534	0.01	0.012	0.00005	0.00005	0.014
2016	Q1	CM_MC2	0.00091	0.00098	916	0.00052	< 0.0005	0.13	493	< 0.01	0.018	< 0.00005	< 0.00005	0.013
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>														
2017	Q4	CM_MC2	0.00098	0.0011	900	< 0.0005	< 0.0005	0.088	526	< 0.01	0.012	< 0.00005	< 0.00005	0.018
2017	Q1	FR_FRCP1	< 0.0001	< 0.0001	1585	< 0.0002	< 0.0005	0.14	1008	< 0.01	0.023	< 0.00005	< 0.00005	0.062
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>														
2017	Q1	CM_MC2	0.0041	0.0042	1016	< 0.000425	< 0.0005	0.13	553	< 0.01	0.02	< 0.00005	< 0.00005	0.02
2017	Q2	CM_MC2	0.0032	0.004	696	0.00022	0.00068	0.1	348	< 0.01	0.24	< 0.00005	0.00017	0.014
2017	Q3	CM_MC2	0.0016	0.003	873	< 0.000425	0.00053	0.11	487	< 0.01	0.052	< 0.00005	0.000075	0.018

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening

Concentrations of parameters in 2017 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-3: *Hyallolela* Endpoints Paired with Water Quality

Year	Quarter	Sample ID	LITHIUM-T-mg/l	MAGNESIUM-T-mg/l	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
<b>Reference</b>														
2015	Q1	Reference (FR_UFR1)	0.0013	13	0.00062	0.001	0.000009	0.000009	0.00057	0.00057	0.0005	0.0005	0.12	0.001
2015	Q2	Reference (FR_UFR1)	0.0012	9.2	0.00069	0.0022	0.000005	0.000005	0.00056	0.0006	0.0005	0.0005	0.03	0.001
2015	Q3	Reference (FR_UFR1)	0.0021	14	0.00068	0.0013	0.000005	0.000005	0.00064	0.00065	0.0005	0.0005	0.048	0.001
2015	Q4	Reference (FR_UFR1)	0.0013	14	0.00016	0.00031	0.000005	0.000005	0.00061	0.00059	0.0005	0.0005	0.074	0.001
2016	Q1	Reference (FR_UFR1)	0.0017	14	0.0002	0.00036	< 0.000005	< 0.000005	0.00057	0.00059	< 0.0005	< 0.0005	0.16	< 0.001
2016	Q2	Reference (FR_UFR1)	0.0013	10.0	0.00032	0.0016	< 0.000005	0.0000095	0.00063	0.00065	< 0.0005	< 0.0005	0.018	< 0.001
2016	Q3	Reference (FR_UFR1)	0.0016	14	0.00019	0.00071	< 0.000005	< 0.000005	0.00063	0.00064	< 0.0005	< 0.0005	0.043	< 0.001
2016	Q4	Reference (FR_UFR1)	0.0016	12	0.00017	0.00056	< 0.000005	0.0000058	0.00057	0.00058	< 0.0005	< 0.0005	0.097	< 0.001
2017	Q3	Reference (CM_MC1)	0.0045	11	0.00011	0.00054	< 0.000005	0.0000055	0.00089	0.0009	< 0.0005	< 0.0005	0.015	< 0.001
2017	Q4	Reference (CM_MC1)	0.0048	11	0.00013	0.00024	< 0.000005	0.0000054	0.00085	0.00087	< 0.0005	< 0.0005	0.015	0.001
2017	Q1	Reference (FR_UFR1)	0.0015	15	< 0.0001	0.00027	< 0.000005	< 0.000005	0.0006	0.00059	< 0.0005	< 0.0005	0.21	0.0012
2017	Q2	Reference (FR_UFR1)	0.0012	9.4	0.00063	0.0026	< 0.000005	0.0000022	0.00049	0.00052	0.00051	0.00055	0.079	0.0022
2017	Q3	Reference (FR_UFR1)	0.0017	13	0.00021	0.00075	< 0.000005	< 0.000005	0.00063	0.00067	< 0.0005	< 0.0005	0.012	< 0.001
2017	Q4	Reference (FR_UFR1)	0.0017	14	0.00013	0.0005	< 0.000005	< 0.000005	0.00057	0.00058	< 0.0005	< 0.0005	0.024	0.001
2017	Q2	Reference (GH_ER2)	0.0019	12	0.00078	0.0088	< 0.000005	0.0000011	0.00092	0.00093	< 0.0005	0.00059	0.12	< 0.001
2017	Q3	Reference (GH_ER2)	0.0018	10	0.0021	0.0037	< 0.000005	0.0000053	0.00099	0.001	< 0.0005	< 0.0005	0.04	< 0.001
2017	Q4	Reference (GH_ER2)	0.0017	11	0.00045	0.0016	< 0.000005	< 0.000005	0.001	0.001	< 0.0005	< 0.0005	0.047	< 0.001
<b>Tests categorized as no adverse response</b>														
2015	Q1	CM_MC2	0.0084	33	0.0038	0.011	0.000009	0.000009	0.00092	0.00096	0.0061	0.0067	1.6	0.01
2015	Q2	CM_MC2	0.0069	23	0.0027	0.028	0.000005	0.000007	0.00077	0.00097	0.006	0.0081	1.1	0.0029
2015	Q4	CM_MC2	0.012	46	0.0039	0.0065	0.000005	0.0000051	0.0011	0.0011	0.0087	0.009	2.4	0.034
2015	Q1	FR_FRCP1	0.043	78	0.0069	0.01	0.000009	0.000009	0.002	0.002	0.0073	0.0077	15	0.014
2015	Q3	FR_FRCP1	0.036	59	0.0052	0.0071	0.000005	0.000005	0.0015	0.0015	0.0056	0.0058	10	0.0071
2015	Q4	FR_FRCP1	0.041	74	0.0076	0.0089	0.000005	0.000005	0.0015	0.0015	0.007	0.0072	16	0.0053
2015	Q1	GH_FR1	0.014	49	0.0023	0.0043	0.000009	0.000009	0.0012	0.0012	0.0037	0.0039	11	0.0038
2015	Q2	GH_FR1	0.015	32	0.00099	0.0047	0.000005	0.000005	0.00099	0.00099	0.0016	0.0018	7.8	0.003
2015	Q3	GH_FR1	0.015	38	0.002	0.0057	0.000005	0.000005	0.00099	0.001	0.0015	0.0016	9.6	0.006
2015	Q4	GH_FR1	0.016	45	0.0012	0.0016	0.000005	0.000005	0.00094	0.00098	0.0015	0.0015	10	0.005
2016	Q3	CM_MC2	0.018	55	0.00064	0.0015	< 0.000005	< 0.000005	0.0012	0.0012	0.014	0.015	3.1	0.0062
2016	Q4	CM_MC2	0.011	37	0.0073	0.011	< 0.000005	0.0000078	0.00089	0.00093	0.0098	0.011	2.2	0.008
2016	Q1	GH_FR1	0.015	52	0.0012	0.0016	< 0.000005	< 0.00001625	0.00089	0.00089	0.0016	0.0016	13	0.0052
2016	Q4	GH_FR1	0.018	46	0.00096	0.0017	< 0.000005	< 0.00001625	0.0011	0.0011	0.0024	0.0025	9.5	< 0.005
2017	Q2	FR_FRCP1	0.029	40	0.0044	0.014	< 0.000005	0.0000021	0.0013	0.0014	0.0042	0.005	11	0.0045
2017	Q3	FR_FRCP1	0.034	68	0.0051	0.0088	< 0.000005	< 0.000005	0.0013	0.0014	0.0065	0.0067	11	0.0059
2017	Q4	FR_FRCP1	0.041	91	0.0072	0.013	< 0.000005	< 0.000005	0.0013	0.0014	0.0085	0.0093	15	0.0072
2017	Q1	GH_FR1	0.017	49	0.0012	0.0015	< 0.000005	< 0.000005	0.00081	0.00086	0.0014	0.0014	13	< 0.005
2017	Q2	GH_FR1	0.014	37	0.0018	0.011	< 0.000005	0.0000053	0.0011	0.0012	0.0024	0.0034	6.7	0.0037
2017	Q3	GH_FR1	0.019	45	0.001	0.0022	< 0.000005	0.000005	0.00097	0.001	0.0025	0.0027	10	0.0069
2017	Q4	GH_FR1	0.017	60	0.0011	0.0019	< 0.000005	< 0.000005	0.0011	0.0011	0.0029	0.0031	10	0.0055
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2016)</b>														
2015	Q2	FR_FRCP1	0.019	30	0.0027	0.0079	0.000005	0.000005	0.0012	0.0012	0.0018	0.0021	8.1	0.0046
2016	Q2	CM_MC2	0.0093	26	0.011	0.025	< 0.000005	0.000001	0.00087	0.00088	0.015	0.017	2.0	0.0088
2016	Q1	FR_FRCP1	0.06	108	0.0073	0.0092	< 0.000005	< 0.000005	0.0017	0.0017	0.0092	0.0098	26	0.0066
2016	Q2	FR_FRCP1	0.019	31	0.0022	0.0076	< 0.000005	0.0000091	0.0011	0.0011	0.0019	0.0024	8.4	0.0027
2016	Q3	FR_FRCP1	0.037	56	0.0043	0.0075	< 0.000005	< 0.000005	0.0013	0.0013	0.0054	0.0057	13	0.0068
2016	Q4	FR_FRCP1	0.033	50	0.0068	0.0087	< 0.000005	< 0.000005	0.0013	0.0013	0.0049	0.0052	12	< 0.005
2016	Q2	GH_FR1	0.014	33	0.00088	0.0043	< 0.000005	0.0000011	0.00099	0.00099	0.0016	0.0017	7.6	0.0027
2016	Q3	GH_FR1	0.019	42	0.0009	0.0018	< 0.000005	< 0.000010625	0.00094	0.00098	0.0015	0.0016	10	0.0057
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>														
2015	Q3	CM_MC2	0.015	58	0.00076	0.0017	0.000005	0.000005	0.0011	0.0011	0.012	0.013	3.2	0.0068
2016	Q1	CM_MC2	0.014	50	0.006	0.0071	< 0.000005	< 0.00000275	0.0011	0.0011	0.01	0.01	3.0	0.026
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>														
2017	Q4	CM_MC2	0.019	57	0.004	0.005	< 0.000005	< 0.000005	0.0013	0.0013	0.015	0.016	3.7	0.012
2017	Q1	FR_FRCP1	0.06	122	0.0064	0.0076	< 0.000005	< 0.000005	0.0018	0.0018	0.013	0.012	23	0.011
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>														
2017	Q1	CM_MC2	0.021	56	0.018	0.02	< 0.000005	< 0.000005	0.0016	0.0016	0.032	0.033	4.6	0.021
2017	Q2	CM_MC2	0.014	36	0.017	0.028	< 0.000005	0.0000014	0.0011	0.0013	0.018	0.02	2.3	0.0095
2017	Q3	CM_MC2	0.017	53	0.0021	0.012	< 0.000005	0.0000073	0.0015	0.0015	0.026	0.027	3.3	0.019

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; ∑ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening  
 Concentrations of parameters in 2017 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-3: *Hyallolela* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>														
2015	Q1	Reference (FR_UFR1)	0.005	0.003	8.3	0.005	0.42	0.00072	0.00077	0.00001	0.00001	0.71	0.084	0.085
2015	Q2	Reference (FR_UFR1)	0.005	0.003	8.3	0.007	0.36	0.00045	0.0005	0.00001	0.00001	0.58	0.063	0.066
2015	Q3	Reference (FR_UFR1)	0.005	0.0036	8.4	0.0033	0.54	0.00049	0.00049	0.00001	0.00001	0.74	0.095	0.097
2015	Q4	Reference (FR_UFR1)	0.005	0.0015	8.4	0.0024	0.39	0.00065	0.00067	0.00001	0.00001	0.68	0.092	0.091
2016	Q1	Reference (FR_UFR1)	< 0.005	0.0031	8.3	0.0041	0.39	0.00083	0.00081	< 0.00001	< 0.00001	0.71	0.089	0.092
2016	Q2	Reference (FR_UFR1)	< 0.005	0.0025	8.3	0.0047	0.34	0.00051	0.00055	< 0.00001	< 0.00001	0.63	0.065	0.067
2016	Q3	Reference (FR_UFR1)	< 0.005	0.0027	8.3	0.0051	0.46	0.0006	0.00064	< 0.00001	< 0.00001	0.74	0.098	0.1
2016	Q4	Reference (FR_UFR1)	< 0.005	0.0024	8.3	0.0045	0.37	0.00066	0.00066	< 0.00001	< 0.00001	0.68	0.089	0.089
2017	Q3	Reference (CM_MC1)	0.0063	0.0049	8.3	0.021	0.49	0.00018	0.00023	< 0.00001	< 0.00001	2.4	0.15	0.15
2017	Q4	Reference (CM_MC1)	0.0075	0.0035	8.2	0.0028	0.51	0.0002	0.00021	< 0.00001	< 0.00001	3.0	0.16	0.16
2017	Q1	Reference (FR_UFR1)	< 0.005	0.007	8.2	0.012	0.43	0.001	0.00094	< 0.00001	< 0.00001	0.84	0.094	0.092
2017	Q2	Reference (FR_UFR1)	0.007	0.0074	8.3	0.018	0.36	0.00068	0.00068	< 0.00001	0.000013	0.6	0.066	0.064
2017	Q3	Reference (FR_UFR1)	0.0063	0.0025	8.4	0.0042	0.46	0.00055	0.00059	< 0.00001	< 0.00001	0.69	0.096	0.096
2017	Q4	Reference (FR_UFR1)	0.0052	0.0014	8.4	0.0028	0.4	0.00059	0.00061	< 0.00001	< 0.00001	0.7	0.098	0.099
2017	Q2	Reference (GH_ER2)	< 0.005	0.0011	8.3	0.009	0.43	0.00089	0.00088	< 0.00001	< 0.00001	0.79	0.21	0.21
2017	Q3	Reference (GH_ER2)	0.0055	0.0011	8.2	0.004	0.38	0.00065	0.00064	< 0.00001	< 0.00001	0.6	0.21	0.21
2017	Q4	Reference (GH_ER2)	0.0074	< 0.001	8.4	0.0015	0.37	0.00083	0.00081	< 0.00001	< 0.00001	0.7	0.2	0.2
<b>Tests categorized as no adverse response</b>														
2015	Q1	CM_MC2	0.0079	0.0015	8.3	0.014	1.2	0.0043	0.0043	0.00001	0.00001	6.9	0.22	0.23
2015	Q2	CM_MC2	0.0068	0.0017	8.4	0.062	1.1	0.0039	0.0039	0.00001	0.000013	3.9	0.15	0.16
2015	Q4	CM_MC2	0.016	0.0012	8.4	0.0081	1.4	0.0052	0.0052	0.00001	0.00001	9.5	0.29	0.29
2015	Q1	FR_FRCP1	0.019	0.001	8.4	0.004	2.2	0.11	0.11	0.00001	0.00001	2.5	0.17	0.17
2015	Q3	FR_FRCP1	0.0064	0.001	8.4	0.0022	1.9	0.072	0.073	0.00001	0.00001	1.8	0.15	0.15
2015	Q4	FR_FRCP1	0.005	0.001	8.3	0.002	2.0	0.091	0.091	0.00001	0.00001	2.1	0.17	0.17
2015	Q1	GH_FR1	0.005	0.0014	8.3	0.0061	1.3	0.05	0.049	0.00001	0.00001	2.4	0.15	0.15
2015	Q2	GH_FR1	0.0054	0.001	8.4	0.009	1.1	0.03	0.03	0.00001	0.00001	1.6	0.11	0.11
2015	Q3	GH_FR1	0.0062	0.001	8.3	0.0031	1.2	0.037	0.037	0.00001	0.00001	1.9	0.13	0.13
2015	Q4	GH_FR1	0.005	0.0011	8.4	0.0022	1.2	0.042	0.042	0.00001	0.00001	2.1	0.15	0.15
2016	Q3	CM_MC2	< 0.005	0.001	8.3	0.0022	1.8	0.0067	0.0069	< 0.00001	< 0.00001	12	0.36	0.36
2016	Q4	CM_MC2	0.0057	0.0013	8.3	0.0053	1.3	0.0057	0.0058	< 0.00001	< 0.00001	7.7	0.23	0.24
2016	Q1	GH_FR1	< 0.005	< 0.001	8.2	0.0032	1.2	0.051	0.05	< 0.00001	< 0.00001	2.4	0.16	0.16
2016	Q4	GH_FR1	0.0054	0.0011	8.3	0.011	1.3	0.043	0.042	< 0.00001	< 0.00001	2.1	0.14	0.15
2017	Q2	FR_FRCP1	0.015	0.0022	8.3	0.024	1.5	0.056	0.049	< 0.00001	0.000014	1.4	0.13	0.13
2017	Q3	FR_FRCP1	0.0059	0.0013	8.3	0.0041	2.0	0.086	0.086	< 0.00001	< 0.00001	1.6	0.15	0.15
2017	Q4	FR_FRCP1	0.0067	< 0.001	8.2	0.0025	2.1	0.14	0.13	< 0.00001	< 0.00001	2.0	0.17	0.17
2017	Q1	GH_FR1	0.0057	0.0016	8.3	0.003	1.2	0.053	0.053	< 0.00001	< 0.00001	2.3	0.17	0.17
2017	Q2	GH_FR1	< 0.005	0.0034	8.3	0.018	1.3	0.035	0.033	< 0.00001	0.000015	1.9	0.12	0.12
2017	Q3	GH_FR1	0.0056	< 0.001	8.3	0.0029	1.3	0.051	0.048	< 0.00001	< 0.00001	1.9	0.14	0.14
2017	Q4	GH_FR1	0.0073	< 0.001	8.4	0.0017	1.4	0.067	0.065	< 0.00001	< 0.00001	2.3	0.16	0.16
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2016)</b>														
2015	Q2	FR_FRCP1	0.011	0.0012	8.4	0.01	1.2	0.03	0.03	0.00001	0.00001	1.2	0.10	0.1
2016	Q2	CM_MC2	0.024	0.0023	8.3	0.02	1.1	0.0046	0.0045	< 0.00001	< 0.00001	6.0	0.2	0.19
2016	Q1	FR_FRCP1	< 0.005	< 0.001	8.3	0.0025	2.4	0.15	0.15	< 0.00001	< 0.00001	2.5	0.2	0.2
2016	Q2	FR_FRCP1	0.0059	0.0017	8.3	0.0094	1.1	0.03	0.031	< 0.00001	< 0.00001	1.1	0.099	0.1
2016	Q3	FR_FRCP1	0.0057	0.0014	8.3	0.0046	1.7	0.066	0.066	< 0.00001	< 0.00001	1.8	0.15	0.16
2016	Q4	FR_FRCP1	< 0.005	< 0.001	8.3	0.0031	1.6	0.059	0.058	< 0.00001	< 0.00001	1.6	0.15	0.15
2016	Q2	GH_FR1	0.005	0.0013	8.4	0.0096	1.1	0.029	0.03	< 0.00001	< 0.00001	1.5	0.11	0.11
2016	Q3	GH_FR1	< 0.005	0.001	8.3	0.0043	1.2	0.039	0.04	< 0.00001	< 0.00001	2.0	0.14	0.14
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>														
2015	Q3	CM_MC2	0.0062	0.001	8.3	0.0029	1.8	0.0079	0.0081	0.00001	0.00001	10	0.31	0.32
2016	Q1	CM_MC2	0.01	0.0012	8.3	0.0023	1.6	0.0055	0.0055	< 0.00001	< 0.00001	13	0.33	0.33
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>														
2017	Q4	CM_MC2	0.017	< 0.001	8.3	0.003	1.9	0.0084	0.0078	< 0.00001	< 0.00001	13	0.41	0.41
2017	Q1	FR_FRCP1	0.0062	0.0052	8.2	0.014	2.6	0.2	0.19	< 0.00001	< 0.00001	2.3	0.2	0.2
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>														
2017	Q1	CM_MC2	0.038	0.0023	8.3	0.0036	2.0	0.0074	0.0069	< 0.00001	< 0.00001	16	0.44	0.45
2017	Q2	CM_MC2	0.047	0.0016	8.2	0.029	1.5	0.0069	0.0062	< 0.00001	< 0.00001	11	0.3	0.31
2017	Q3	CM_MC2	0.015	0.0012	8.4	0.013	1.8	0.0084	0.0081	< 0.00001	< 0.00001	12	0.38	0.38

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline: Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening

Concentrations of parameters in 2017 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-3: *Hyallolela* Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>														
2015	Q1	Reference (FR_UFR1)	38	0.00001	0.00001	0.0001	0.0001	0.01	0.01	203	0.075	1.1	1.1	0.69
2015	Q2	Reference (FR_UFR1)	14	0.00001	0.00001	0.0001	0.0001	0.01	0.01	141	0.094	2.0	2.0	1.4
2015	Q3	Reference (FR_UFR1)	36	0.00001	0.000016	0.0001	0.0001	0.01	0.01	221	0.06	0.84	1.0	0.24
2015	Q4	Reference (FR_UFR1)	47	0.00001	0.00001	0.0001	0.0001	0.01	0.01	217	0.065	0.6	1.0	0.22
2016	Q1	Reference (FR_UFR1)	49	< 0.00001	< 0.00001	< 0.0001	< 0.0001	0.01	0.01	237	0.055	0.53	< 1	0.2
2016	Q2	Reference (FR_UFR1)	15	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	147	0.077	2.0	1.5	0.82
2016	Q3	Reference (FR_UFR1)	38	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	218	0.07	0.97	1.7	0.27
2016	Q4	Reference (FR_UFR1)	38	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	197	0.065	1.3	< 1	0.69
2017	Q3	Reference (CM_MC1)	13	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	162	0.064	1.1	< 1	0.37
2017	Q4	Reference (CM_MC1)	14	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	173	0.12	1.2	1.4	0.52
2017	Q1	Reference (FR_UFR1)	46	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	195	0.074	0.77	< 1	0.27
2017	Q2	Reference (FR_UFR1)	18	< 0.00001	0.000011	0.0001	< 0.0001	< 0.01	< 0.01	146	0.12	3.3	3.0	2.6
2017	Q3	Reference (FR_UFR1)	36	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	201	0.063	1.5	1.1	0.24
2017	Q4	Reference (FR_UFR1)	46	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	235	0.071	0.78	1.1	0.36
2017	Q2	Reference (GH_ER2)	18	< 0.00001	0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	182	0.1	1.8	11	5.2
2017	Q3	Reference (GH_ER2)	16	< 0.00001	< 0.00001	0.0001	< 0.0001	< 0.01	< 0.01	162	0.067	0.79	1.3	0.62
2017	Q4	Reference (GH_ER2)	19	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	194	0.19	0.69	1.6	0.7
<b>Tests categorized as no adverse response</b>														
2015	Q1	CM_MC2	159	0.00001	0.000017	0.0001	0.0001	0.01	0.014	408	0.12	1.9	10	6.1
2015	Q2	CM_MC2	103	0.00001	0.000034	0.0001	0.0001	0.01	0.018	308	0.18	2.2	32	16
2015	Q4	CM_MC2	252	0.000011	0.000012	0.0001	0.0001	0.011	0.012	571	0.14	1.4	4.1	2.0
2015	Q1	FR_FRCP1	407	0.000013	0.000013	0.0001	0.0001	0.013	0.014	866	0.05	1.3	1.9	1.3
2015	Q3	FR_FRCP1	291	0.000011	0.00001	0.0001	0.0001	0.01	0.01	703	0.13	0.96	1.0	0.23
2015	Q4	FR_FRCP1	364	0.00001	0.00001	0.0001	0.0001	0.011	0.011	836	0.1	0.88	1.1	0.37
2015	Q1	GH_FR1	230	0.00001	0.00001	0.0001	0.0001	0.012	0.014	574	0.12	1.9	2.5	3.6
2015	Q2	GH_FR1	129	0.00001	0.00001	0.0001	0.0001	0.01	0.01	386	0.073	1.6	4.4	1.8
2015	Q3	GH_FR1	160	0.00001	0.00001	0.0001	0.0001	0.01	0.01	508	0.12	0.89	8.3	1.9
2015	Q4	GH_FR1	202	0.00001	0.00001	0.0001	0.0001	0.01	0.011	545	0.11	0.7	1.0	0.27
2016	Q3	CM_MC2	310	0.000016	0.000015	< 0.0001	< 0.0001	< 0.01	< 0.01	704	0.14	1.2	1.1	0.43
2016	Q4	CM_MC2	195	0.000011	0.000015	< 0.0001	< 0.0001	< 0.01	< 0.01	482	0.13	1.9	4.2	2.2
2016	Q1	GH_FR1	251	< 0.00001	< 0.00001	< 0.0001	< 0.0001	0.013	0.013	618	0.084	0.88	< 1	0.56
2016	Q4	GH_FR1	212	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	553	0.21	1.8	2.2	0.79
2017	Q2	FR_FRCP1	190	0.00001	0.000018	< 0.0001	< 0.0001	< 0.01	< 0.01	495	0.5	2.8	8.9	9.4
2017	Q3	FR_FRCP1	341	0.000011	0.000011	< 0.0001	< 0.0001	< 0.01	< 0.01	792	0.42	1.8	1.5	0.57
2017	Q4	FR_FRCP1	513	0.000012	0.000013	< 0.0001	< 0.0001	< 0.01	< 0.01	1053	0.45	1.0	1.3	0.69
2017	Q1	GH_FR1	239	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	623	0.092	0.78	< 1	0.38
2017	Q2	GH_FR1	143	< 0.00001	0.000016	< 0.0001	< 0.0001	< 0.01	< 0.01125	423	0.31	4.3	12	14
2017	Q3	GH_FR1	206	< 0.00001	< 0.00001	0.0001	< 0.0001	< 0.01	< 0.01	568	0.37	1.2	1.6	0.38
2017	Q4	GH_FR1	274	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	685	0.43	1.5	1.3	0.8
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2016)</b>														
2015	Q2	FR_FRCP1	119	0.00001	0.00001	0.0001	0.0001	0.01	0.01	374	0.05	1.7	5.4	1.4
2016	Q2	CM_MC2	134	0.000012	0.000022	< 0.0001	< 0.0001	0.012	0.017	366	0.2	1.8	14	6.6
2016	Q1	FR_FRCP1	561	0.000013	0.000015	< 0.0001	< 0.0001	0.015	0.015	1205	0.12	0.87	1.0	0.31
2016	Q2	FR_FRCP1	119	< 0.00001	0.000011	< 0.0001	< 0.0001	0.011	0.011	377	0.16	2.0	6.0	0.98
2016	Q3	FR_FRCP1	280	< 0.00001	0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	692	0.14	1.1	1.7	0.74
2016	Q4	FR_FRCP1	253	0.000011	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	626	0.073	1.4	1.4	1.2
2016	Q2	GH_FR1	128	< 0.00001	< 0.00001	< 0.0001	< 0.0001	0.011	0.011	394	0.17	1.8	4.4	1.4
2016	Q3	GH_FR1	188	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01	514	0.13	1.1	< 1	0.36
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>														
2015	Q3	CM_MC2	325	0.000019	0.000018	0.0001	0.0001	0.01	0.01	725	0.14	1.1	1.3	0.48
2016	Q1	CM_MC2	291	0.000011	0.000016	< 0.0001	< 0.0001	0.011	0.011	642	0.12	0.8	1.1	0.74
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>														
2017	Q4	CM_MC2	325	0.000014	0.000015	< 0.0001	< 0.0001	< 0.01	< 0.01	744	0.44	1.0	3.2	1.4
2017	Q1	FR_FRCP1	680	0.000015	0.000016	< 0.0001	< 0.0001	< 0.01	< 0.01	1330	0.22	1.3	1.1	0.35
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>														
2017	Q1	CM_MC2	356	0.000018	0.000021	< 0.0001	< 0.0001	< 0.01	< 0.01	750	0.13	0.78	1.1	0.63
2017	Q2	CM_MC2	204	0.000014	0.000028	< 0.0001	0.00013	< 0.01	< 0.01	479	0.21	2.3	11	9.3
2017	Q3	CM_MC2	305	0.00002	0.000021	< 0.0001	< 0.0001	< 0.01	< 0.01	627	0.24	1.2	3.2	1.2

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening

Concentrations of parameters in 2017 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-3: Hyallela Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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-WQG	ΣTU-WQGs/Benchmarks	PCA Factor 1 (2015 to 2017)	PCA Factor 2 (2015 to 2017)	PCA Factor 3 (2015 to 2017)	PCA Factor 4 (2015 to 2017)	PCA Factor 1 (2017)	PCA Factor 2 (2017)	PCA Factor 3 (2017)	
<b>Reference</b>																		
2015	Q1	Reference (FR_UFR1)	0.00044	0.00044	0.0008	0.0008	0.003	0.0032	-	-	-6.4	0.29	3.1	-6.0	-	-	-	
2015	Q2	Reference (FR_UFR1)	0.00031	0.00031	0.0005	0.0005	0.003	0.003	-	-	-8.2	1.9	0.87	-0.86	-	-	-	
2015	Q3	Reference (FR_UFR1)	0.00043	0.00044	0.0005	0.00053	0.003	0.003	-	-	-6.3	-1.4	0.059	-2.1	-	-	-	
2015	Q4	Reference (FR_UFR1)	0.00045	0.00045	0.0005	0.0005	0.003	0.003	-	-	-7.0	-2.5	-0.28	-2.1	-	-	-	
2016	Q1	Reference (FR_UFR1)	0.00045	0.0005	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	-7.0	-2.6	-0.63	-1.2	-	-	-	
2016	Q2	Reference (FR_UFR1)	0.00032	0.00033	< 0.0005	0.0005	< 0.003	< 0.003	-	-	-8.6	1.6	0.23	0.32	-	-	-	
2016	Q3	Reference (FR_UFR1)	0.00045	0.00045	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	-7.1	-1.8	-0.74	0.63	-	-	-	
2016	Q4	Reference (FR_UFR1)	0.00043	0.00045	< 0.0005	0.0005	< 0.003	< 0.00375	-	-	-7.5	-0.069	-0.34	0.73	-	-	-	
2017	Q3	Reference (CM_MC1)	0.00022	0.00022	< 0.0005	< 0.0005	< 0.0025	< 0.003	1.3	1.1	-6.8	1.8	-3.8	0.057	-5.7	0.66	-3.0	
2017	Q4	Reference (CM_MC1)	0.00022	0.00023	< 0.0005	< 0.0005	< 0.003	< 0.003	1.2	1.1	-6.9	0.9	-4.1	-0.22	-6.0	-0.32	-2.9	
2017	Q1	Reference (FR_UFR1)	0.00046	0.00046	< 0.0005	< 0.0005	< 0.001	0.0037	1.6	1.2	-7.1	-2.3	-1.3	2.2	-6.0	-1.8	1.1	
2017	Q2	Reference (FR_UFR1)	0.00031	0.00034	0.00051	0.00066	0.0011	< 0.003	2.7	2.4	-8.3	6.2	2.0	3.8	-6.9	6.4	1.6	
2017	Q3	Reference (FR_UFR1)	0.00043	0.00041	< 0.0005	< 0.0005	< 0.0025	< 0.003	1.5	1.2	-7.2	-1.3	-0.7	0.7	-6.1	-1.1	0.56	
2017	Q4	Reference (FR_UFR1)	0.00052	0.00051	< 0.0005	< 0.0005	< 0.003	< 0.003	1.4	1.1	-7.1	-2.2	-1.3	-0.18	-6.2	-2.1	0.27	
2017	Q2	Reference (GH_ER2)	0.00079	0.00082	< 0.0005	0.0009	< 0.003	< 0.003	2.3	1.8	-4.6	3.8	0.15	0.58	-3.8	3.4	-0.75	
2017	Q3	Reference (GH_ER2)	0.00063	0.00063	< 0.0005	< 0.0005	< 0.0025	< 0.003	1.6	1.2	-6.3	0.047	-2.2	0.73	-5.6	-0.63	-1.5	
2017	Q4	Reference (GH_ER2)	0.00078	0.00076	< 0.0005	< 0.0005	< 0.003	< 0.003	1.7	1.3	-6.0	-0.56	-2.5	-0.49	-5.4	-1.4	-1.7	
<b>Tests categorized as no adverse response</b>																		
2015	Q1	CM_MC2	0.0015	0.0015	0.0008	0.00092	0.003	0.0036	-	-	2.6	6.0	2.1	-6.4	-	-	-	
2015	Q2	CM_MC2	0.0011	0.0011	0.0005	0.0016	0.0035	0.0091	-	-	1.6	13	2.6	-0.16	-	-	-	
2015	Q4	CM_MC2	0.0024	0.0023	0.0005	0.00053	0.003	0.003	-	-	4.1	1.7	-2.3	-2.4	-	-	-	
2015	Q1	FR_FRCP1	0.0041	0.0042	0.0008	0.0008	0.003	0.0031	-	-	7.1	-1.6	4.8	-5.8	-	-	-	
2015	Q3	FR_FRCP1	0.0032	0.0033	0.0005	0.0005	0.003	0.003	-	-	4.1	-3.5	1.5	-0.073	-	-	-	
2015	Q4	FR_FRCP1	0.0042	0.0043	0.0005	0.0005	0.003	0.003	-	-	4.7	-3.9	1.7	-0.23	-	-	-	
2015	Q1	GH_FR1	0.0022	0.0023	0.0008	0.00083	0.003	0.003	-	-	3.0	-0.33	5.4	-5.4	-	-	-	
2015	Q2	GH_FR1	0.0015	0.0015	0.0005	0.00056	0.003	0.003	-	-	-0.11	-0.34	2.7	-0.17	-	-	-	
2015	Q3	GH_FR1	0.0018	0.0019	0.0005	0.00051	0.003	0.003	-	-	1.3	-1.4	1.9	-0.21	-	-	-	
2015	Q4	GH_FR1	0.002	0.0021	0.0005	0.0005	0.003	0.003	-	-	0.86	-4.4	1.1	-1.1	-	-	-	
2016	Q3	CM_MC2	0.0029	0.0029	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	4.0	-1.6	-5.2	-0.81	-	-	-	
2016	Q4	CM_MC2	0.0018	0.0019	< 0.0005	< 0.0005	0.0032	0.004	-	-	2.6	3.1	-2.7	0.23	-	-	-	
2016	Q1	GH_FR1	0.0022	0.0022	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	1.5	-4.3	1.6	-1.1	-	-	-	
2016	Q4	GH_FR1	0.0023	0.0023	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	1.5	-2.8	0.91	1.7	-	-	-	
2017	Q2	FR_FRCP1	0.0022	0.0023	< 0.0005	0.0016	0.0028	0.0066	32	7.0	3.7	6.3	4.2	4.7	4.3	6.6	3.1	
2017	Q3	FR_FRCP1	0.0039	0.0038	< 0.0005	< 0.0005	< 0.0025	< 0.003	50	8.6	4.0	-3.0	1.0	2.8	3.7	-2.8	2.9	
2017	Q4	FR_FRCP1	0.0058	0.0058	< 0.0005	0.00052	< 0.003	0.0032	75	12	5.3	-2.8	0.19	2.6	4.8	-3.0	2.3	
2017	Q1	GH_FR1	0.0024	0.0024	< 0.0005	< 0.0005	< 0.003	< 0.003	33	5.5	0.74	-4.6	0.23	1.1	0.75	-4.2	2.8	
2017	Q2	GH_FR1	0.0019	0.0019	< 0.0005	0.0016	< 0.003	0.0049	23	5.9	2.6	6.5	4.9	3.5	3.8	8.4	4.5	
2017	Q3	GH_FR1	0.0023	0.0023	< 0.0005	< 0.0005	< 0.0025	< 0.003	30	5.4	1.1	-3.7	0.64	2.4	1.1	-3.3	3.0	
2017	Q4	GH_FR1	0.003	0.003	< 0.0005	< 0.0005	< 0.003	< 0.003	39	6.5	1.8	-3.3	0.36	1.7	1.7	-3.2	2.4	
<b>Tests categorized as possible or likely adverse response for dry weight (2015 to 2016)</b>																		
2015	Q2	FR_FRCP1	0.0016	0.0016	0.0005	0.00051	0.003	0.003	-	-	0.26	0.053	2.8	0.11	-	-	-	
2016	Q2	CM_MC2	0.0014	0.0014	< 0.0005	0.00088	0.0059	0.011	-	-	3.6	9.3	-1.0	-0.58	-	-	-	
2016	Q1	FR_FRCP1	0.0062	0.0063	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	7.0	-3.7	2.0	-0.36	-	-	-	
2016	Q2	FR_FRCP1	0.0017	0.0017	< 0.0005	0.00053	< 0.003	0.0031	-	-	0.16	0.39	2.7	1.7	-	-	-	
2016	Q3	FR_FRCP1	0.0034	0.0035	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	3.3	-3.2	1.1	2.1	-	-	-	
2016	Q4	FR_FRCP1	0.0031	0.0032	< 0.0005	< 0.0005	< 0.003	< 0.0045	-	-	3.0	-2.4	1.5	2.0	-	-	-	
2016	Q2	GH_FR1	0.0016	0.0016	< 0.0005	0.00053	< 0.003	< 0.003	-	-	-0.11	-0.34	2.4	1.2	-	-	-	
2016	Q3	GH_FR1	0.0021	0.0021	< 0.0005	0.00051	< 0.003	< 0.003	-	-	0.67	-3.8	0.73	1.2	-	-	-	
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2015 to 2016)</b>																		
2015	Q3	CM_MC2	0.0029	0.003	0.0005	0.0005	0.003	0.003	-	-	4.2	-1.2	-3.7	-2.3	-	-	-	
2016	Q1	CM_MC2	0.0026	0.0026	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-	4.7	-0.61	-3.7	-2.7	-	-	-	
<b>Tests categorized as possible or likely adverse response for dry weight (2017)</b>																		
2017	Q4	CM_MC2	0.003	0.0031	< 0.0005	< 0.0005	< 0.003	< 0.003	11	6.1	5.6	0.03	-5.6	-0.43	5.1	-2.3	-3.7	
2017	Q1	FR_FRCP1	0.0073	0.0073	< 0.0005	< 0.0005	0.0019	< 0.003	109	17	7.0	-3.5	0.11	4.1	6.5	-3.4	2.8	
<b>Tests categorized as possible or likely adverse response for dry weight and survival (2017)</b>																		
2017	Q1	CM_MC2	0.0037	0.0037	< 0.0005	< 0.0005	0.0043	0.0049	15	11	8.1	0.79	-6.3	-0.56	7.5	-2.1	-4.7	
2017	Q2	CM_MC2	0.0019	0.002	< 0.0005	0.00081	0.0063	0.0096	12	8.4	6.5	8.8	-3.4	1.4	6.9	6.3	-4.6	
2017	Q3	CM_MC2	0.0029	0.0029	< 0.0005	< 0.0005	< 0.0025	0.0039	14	9.7	6.0	2.6	-5.8	-0.37	5.6	-0.019	-4.8	

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of; ma/l = milligrams per litre; ua/l = micrograms per litre; % = Screening  
 Concentrations of parameters in 2017 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-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	Significant Test Result?	Mean Survival (Control Normalized)	Mean Wet Weight (Control Normalized)	ALKALINITY, TOTAL (As CaCO <sub>3</sub> ), lab measured.-N-mg/l	ALUMINUM-D-mg/l	ALUMINUM-T-mg/l
<b>Reference</b>								
2015	Q2	Reference (FR_UFR1)	Reference	91	100	118	0.0075	0.059
2015	Q4	Reference (FR_UFR1)	Reference	90	102	146	0.003	0.0056
2015	Q2	Reference (GH_ER2)	Reference	61	106	150	0.003	0.082
2015	Q4	Reference (GH_ER2)	Reference	94	99	147	0.003	0.014
2016	Q2	Reference (FR_UFR1)	Reference	84	103	114	0.0059	0.054
2016	Q4	Reference (FR_UFR1)	Reference	91	103	141	0.0082	0.042
2016	Q2	Reference (GH_ER2)	Reference	103	103	141	0.0032	0.14
2016	Q4	Reference (GH_ER2)	Reference	96	103	146	<0.003	0.0076
2017	Q4	Reference (CM_MC1)	Reference	35	103	136	<0.003	0.0067
2017	Q2	Reference (FR_UFR1)	Reference	79	111	113	0.0056	0.16
2017	Q4	Reference (FR_UFR1)	Reference	70	99	144	<0.003	0.0033
2017	Q2	Reference (GH_ER2)	Reference	100	108	143	0.0047	0.71
2017	Q4	Reference (GH_ER2)	Reference	57	98	147	<0.003	0.0068
<b>Tests categorized as no adverse response</b>								
2015	Q2	CM_MC2	No	80	101	138	0.012	0.58
2015	Q2	EV_MC2	No	103	104	104	0.0065	0.66
2015	Q4	EV_MC2	No	87	98	167	0.0068	0.081
2015	Q2	FR_FRCP1	No	83	110	145	0.003	0.047
2015	Q2	GH_ERC	No	69	106	153	0.0032	0.21
2015	Q2	GH_FR1	No	89	98	156	0.003	0.051
2015	Q2	LC_LCDSSLCC	No	102	101	121	0.003	0.041
2015	Q4	LC_LCDSSLCC	No	88	103	199	0.003	0.0052
2016	Q4	EV_MC2	No	87	110	132	0.012	0.1
2017	Q2	CM_MC2	No	97	117	142	0.0067	0.6
2017	Q2	EV_HC1	No	103	115	166	0.0064	0.38
2017	Q2	EV_MC2	No	102	119	105	0.022	1.0
2017	Q2	FR_FRCP1	Yes - survival	81	113	164	0.0033	0.24
2017	Q2	GH_FR1	No	91	127	159	0.0041	0.35
2017	Q2	LC_LCDSSLCC	No	99	126	151	0.0017	0.027
<b>Tests categorized as possible or likely response for length (2015 to 2016)</b>								
2016	Q4	GH_ERC	Yes - length	98	103	151	<0.003	0.013
<b>Tests categorized as possible or likely response for survival, viability, and length (2015 to 2016)</b>								
2015	Q4	FR_FRCP1	Yes - survival, viability, and length	73	100	213	0.0032	0.0046
2015	Q4	GH_FR1	Yes - survival, viability, and length	80	98	193	0.003	0.0037
2016	Q2	FR_FRCP1	Yes - survival, viability, and length	81	102	154	<0.003	0.07
<b>Tests categorized as possible or likely response for survival, viability, length, weight (2015 to 2016)</b>								
2015	Q4	GH_ERC	Yes - survival, viability, length, weight	77	95	152	0.0031	0.0089
2015	Q4	CM_MC2	Yes - survival and viability	82	103	195	0.0031	0.05
2015	Q4	EV_HC1	Yes - survival and viability	82	100	197	0.0032	0.023
2016	Q2	CM_MC2	Yes - survival and viability	73	101	146	0.0068	0.37
2016	Q2	EV_HC1	Yes - survival and viability	86	111	176	0.0034	0.074
2016	Q4	EV_HC1	Yes - survival and viability	60	104	195	0.0036	0.037
2016	Q2	EV_MC2	Yes - survival and viability	68	113	100	0.014	0.41
2016	Q4	FR_FRCP1	Yes - survival and viability	54	100	198	0.0038	0.024
2016	Q2	GH_ERC	Yes - survival and viability	81	108	145	0.0045	0.23
2016	Q2	GH_FR1	Yes - survival and viability	76	101	166	<0.003	0.058
2016	Q4	GH_FR1	Yes - survival and viability	44	105	192	<0.003	0.01
2016	Q2	LC_LCDSSLCC	Yes - survival and viability	84	103	157	0.0026	0.017
2016	Q4	LC_LCDSSLCC	Yes - survival and viability	69	116	184	<0.003	0.03
<b>Tests categorized as possible or likely response for viability (2015 to 2016)</b>								
2016	Q4	CM_MC2	Yes - viability	87	110	179	0.0055	0.088
<b>Tests categorized as possible or likely response for weight (2015 to 2016)</b>								
2015	Q2	EV_HC1	Yes - weight	75	98	113	0.0031	0.055
<b>Tests categorized as possible or likely response for survival and viability (2017)</b>								
2017	Q4	CM_MC2	Yes - survival and viability	23	128	202	<0.003	0.0081
2017	Q4	EV_HC1	Yes - survival and viability	34	92	185	<0.003	0.0055
2017	Q4	EV_MC2	Yes - survival and viability	24	102	175	<0.003	0.0086
2017	Q4	FR_FRCP1	Yes - survival and viability	27	105	190	<0.003	0.016
2017	Q2	GH_ERC	Yes - survival and viability	63	123	149	0.005	0.87
2017	Q4	GH_ERC	Yes - survival and viability	23	96	148	<0.003	0.0044
2017	Q4	GH_FR1	Yes - survival and viability	23	108	181	<0.003	0.0055
2017	Q4	LC_LCDSSLCC	Yes - survival and viability	41	119	186	<0.003	0.0043

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = 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 2017 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-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.0001	0.0001	0.0001	0.00013	0.043	0.043	0.0001
2015	Q4	Reference (FR_UFR1)	0.0001	0.0001	0.0001	0.00011	0.073	0.074	0.0001
2015	Q2	Reference (GH_ER2)	0.0001	0.0001	0.00011	0.00016	0.044	0.046	0.0001
2015	Q4	Reference (GH_ER2)	0.0001	0.0001	0.0001	0.00012	0.047	0.048	0.0001
2016	Q2	Reference (FR_UFR1)	<0.0001	<0.0001	0.00011	0.00012	0.042	0.043	<0.00004
2016	Q4	Reference (FR_UFR1)	<0.0001	<0.0001	<0.0001	0.00012	0.064	0.063	<0.00002
2016	Q2	Reference (GH_ER2)	<0.0001	<0.0001	0.0001	0.00019	0.041	0.042	<0.00004
2016	Q4	Reference (GH_ER2)	<0.0001	<0.0001	0.0001	0.00014	0.045	0.045	<0.00002
2017	Q4	Reference (CM_MC1)	<0.0001	<0.0001	0.00015	0.00018	0.051	0.051	<0.00002
2017	Q2	Reference (FR_UFR1)	<0.0001	0.00011	0.00012	0.0002	0.039	0.04	<0.00002
2017	Q4	Reference (FR_UFR1)	<0.0001	<0.0001	<0.0001	0.00011	0.074	0.073	<0.00002
2017	Q2	Reference (GH_ER2)	<0.0001	0.00011	0.00013	0.00063	0.043	0.053	<0.00002
2017	Q4	Reference (GH_ER2)	<0.0001	<0.0001	<0.0001	0.00011	0.048	0.047	<0.00002
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.00019	0.00016	0.00023	0.00049	0.043	0.049	0.00018
2015	Q2	EV_MC2	0.00014	0.00017	0.00018	0.00054	0.064	0.076	0.0001
2015	Q4	EV_MC2	0.00026	0.00029	0.00016	0.00022	0.11	0.11	0.0001
2015	Q2	FR_FRCP1	0.00022	0.00022	0.0001	0.00013	0.063	0.064	0.0001
2015	Q2	GH_ERC	0.0001	0.0001	0.0001	0.00024	0.049	0.051	0.0001
2015	Q2	GH_FR1	0.00016	0.00017	0.0001	0.00015	0.085	0.086	0.0001
2015	Q2	LC_LCDSSLCC	0.00014	0.00016	0.00012	0.00016	0.035	0.035	0.0001
2015	Q4	LC_LCDSSLCC	0.00028	0.00032	0.0001	0.00013	0.083	0.087	0.0001
2016	Q4	EV_MC2	0.00012	0.00013	0.00018	0.00024	0.079	0.083	<0.00002
2017	Q2	CM_MC2	0.00018	0.00023	0.00018	0.00049	0.043	0.048	<0.00002
2017	Q2	EV_HC1	0.00011	0.00011	0.00017	0.00033	0.04	0.043	<0.00002
2017	Q2	EV_MC2	0.0001	0.00018	0.00021	0.0007	0.059	0.077	<0.00002
2017	Q2	FR_FRCP1	0.00018	0.00019	0.00011	0.00027	0.054	0.057	<0.00002
2017	Q2	GH_FR1	0.00016	0.00019	0.00013	0.00034	0.07	0.077	<0.00002
2017	Q2	LC_LCDSSLCC	0.00021	0.00021	0.00013	0.00017	0.035	0.034	<0.00002
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	<0.0001	<0.0001	<0.0001	0.00014	0.055	0.054	<0.00002
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.00025	0.00028	0.0001	0.00011	0.08	0.08	0.0001
2015	Q4	GH_FR1	0.00012	0.00015	0.0001	0.00012	0.11	0.11	0.0001
2016	Q2	FR_FRCP1	0.00017	0.00022	<0.0001	0.00014	0.058	0.059	<0.00004
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.0001	0.0001	0.0001	0.00012	0.06	0.06	0.0001
2015	Q4	CM_MC2	0.00015	0.00017	0.00017	0.00023	0.074	0.074	0.0001
2015	Q4	EV_HC1	0.0001	0.00011	0.00015	0.00018	0.063	0.064	0.0001
2016	Q2	CM_MC2	0.00015	0.00017	0.00017	0.0003	0.045	0.045	<0.00004
2016	Q2	EV_HC1	<0.0001	0.00011	0.00015	0.0002	0.041	0.042	<0.00004
2016	Q4	EV_HC1	<0.0001	0.0001	0.00015	0.00018	0.057	0.056	<0.00002
2016	Q2	EV_MC2	0.00012	0.00016	0.00018	0.00037	0.057	0.062	<0.00004
2016	Q4	FR_FRCP1	0.00019	0.0002	<0.0001	0.00014	0.075	0.074	<0.00002
2016	Q2	GH_ERC	<0.0001	0.0001	0.0001	0.00025	0.048	0.05	<0.00004
2016	Q2	GH_FR1	0.00015	0.00018	0.0001	0.00014	0.08	0.08	<0.00004
2016	Q4	GH_FR1	0.00016	0.00024	0.00011	0.00014	0.1	0.1	<0.00002
2016	Q2	LC_LCDSSLCC	0.00023	0.00026	0.00012	0.00015	0.039	0.04	<0.00004
2016	Q4	LC_LCDSSLCC	0.00022	0.00027	<0.0001	0.00019	0.061	0.062	<0.00002
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.00014	0.00016	0.00017	0.00023	0.054	0.056	<0.00002
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.0001	0.0001	0.00013	0.00017	0.027	0.028	0.0001
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.00025	0.00028	0.00017	0.0002	0.079	0.077	<0.00002
2017	Q4	EV_HC1	<0.0001	0.00011	0.00015	0.00018	0.065	0.062	<0.00002
2017	Q4	EV_MC2	<0.0001	0.00012	0.00015	0.00018	0.11	0.11	<0.00002
2017	Q4	FR_FRCP1	0.00024	0.00026	<0.0001	0.00013	0.074	0.075	<0.00002
2017	Q2	GH_ERC	<0.0001	0.00013	0.00012	0.00078	0.049	0.062	<0.00002
2017	Q4	GH_ERC	<0.0001	<0.0001	<0.0001	0.00011	0.057	0.055	<0.00002
2017	Q4	GH_FR1	0.00017	0.00019	0.0001	0.00012	0.11	0.11	<0.00002
2017	Q4	LC_LCDSSLCC	0.00026	0.00028	0.00011	0.00013	0.079	0.077	<0.00002

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000066
2015	Q4	Reference (FR_UFR1)	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000065
2015	Q2	Reference (GH_ER2)	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000056
2015	Q4	Reference (GH_ER2)	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000051
2016	Q2	Reference (FR_UFR1)	<0.00004	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00006
2016	Q4	Reference (FR_UFR1)	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000064
2016	Q2	Reference (GH_ER2)	<0.00004	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000059
2016	Q4	Reference (GH_ER2)	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000055
2017	Q4	Reference (CM_MC1)	<0.00002	<0.00005	<0.00005	0.013	0.014	<0.09	0.000077
2017	Q2	Reference (FR_UFR1)	0.000021	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000094
2017	Q4	Reference (FR_UFR1)	<0.00002	<0.00005	<0.00005	<0.01	<0.01	0.052	0.000068
2017	Q2	Reference (GH_ER2)	0.000059	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00008
2017	Q4	Reference (GH_ER2)	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000052
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.00014	0.00054	0.00054	0.021	0.018	0.05	0.000038
2015	Q2	EV_MC2	0.00012	0.00005	0.00005	0.01	0.01	0.05	0.000024
2015	Q4	EV_MC2	0.0001	0.00005	0.00005	0.013	0.013	0.10	0.000029
2015	Q2	FR_FRCP1	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000028
2015	Q2	GH_ERC	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000073
2015	Q2	GH_FR1	0.0001	0.00005	0.00005	0.01	0.01	0.07	0.000021
2015	Q2	LC_LCDSSLCC	0.0001	0.00005	0.00005	0.01	0.01	0.06	0.00011
2015	Q4	LC_LCDSSLCC	0.0001	0.00005	0.00005	0.015	0.016	0.25	0.0002
2016	Q4	EV_MC2	<0.00002	<0.00005	<0.00005	<0.01	0.01	<0.05	0.000025
2017	Q2	CM_MC2	0.000042	<0.00005	<0.00005	0.016	0.017	<0.05	0.000092
2017	Q2	EV_HC1	0.000028	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000025
2017	Q2	EV_MC2	0.000065	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000029
2017	Q2	FR_FRCP1	0.000027	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00005
2017	Q2	GH_FR1	0.00003	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000025
2017	Q2	LC_LCDSSLCC	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00022
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000057
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.0001	0.00005	0.00005	0.011	0.012	0.25	0.000043
2015	Q4	GH_FR1	0.0001	0.00005	0.00005	0.01	0.012	0.25	0.000017
2016	Q2	FR_FRCP1	<0.00004	<0.00005	0.000051	<0.01	<0.01	<0.05	0.000027
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.0001	0.00005	0.00005	0.01	0.01	0.05	0.000056
2015	Q4	CM_MC2	0.0001	0.00005	0.00005	0.024	0.027	0.25	0.000012
2015	Q4	EV_HC1	0.0001	0.00005	0.00005	0.01	0.01	0.2	0.000015
2016	Q2	CM_MC2	0.000044	<0.00005	<0.00005	0.017	0.017	<0.05	0.000064
2016	Q2	EV_HC1	<0.00004	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.00002
2016	Q4	EV_HC1	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.2	0.000016
2016	Q2	EV_MC2	0.000047	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000028
2016	Q4	FR_FRCP1	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.25	0.000042
2016	Q2	GH_ERC	<0.00004	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000082
2016	Q2	GH_FR1	<0.00004	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000022
2016	Q4	GH_FR1	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.25	0.000016
2016	Q2	LC_LCDSSLCC	<0.00004	<0.00005	<0.00005	0.01	0.011	<0.1	0.0002
2016	Q4	LC_LCDSSLCC	<0.00002	<0.00005	<0.00005	0.01	0.011	<0.25	0.00015
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	<0.00002	<0.00005	<0.00005	0.019	0.021	<0.1	0.000027
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.0001	0.00005	0.00005	0.01	0.01	0.057	0.000014
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	<0.00002	<0.00005	<0.00005	0.033	0.035	0.099	0.000012
2017	Q4	EV_HC1	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.09	0.000016
2017	Q4	EV_MC2	<0.00002	<0.00005	<0.00005	0.012	0.013	<0.09	0.000026
2017	Q4	FR_FRCP1	<0.00002	<0.00005	<0.00005	0.011	0.011	0.29	0.000012
2017	Q2	GH_ERC	0.000072	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000011
2017	Q4	GH_ERC	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000063
2017	Q4	GH_FR1	<0.00002	<0.00005	<0.00005	<0.01	<0.01	0.05	0.000017
2017	Q4	LC_LCDSSLCC	<0.00002	<0.00005	<0.00005	0.013	0.014	0.053	0.00016

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; WQG = water quality guideline; ug/l = micrograms per litre; % = percent

**Screening**  
 Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration of the corresponding parameter categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout 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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.000099	38	1.9	1.0	0.00012	0.00026	0.0001
2015	Q4	Reference (FR_UFR1)	0.000085	56	0.55	1.0	0.00012	0.00018	0.0001
2015	Q2	Reference (GH_ER2)	0.000017	49	1.1	1.2	0.0002	0.00075	0.0001
2015	Q4	Reference (GH_ER2)	0.000074	52	0.68	1.1	0.00022	0.0003	0.0001
2016	Q2	Reference (FR_UFR1)	0.000012	38	1.7	0.1	0.00013	0.0002	<0.0001
2016	Q4	Reference (FR_UFR1)	0.000092	47	1.2	0.19	0.00011	0.0002	<0.0001
2016	Q2	Reference (GH_ER2)	0.00002	48	1.1	0.57	0.00019	0.00049	<0.0001
2016	Q4	Reference (GH_ER2)	0.000077	48	0.64	0.37	0.00024	0.00026	<0.0001
2017	Q4	Reference (CM_MC1)	0.000086	41	1.2	1.1	0.00018	0.00019	<0.0001
2017	Q2	Reference (FR_UFR1)	0.000025	31	2.5	<0.5	0.0001	0.00058	<0.0001
2017	Q4	Reference (FR_UFR1)	0.000098	51	0.71	<0.5	0.0001	0.00018	<0.0001
2017	Q2	Reference (GH_ER2)	0.00012	53	1.8	0.45	0.00017	0.0019	<0.0001
2017	Q4	Reference (GH_ER2)	0.000075	43	0.63	<0.5	0.00025	0.00028	<0.0001
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.000081	60	1.3	1.4	0.00028	0.00091	0.00034
2015	Q2	EV_MC2	0.00013	46	2.0	3.2	0.00018	0.0012	0.0001
2015	Q4	EV_MC2	0.000045	81	1.5	5.6	0.00014	0.00027	0.0001
2015	Q2	FR_FRCP1	0.000042	75	1.5	1.1	0.0001	0.00018	0.0001
2015	Q2	GH_ERC	0.000033	53	1.1	1.3	0.00024	0.00069	0.0001
2015	Q2	GH_FR1	0.000028	81	1.4	1.6	0.00012	0.00024	0.0001
2015	Q2	LC_LCDSSLCC	0.00013	58	1.2	1.5	0.00012	0.00032	0.0001
2015	Q4	LC_LCDSSLCC	0.00024	125	0.67	3.8	0.00014	0.00017	0.0001
2016	Q4	EV_MC2	0.000036	55	2.1	3.5	0.00012	0.00029	<0.0001
2017	Q2	CM_MC2	0.00017	62	2.1	0.72	0.00015	0.00096	0.0018
2017	Q2	EV_HC1	0.000057	59	2.4	0.5	0.00012	0.00061	<0.0001
2017	Q2	EV_MC2	0.00016	38	2.9	2.0	0.00013	0.0016	<0.0001
2017	Q2	FR_FRCP1	0.00011	68	2.0	0.5	<0.0001	0.00059	<0.0001
2017	Q2	GH_FR1	0.000088	68	2.1	0.84	0.0001	0.00078	<0.0001
2017	Q2	LC_LCDSSLCC	0.00023	59	1.8	2.0	0.00011	0.00023	0.0001
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	0.000068	52	0.54	0.45	0.00023	0.0003	<0.0001
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.000058	141	0.78	2.4	0.00012	0.00016	0.0001
2015	Q4	GH_FR1	0.000019	107	0.66	2.0	0.00012	0.00017	0.0001
2016	Q2	FR_FRCP1	0.000045	75	1.5	0.51	0.00011	0.00024	<0.0001
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.000063	58	0.58	1.2	0.00023	0.0003	0.0001
2015	Q4	CM_MC2	0.000019	107	1.2	3.4	0.00016	0.00026	0.00051
2015	Q4	EV_HC1	0.000022	93	1.3	1.9	0.00014	0.00028	0.0001
2016	Q2	CM_MC2	0.0001	68	1.5	1.2	0.00017	0.0006	0.0021
2016	Q2	EV_HC1	0.000031	71	1.3	0.74	0.00012	0.00024	<0.0001
2016	Q4	EV_HC1	0.00002	82	1.2	1.2	0.00015	0.00018	<0.0001
2016	Q2	EV_MC2	0.000082	40	2.3	1.7	0.00013	0.00073	<0.0001
2016	Q4	FR_FRCP1	0.000051	106	1.0	1.4	<0.0001	0.00015	<0.0001
2016	Q2	GH_ERC	0.000029	53	1.1	0.67	0.00022	0.00067	<0.0001
2016	Q2	GH_FR1	0.000032	79	1.4	0.96	0.00011	0.00022	<0.0001
2016	Q4	GH_FR1	0.00002	100	0.84	1.6	0.00012	0.00016	<0.0001
2016	Q2	LC_LCDSSLCC	0.00022	75	1.3	3.2	0.00015	0.00019	0.000092
2016	Q4	LC_LCDSSLCC	0.00016	95	0.8	6.5	0.00012	0.00021	<0.0001
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.000035	85	1.6	2.0	0.00016	0.00033	0.00076
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.00002	47	1.1	1.3	0.00014	0.00023	0.0001
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.000014	121	1.1	4.4	0.00012	0.00019	0.0011
2017	Q4	EV_HC1	0.000019	84	1.1	1.1	0.00013	0.00019	<0.0001
2017	Q4	EV_MC2	0.000035	81	0.93	7.1	0.00011	0.00015	<0.0001
2017	Q4	FR_FRCP1	0.000056	151	0.97	<2.5	<0.0001	0.00018	<0.0001
2017	Q2	GH_ERC	0.000014	56	1.8	0.55	0.00021	0.00023	<0.0001
2017	Q4	GH_ERC	0.000007	47	0.68	<0.5	0.00022	0.00029	<0.0001
2017	Q4	GH_FR1	0.00002	106	1.1	1.3	0.00012	0.00015	<0.0001
2017	Q4	LC_LCDSSLCC	0.00017	114	0.87	6.7	0.00011	0.00019	<0.0001

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; mg/l = milligrams per litre; ug/l = micrograms per litre; % = percent

**Screening**  
 Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration for a parameter categorized as no adverse response.



**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.0001	239	0.0005	0.0005	0.15	132	0.01
2015	Q4	Reference (FR_UFR1)	0.0001	356	0.0005	0.0005	0.15	193	0.01
2015	Q2	Reference (GH_ER2)	0.0001	297	0.0005	0.00052	0.16	162	0.01
2015	Q4	Reference (GH_ER2)	0.0001	314	0.0005	0.0005	0.16	173	0.01
2016	Q2	Reference (FR_UFR1)	<0.0001	243	<0.0005	<0.0005	0.16	133	<0.01
2016	Q4	Reference (FR_UFR1)	<0.0001	319	<0.0005	<0.0005	0.16	171	<0.01
2016	Q2	Reference (GH_ER2)	0.0001	287	<0.0005	<0.0005	0.16	162	<0.01
2016	Q4	Reference (GH_ER2)	<0.0001	297	<0.0005	<0.0005	0.17	163	<0.01
2017	Q4	Reference (CM_MC1)	<0.0001	275	<0.0005	<0.0005	0.093	144	<0.01
2017	Q2	Reference (FR_UFR1)	0.00014	218	0.00025	0.0006	0.11	112	<0.01
2017	Q4	Reference (FR_UFR1)	<0.0001	334	<0.0005	<0.0005	0.11	184	<0.01
2017	Q2	Reference (GH_ER2)	0.00047	276	<0.00044	0.0013	0.14	155	<0.01
2017	Q4	Reference (GH_ER2)	<0.0001	280	<0.0005	<0.0005	0.13	155	<0.01
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.00082	466	0.0005	0.0011	0.097	245	0.022
2015	Q2	EV_MC2	0.00048	321	0.00061	0.0014	0.12	170	0.01
2015	Q4	EV_MC2	0.00011	588	0.0005	0.00056	0.15	320	0.013
2015	Q2	FR_FRCP1	0.0001	580	0.0005	0.0005	0.2	315	0.01
2015	Q2	GH_ERC	0.00014	323	0.0005	0.0007	0.15	177	0.01
2015	Q2	GH_FR1	0.0001	595	0.0005	0.0005	0.17	335	0.01
2015	Q2	LC_LCDSSLCC	0.00012	436	0.0005	0.00056	0.15	232	0.01
2015	Q4	LC_LCDSSLCC	0.0001	901	0.0005	0.0005	0.22	497	0.01
2016	Q4	EV_MC2	0.00011	410	<0.0005	0.00054	0.13	211	0.014
2017	Q2	CM_MC2	0.0029	517	0.00023	0.0011	0.085	252	0.01
2017	Q2	EV_HC1	0.00018	458	<0.0005	0.00082	0.16	260	<0.01
2017	Q2	EV_MC2	0.00069	277	<0.0005	0.0018	0.11	142	0.024
2017	Q2	FR_FRCP1	0.00027	540	0.00025	0.00087	0.16	279	<0.01
2017	Q2	GH_FR1	0.00029	506	<0.00044	0.00097	0.16	281	<0.01
2017	Q2	LC_LCDSSLCC	0.00012	489	0.00033	0.00057	0.18	248	<0.01
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	<0.0001	324	<0.0005	0.00051	0.16	178	<0.01
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.0001	1100	0.0005	0.0005	0.18	650	0.01
2015	Q4	GH_FR1	0.0001	783	0.0005	0.0005	0.16	445	0.01
2016	Q2	FR_FRCP1	0.0001	569	<0.0005	0.00051	0.21	311	<0.01
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.0001	357	0.0005	0.00052	0.16	195	0.01
2015	Q4	CM_MC2	0.0006	821	0.0005	0.00059	0.11	456	0.01
2015	Q4	EV_HC1	0.0001	750	0.0005	0.00053	0.2	434	0.01
2016	Q2	CM_MC2	0.0029	537	<0.0005	0.0007	0.1	282	<0.01
2016	Q2	EV_HC1	<0.0001	545	<0.0005	<0.0005	0.19	311	<0.01
2016	Q4	EV_HC1	<0.0001	661	<0.0005	<0.0005	0.21	381	<0.01
2016	Q2	EV_MC2	0.00031	286	0.00051	0.00098	0.12	152	0.012
2016	Q4	FR_FRCP1	<0.0001	850	<0.0005	<0.0005	0.21	478	<0.01
2016	Q2	GH_ERC	0.00014	327	<0.0005	0.00055	0.16	180	<0.01
2016	Q2	GH_FR1	<0.0001	598	<0.0005	<0.0005	0.18	332	<0.01
2016	Q4	GH_FR1	<0.0001	758	<0.0005	<0.0005	0.17	431	<0.01
2016	Q2	LC_LCDSSLCC	0.000095	562	0.00044	0.00051	0.23	304	<0.01
2016	Q4	LC_LCDSSLCC	<0.0001	742	<0.0005	<0.0005	0.25	395	<0.01
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.00099	669	<0.0005	<0.0005	0.11	358	<0.01
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.0001	364	0.0005	0.00051	0.13	206	0.01
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.0012	919	<0.0005	<0.0005	0.09	532	<0.01
2017	Q4	EV_HC1	<0.0001	698	<0.0005	<0.0005	0.22	399	<0.01
2017	Q4	EV_MC2	<0.0001	588	<0.0005	<0.0005	0.14	314	<0.01
2017	Q4	FR_FRCP1	0.00011	1174	<0.0005	<0.0005	0.11	745	0.01
2017	Q2	GH_ERC	0.00058	302	<0.00044	0.0016	0.14	168	<0.01
2017	Q4	GH_ERC	<0.0001	300	<0.0005	<0.0005	0.13	167	<0.01
2017	Q4	GH_FR1	<0.0001	826	<0.0005	<0.0005	0.13	497	<0.01
2017	Q4	LC_LCDSSLCC	<0.0001	853	<0.0005	<0.0005	0.18	494	<0.01

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; TU = toxic unit; WQG = water quality guideline; ug/l = micrograms per litre; % = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.04	0.00005	0.00005	0.0012	0.0012	9.4	0.00067
2015	Q4	Reference (FR_UFR1)	0.01	0.00005	0.00005	0.0014	0.0013	14	0.00016
2015	Q2	Reference (GH_ER2)	0.093	0.00005	0.000072	0.0016	0.0017	11	0.0029
2015	Q4	Reference (GH_ER2)	0.022	0.00005	0.00005	0.0016	0.0016	11	0.0023
2016	Q2	Reference (FR_UFR1)	0.043	<0.00005	0.000053	0.0012	0.0013	10.0	0.00032
2016	Q4	Reference (FR_UFR1)	0.019	<0.00005	<0.00005	0.0013	0.0016	12	0.00017
2016	Q2	Reference (GH_ER2)	0.17	<0.00005	0.00011	0.0016	0.0017	11	0.0014
2016	Q4	Reference (GH_ER2)	0.012	<0.00005	<0.00005	0.0019	0.0018	11	0.0011
2017	Q4	Reference (CM_MC1)	<0.01	<0.00005	<0.00005	0.0046	0.0047	11	0.00013
2017	Q2	Reference (FR_UFR1)	0.2	<0.00005	0.00014	0.001	0.0012	8.6	0.00054
2017	Q4	Reference (FR_UFR1)	<0.01	<0.00005	<0.00005	0.0017	0.0017	14	0.00012
2017	Q2	Reference (GH_ER2)	1.1	<0.00005	0.00069	0.0013	0.0026	12	0.0014
2017	Q4	Reference (GH_ER2)	0.011	<0.00005	<0.00005	0.0019	0.0017	11	0.00044
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.74	0.00009	0.0005	0.0063	0.0068	24	0.0029
2015	Q2	EV_MC2	0.82	0.00005	0.00067	0.0066	0.007	14	0.00073
2015	Q4	EV_MC2	0.083	0.00005	0.000077	0.016	0.015	29	0.0013
2015	Q2	FR_FRCP1	0.066	0.00005	0.000076	0.02	0.02	31	0.0031
2015	Q2	GH_ERC	0.26	0.000051	0.00018	0.0021	0.0023	12	0.00054
2015	Q2	GH_FR1	0.071	0.00005	0.000071	0.015	0.015	32	0.001
2015	Q2	LC_LCDSSLCC	0.048	0.00005	0.000081	0.014	0.012	22	0.00015
2015	Q4	LC_LCDSSLCC	0.01	0.00005	0.00005	0.036	0.036	52	0.00037
2016	Q4	EV_MC2	0.081	<0.00005	0.000078	0.0092	0.0092	19	0.00062
2017	Q2	CM_MC2	0.83	<0.00005	0.0005	0.009	0.0095	26	0.011
2017	Q2	EV_HC1	0.4	<0.00005	0.00023	0.0046	0.0047	26	0.0013
2017	Q2	EV_MC2	1.2	<0.00005	0.0008	0.005	0.0055	13	0.0018
2017	Q2	FR_FRCP1	0.39	<0.00005	0.00028	0.019	0.019	28	0.0023
2017	Q2	GH_FR1	0.51	<0.00005	0.00038	0.013	0.013	28	0.0013
2017	Q2	LC_LCDSSLCC	0.043	<0.00005	0.000055	0.021	0.02	24	0.00054
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	0.018	<0.00005	<0.00005	0.0026	0.0027	12	0.00035
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.021	0.00005	0.00005	0.04	0.041	74	0.0076
2015	Q4	GH_FR1	0.011	0.00005	0.00005	0.016	0.016	45	0.0012
2016	Q2	FR_FRCP1	0.09	<0.00005	0.000078	0.018	0.019	31	0.0022
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.015	0.00005	0.00005	0.0019	0.0019	13	0.00057
2015	Q4	CM_MC2	0.053	0.00005	0.000063	0.012	0.012	46	0.0039
2015	Q4	EV_HC1	0.028	0.00005	0.00005	0.0071	0.0072	49	0.0019
2016	Q2	CM_MC2	0.4	<0.00005	0.00024	0.009	0.0093	26	0.011
2016	Q2	EV_HC1	0.072	<0.00005	0.000063	0.006	0.0061	33	0.00046
2016	Q4	EV_HC1	0.036	<0.00005	<0.00005	0.0075	0.0075	43	0.0015
2016	Q2	EV_MC2	0.43	<0.00005	0.00033	0.0057	0.0058	12	0.00039
2016	Q4	FR_FRCP1	0.034	<0.00005	<0.00005	0.032	0.033	50	0.0068
2016	Q2	GH_ERC	0.28	<0.00005	0.00016	0.0021	0.0024	12	0.00095
2016	Q2	GH_FR1	0.086	<0.00005	0.000072	0.014	0.014	33	0.00088
2016	Q4	GH_FR1	0.018	<0.00005	<0.00005	0.017	0.018	46	0.00096
2016	Q2	LC_LCDSSLCC	0.02	<0.000045	<0.000045	0.025	0.026	29	0.0025
2016	Q4	LC_LCDSSLCC	0.029	<0.00005	0.000052	0.033	0.032	39	0.0018
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.077	<0.00005	0.000066	0.011	0.011	37	0.0073
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.058	0.00005	0.00007	0.0042	0.0042	22	0.00064
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.012	<0.00005	<0.00005	0.018	0.019	59	0.0043
2017	Q4	EV_HC1	0.011	<0.00005	<0.00005	0.007	0.0074	47	0.0025
2017	Q4	EV_MC2	0.016	<0.00005	<0.00005	0.015	0.016	31	0.00073
2017	Q4	FR_FRCP1	0.049	<0.00005	0.000057	0.041	0.04	94	0.0075
2017	Q2	GH_ERC	1.3	<0.00005	0.0049	0.0024	0.0038	14	0.0011
2017	Q4	GH_ERC	<0.01	<0.00005	0.000055	0.0027	0.0026	12	0.00034
2017	Q4	GH_FR1	0.013	<0.00005	<0.00005	0.017	0.017	57	0.0013
2017	Q4	LC_LCDSSLCC	<0.01	<0.00005	<0.00005	0.041	0.041	51	0.00059

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**  
 Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration for the parameter categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout 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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.0022	0.000005	0.000005	0.00055	0.00059	0.0005	0.0005
2015	Q4	Reference (FR_UFR1)	0.00031	0.000005	0.000005	0.00061	0.00059	0.0005	0.0005
2015	Q2	Reference (GH_ER2)	0.0074	0.0000055	0.000005	0.00095	0.00096	0.0005	0.00051
2015	Q4	Reference (GH_ER2)	0.0035	0.000005	0.000005	0.001	0.001	0.0005	0.0005
2016	Q2	Reference (FR_UFR1)	0.0016	<0.000005	0.0000095	0.00063	0.00065	<0.0005	<0.0005
2016	Q4	Reference (FR_UFR1)	0.00056	<0.000005	0.0000058	0.00057	0.00058	<0.0005	<0.0005
2016	Q2	Reference (GH_ER2)	0.013	<0.000005	0.0000073	0.00095	0.00095	<0.0005	0.00053
2016	Q4	Reference (GH_ER2)	0.0019	<0.000005	<0.00001625	0.00098	0.001	<0.0005	<0.0005
2017	Q4	Reference (CM_MC1)	0.00026	<0.000005	0.0000053	0.00085	0.00088	<0.0005	<0.0005
2017	Q2	Reference (FR_UFR1)	0.0087	<0.000005	0.0000022	0.0005	0.00054	<0.0005	0.00064
2017	Q4	Reference (FR_UFR1)	0.00047	<0.000005	<0.0000005	0.00057	0.00059	<0.0005	<0.0005
2017	Q2	Reference (GH_ER2)	0.069	<0.000005	0.0000043	0.00085	0.00097	<0.0005	0.0022
2017	Q4	Reference (GH_ER2)	0.0015	<0.000005	<0.0000005	0.0011	0.001	<0.0005	<0.0005
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.025	0.000006	0.0000076	0.00078	0.00095	0.0062	0.008
2015	Q2	EV_MC2	0.024	0.000005	0.000005	0.00078	0.00087	0.0012	0.0029
2015	Q4	EV_MC2	0.003	<0.0000005	<0.0000005	0.0016	0.0016	0.0029	0.0031
2015	Q2	FR_FRCP1	0.0083	0.000005	0.000005	0.0013	0.0013	0.0021	0.0023
2015	Q2	GH_ERC	0.014	0.000005	0.000005	0.00096	0.00094	0.0005	0.00069
2015	Q2	GH_FR1	0.0045	0.000005	0.000005	0.001	0.001	0.0018	0.002
2015	Q2	LC_LCDSSLCC	0.0023	0.000005	0.000005	0.00095	0.00096	0.0029	0.0032
2015	Q4	LC_LCDSSLCC	0.0005	0.000005	0.000005	0.0018	0.0019	0.0066	0.0069
2016	Q4	EV_MC2	0.0026	0.000001	0.0000015	0.00079	0.00083	0.0013	0.0016
2017	Q2	CM_MC2	0.039	<0.000005	0.0000022	0.00088	0.001	0.013	0.016
2017	Q2	EV_HC1	0.0089	0.0000082	0.0000025	0.00062	0.00066	0.00076	0.0014
2017	Q2	EV_MC2	0.033	0.0000016	0.0000061	0.00061	0.00067	0.0013	0.0037
2017	Q2	FR_FRCP1	0.023	<0.000005	0.0000028	0.0011	0.0012	0.0025	0.0037
2017	Q2	GH_FR1	0.022	<0.000005	<0.000008	0.001	0.0011	0.0018	0.0032
2017	Q2	LC_LCDSSLCC	0.0034	<0.000005	0.0000011	0.0012	0.0012	0.0048	0.0048
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	0.0016	<0.000005	<0.00001625	0.001	0.001	<0.0005	0.00059
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.0089	0.000005	0.000005	0.0015	0.0015	0.007	0.0072
2015	Q4	GH_FR1	0.0016	0.000005	0.000005	0.00094	0.00098	0.0015	0.0015
2016	Q2	FR_FRCP1	0.0076	<0.000005	0.00000091	0.0011	0.0011	0.0019	0.0024
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.0014	0.000005	0.000005	0.0010	0.001	0.0005	0.0005
2015	Q4	CM_MC2	0.0065	0.000005	0.0000051	0.0011	0.0011	0.0087	0.009
2015	Q4	EV_HC1	0.0024	<0.0000005	<0.0000005	0.0010	0.001	0.00076	0.00079
2016	Q2	CM_MC2	0.025	<0.000005	0.000001	0.00087	0.00088	0.015	0.017
2016	Q2	EV_HC1	0.0027	0.00000054	0.00000067	0.00076	0.00078	0.00086	0.001
2016	Q4	EV_HC1	0.0025	<0.0000005	0.00000062	0.00091	0.00093	0.00075	0.00082
2016	Q2	EV_MC2	0.012	0.0000013	0.0000024	0.00073	0.00074	0.0017	0.0026
2016	Q4	FR_FRCP1	0.0087	<0.000005	<0.0000005	0.0013	0.0013	0.0049	0.0052
2016	Q2	GH_ERC	0.017	<0.000005	0.0000012	0.00096	0.00094	<0.0005	0.00059
2016	Q2	GH_FR1	0.0043	<0.000005	0.0000011	0.00099	0.00099	0.0016	0.0017
2016	Q4	GH_FR1	0.0017	<0.000005	<0.00001625	0.0011	0.0011	0.0024	0.0025
2016	Q2	LC_LCDSSLCC	0.0037	<0.000005	0.00000056	0.0014	0.0014	0.0046	0.0049
2016	Q4	LC_LCDSSLCC	0.0033	<0.000005	0.00000054	0.0016	0.0016	0.0044	0.0045
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.011	<0.000005	0.00000078	0.00089	0.00093	0.0098	0.011
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.0021	0.000005	0.000005	0.00051	0.00052	0.00073	0.00085
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.0054	<0.000005	<0.0000005	0.0013	0.0014	0.016	0.017
2017	Q4	EV_HC1	0.0044	0.0000015	0.0000013	0.00089	0.00089	0.00058	0.00067
2017	Q4	EV_MC2	0.0017	0.0000031	0.0000032	0.00078	0.0008	0.00052	0.00062
2017	Q4	FR_FRCP1	0.013	<0.000005	<0.0000005	0.0013	0.0014	0.0086	0.0092
2017	Q2	GH_ERC	0.081	<0.000005	0.0000053	0.00094	0.0011	<0.0005	0.0027
2017	Q4	GH_ERC	0.00097	<0.000005	<0.0000005	0.001	0.0011	<0.0005	<0.0005
2017	Q4	GH_FR1	0.002	<0.000005	0.0000011	0.0011	0.0011	0.0026	0.0028
2017	Q4	LC_LCDSSLCC	0.0013	<0.000005	0.0000005	0.0016	0.0017	0.0056	0.0058

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.038	0.001	0.005	0.0035	8.3	0.0077	0.36
2015	Q4	Reference (FR_UFR1)	0.074	0.001	0.005	0.0015	8.4	0.0024	0.39
2015	Q2	Reference (GH_ER2)	0.082	0.001	0.0068	0.0011	8.3	0.009	0.37
2015	Q4	Reference (GH_ER2)	0.081	0.001	0.005	0.0012	8.3	0.003	0.36
2016	Q2	Reference (FR_UFR1)	0.018	<0.001	<0.005	0.0025	8.3	0.0047	0.34
2016	Q4	Reference (FR_UFR1)	0.097	<0.001	<0.005	0.0024	8.3	0.0045	0.37
2016	Q2	Reference (GH_ER2)	0.089	<0.001	<0.005	0.0011	8.3	0.013	0.41
2016	Q4	Reference (GH_ER2)	0.075	<0.001	0.0056	0.0012	8.3	0.0023	0.37
2017	Q4	Reference (CM_MC1)	0.068	0.0018	0.007	0.0035	8.2	0.0033	0.5
2017	Q2	Reference (FR_UFR1)	0.07	0.0019	0.0056	0.0061	8.3	0.023	0.42
2017	Q4	Reference (FR_UFR1)	0.031	0.001	0.0052	0.0015	8.4	0.0028	0.39
2017	Q2	Reference (GH_ER2)	0.11	<0.001	0.005	0.0019	8.4	0.1	0.67
2017	Q4	Reference (GH_ER2)	0.05	<0.001	0.0069	<0.001	8.4	0.0017	0.36
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	1.1	0.0047	0.0064	0.0016	8.3	0.052	1.0
2015	Q2	EV_MC2	1.1	0.0013	0.006	0.0029	8.3	0.081	0.82
2015	Q4	EV_MC2	3.8	0.0023	0.0054	0.0052	8.2	0.0088	1.1
2015	Q2	FR_FRCP1	7.9	0.0052	0.012	0.0013	8.4	0.0097	1.2
2015	Q2	GH_ERC	0.26	0.001	0.0052	0.001	8.4	0.025	0.44
2015	Q2	GH_FR1	7.8	0.0034	0.0053	0.001	8.4	0.0084	1.1
2015	Q2	LC_LCDSSLCC	4.8	0.0015	0.005	0.0014	8.0	0.0088	0.68
2015	Q4	LC_LCDSSLCC	15	0.005	0.005	0.001	8.3	0.002	1.5
2016	Q4	EV_MC2	1.8	0.0011	<0.005	0.0065	8.2	0.011	0.79
2017	Q2	CM_MC2	2.0	0.0064	0.03	0.0034	8.3	0.066	1.3
2017	Q2	EV_HC1	0.56	<0.001	<0.005	0.0067	8.3	0.023	0.85
2017	Q2	EV_MC2	0.76	0.0011	0.0058	0.015	8.1	0.11	0.92
2017	Q2	FR_FRCP1	8.7	0.0031	0.0076	0.0025	8.3	0.048	1.3
2017	Q2	GH_FR1	5.8	0.0024	0.0063	0.0033	8.4	0.037	1.1
2017	Q2	LC_LCDSSLCC	5.6	0.0011	0.0056	0.0014	8.3	0.0058	0.94
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	0.29	<0.001	<0.005	0.0012	8.2	0.003	0.41
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	16	0.0053	0.005	0.001	8.3	0.002	2.0
2015	Q4	GH_FR1	10	0.005	0.005	0.0011	8.4	0.0022	1.2
2016	Q2	FR_FRCP1	8.4	0.0027	0.0059	0.0017	8.3	0.0094	1.1
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.49	0.001	0.005	0.0012	8.3	0.0035	0.4
2015	Q4	CM_MC2	2.4	0.034	0.016	0.0012	8.4	0.0081	1.4
2015	Q4	EV_HC1	1.2	0.004	0.005	0.0057	8.4	0.0069	0.97
2016	Q2	CM_MC2	2.0	0.0088	0.024	0.0023	8.3	0.02	1.1
2016	Q2	EV_HC1	0.76	<0.001	<0.005	0.0048	8.4	0.0084	0.85
2016	Q4	EV_HC1	1.0	<0.004	<0.005	0.0045	8.4	0.0064	0.93
2016	Q2	EV_MC2	1.0	0.0012	<0.005	0.011	8.2	0.042	0.68
2016	Q4	FR_FRCP1	12	<0.005	<0.005	<0.001	8.3	0.0031	1.6
2016	Q2	GH_ERC	0.31	<0.001	<0.005	0.0011	8.3	0.021	0.47
2016	Q2	GH_FR1	7.6	0.0027	0.005	0.0013	8.4	0.0096	1.1
2016	Q4	GH_FR1	9.5	<0.005	0.0054	0.0011	8.3	0.011	1.3
2016	Q2	LC_LCDSSLCC	6.3	0.002	<0.005	0.001	8.3	0.0027	1.0
2016	Q4	LC_LCDSSLCC	9.9	<0.005	<0.005	0.0015	8.3	0.0049	1.2
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	2.2	0.008	0.0057	0.0013	8.3	0.0053	1.3
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.56	0.0011	0.0064	0.003	7.7	0.0082	0.56
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	3.9	0.014	0.02	<0.001	8.3	0.0029	1.9
2017	Q4	EV_HC1	0.94	0.002	0.0088	0.0043	8.4	0.0063	0.88
2017	Q4	EV_MC2	2.8	0.0019	0.0091	0.0014	8.2	0.0029	1.0
2017	Q4	FR_FRCP1	15	0.0067	0.0063	<0.001	8.2	0.0022	2.2
2017	Q2	GH_ERC	0.38	<0.001	0.0052	0.0018	8.4	0.13	0.79
2017	Q4	GH_ERC	0.25	0.0013	0.0085	<0.001	8.4	0.002	0.4
2017	Q4	GH_FR1	10	0.0056	0.0068	<0.001	8.4	0.0019	1.3
2017	Q4	LC_LCDSSLCC	11	0.0015	0.008	0.0011	8.3	0.0024	1.5

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**  
 Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration for a parameter categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	0.00046	0.0005	0.00001	0.00001	0.58	0.064	0.066
2015	Q4	Reference (FR_UFR1)	0.00065	0.00067	0.00001	0.00001	0.68	0.092	0.091
2015	Q2	Reference (GH_ER2)	0.00075	0.00079	0.00001	0.00001	0.74	0.2	0.21
2015	Q4	Reference (GH_ER2)	0.00079	0.00084	0.00001	0.00001	0.67	0.21	0.22
2016	Q2	Reference (FR_UFR1)	0.00051	0.00055	<0.00001	<0.00001	0.63	0.065	0.067
2016	Q4	Reference (FR_UFR1)	0.00066	0.00066	<0.00001	<0.00001	0.68	0.089	0.089
2016	Q2	Reference (GH_ER2)	0.00075	0.00077	<0.00001	<0.00001	0.72	0.2	0.21
2016	Q4	Reference (GH_ER2)	0.00085	0.00089	<0.00001	<0.00001	0.69	0.23	0.24
2017	Q4	Reference (CM_MC1)	0.0002	0.00022	<0.00001	<0.00001	3.0	0.16	0.16
2017	Q2	Reference (FR_UFR1)	0.00056	0.00049	<0.00001	<0.00001	0.53	0.061	0.06
2017	Q4	Reference (FR_UFR1)	0.00059	0.00061	<0.00001	<0.00001	0.69	0.099	0.099
2017	Q2	Reference (GH_ER2)	0.00072	0.00077	<0.00001	0.00002	0.69	0.19	0.21
2017	Q4	Reference (GH_ER2)	0.00084	0.00081	<0.00001	<0.00001	0.7	0.21	0.2
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	0.004	0.004	0.000018	0.00002	4.1	0.16	0.17
2015	Q2	EV_MC2	0.0064	0.0063	0.00001	0.000025	2.2	0.1	0.1
2015	Q4	EV_MC2	0.016	0.016	0.00001	0.00001	3.9	0.19	0.19
2015	Q2	FR_FRCP1	0.033	0.032	0.00001	0.00001	1.2	0.1	0.11
2015	Q2	GH_ERC	0.0015	0.0015	0.00001	0.000011	0.94	0.2	0.2
2015	Q2	GH_FR1	0.031	0.032	0.00001	0.00001	1.6	0.11	0.12
2015	Q2	LC_LCDSSLCC	0.022	0.022	0.00001	0.00001	2.4	0.11	0.11
2015	Q4	LC_LCDSSLCC	0.05	0.054	0.00001	0.00001	7.2	0.22	0.22
2016	Q4	EV_MC2	0.0077	0.0081	<0.00001	<0.00001	3.0	0.13	0.13
2017	Q2	CM_MC2	0.0063	0.0057	<0.00001	0.00001	6.2	0.2	0.21
2017	Q2	EV_HC1	0.022	0.022	<0.00001	0.000011	1.1	0.087	0.086
2017	Q2	EV_MC2	0.0042	0.0043	<0.00001	0.000026	2.0	0.09	0.093
2017	Q2	FR_FRCP1	0.035	0.031	<0.00001	0.000012	1.1	0.096	0.097
2017	Q2	GH_FR1	0.026	0.025	<0.00001	0.000015	1.4	0.10	0.1
2017	Q2	LC_LCDSSLCC	0.022	0.02	<0.00001	<0.00001	3.0	0.12	0.12
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	0.0014	0.0014	<0.00001	<0.00001	0.88	0.23	0.24
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	0.091	0.091	0.00001	0.00001	2.1	0.17	0.17
2015	Q4	GH_FR1	0.042	0.042	0.00001	0.00001	2.1	0.15	0.15
2016	Q2	FR_FRCP1	0.03	0.031	<0.00001	<0.00001	1.1	0.099	0.1
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	0.0016	0.0016	0.00001	0.00001	0.93	0.22	0.23
2015	Q4	CM_MC2	0.0052	0.0052	0.00001	0.00001	9.5	0.29	0.29
2015	Q4	EV_HC1	0.036	0.037	0.00001	0.00001	1.9	0.13	0.14
2016	Q2	CM_MC2	0.0046	0.0045	<0.00001	<0.00001	6.0	0.2	0.19
2016	Q2	EV_HC1	0.03	0.03	<0.00001	<0.00001	1.3	0.096	0.099
2016	Q4	EV_HC1	0.033	0.032	<0.00001	<0.00001	1.7	0.13	0.13
2016	Q2	EV_MC2	0.0042	0.0041	<0.00001	0.000015	1.8	0.091	0.092
2016	Q4	FR_FRCP1	0.059	0.058	<0.00001	<0.00001	1.6	0.15	0.15
2016	Q2	GH_ERC	0.0016	0.0016	<0.00001	<0.00001	0.89	0.21	0.2
2016	Q2	GH_FR1	0.029	0.03	<0.00001	<0.00001	1.5	0.11	0.11
2016	Q4	GH_FR1	0.043	0.042	<0.00001	<0.00001	2.1	0.14	0.15
2016	Q2	LC_LCDSSLCC	0.021	0.021	<0.00001	<0.00001	3.9	0.13	0.14
2016	Q4	LC_LCDSSLCC	0.028	0.028	<0.00001	<0.00001	5.3	0.19	0.19
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	0.0057	0.0058	<0.00001	<0.00001	7.7	0.23	0.24
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	0.019	0.019	0.00001	0.00001	0.86	0.064	0.064
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	0.0084	0.0079	<0.00001	<0.00001	14	0.41	0.41
2017	Q4	EV_HC1	0.04	0.04	<0.00001	0.000011	1.6	0.13	0.13
2017	Q4	EV_MC2	0.018	0.018	<0.00001	<0.00001	5.0	0.2	0.19
2017	Q4	FR_FRCP1	0.14	0.13	<0.00001	<0.00001	2.0	0.18	0.18
2017	Q2	GH_ERC	0.0018	0.0018	<0.00001	0.000022	0.9	0.19	0.21
2017	Q4	GH_ERC	0.0012	0.0012	<0.00001	<0.00001	0.85	0.21	0.21
2017	Q4	GH_FR1	0.065	0.063	<0.00001	<0.00001	2.2	0.16	0.16
2017	Q4	LC_LCDSSLCC	0.054	0.051	<0.00001	<0.00001	6.7	0.21	0.21

**Notes:**  
 "-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**  
 Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	14	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q4	Reference (FR_UFR1)	47	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q2	Reference (GH_ER2)	17	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q4	Reference (GH_ER2)	22	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2016	Q2	Reference (FR_UFR1)	15	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q4	Reference (FR_UFR1)	38	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q2	Reference (GH_ER2)	17	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	0.01
2016	Q4	Reference (GH_ER2)	23	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	Reference (CM_MC1)	28	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	Reference (FR_UFR1)	10	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	Reference (FR_UFR1)	46	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	Reference (GH_ER2)	14	<0.00001	0.000035	<0.0001	<0.0001	<0.01	0.01
2017	Q4	Reference (GH_ER2)	19	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	107	0.000018	0.000037	0.0001	0.00013	0.01	0.016
2015	Q2	EV_MC2	49	0.000011	0.000036	0.0001	0.0001	0.01	0.017
2015	Q4	EV_MC2	129	0.00001	0.000011	0.0001	0.0001	0.01	0.01
2015	Q2	FR_FRCP1	125	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q2	GH_ERC	23	0.00001	0.000014	0.0001	0.0001	0.01	0.01
2015	Q2	GH_FR1	134	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q2	LC_LCDSSLCC	90	0.000011	0.000012	0.0001	0.0001	0.01	0.01
2015	Q4	LC_LCDSSLCC	248	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2016	Q4	EV_MC2	79	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	CM_MC2	135	0.000013	0.000035	<0.0001	0.00012	<0.01	<0.01
2017	Q2	EV_HC1	85	<0.00001	0.00002	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	EV_MC2	40	<0.00001	0.000044	<0.0001	<0.0001	<0.01	0.015
2017	Q2	FR_FRCP1	111	0.00001	0.000017	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	GH_FR1	99	<0.00001	0.000018	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	LC_LCDSSLCC	98	<0.00001	0.00001	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	32	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	364	0.00001	0.00001	0.0001	0.0001	0.011	0.011
2015	Q4	GH_FR1	202	0.00001	0.00001	0.0001	0.0001	0.01	0.011
2016	Q2	FR_FRCP1	119	<0.00001	0.000011	<0.0001	<0.0001	0.011	0.011
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	39	0.00001	0.00001	0.0001	0.0001	0.01	0.01
2015	Q4	CM_MC2	252	0.000011	0.000012	0.0001	0.0001	0.011	0.012
2015	Q4	EV_HC1	217	0.00001	0.00001	0.0001	0.0001	0.01	0.011
2016	Q2	CM_MC2	134	0.000012	0.000022	<0.0001	<0.0001	0.012	0.017
2016	Q2	EV_HC1	120	<0.00001	0.000012	<0.0001	<0.0001	0.011	0.012
2016	Q4	EV_HC1	182	<0.00001	0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q2	EV_MC2	44	<0.00001	0.000022	<0.0001	<0.0001	<0.01	0.014
2016	Q4	FR_FRCP1	253	0.000011	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q2	GH_ERC	29	<0.00001	0.000012	<0.0001	<0.0001	<0.01	0.011
2016	Q2	GH_FR1	128	<0.00001	<0.00001	<0.0001	<0.0001	0.011	0.011
2016	Q4	GH_FR1	212	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2016	Q2	LC_LCDSSLCC	120	0.00001	0.00001	<0.0000875	<0.0000875	0.008	0.0083
2016	Q4	LC_LCDSSLCC	194	0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	195	0.000011	0.000015	<0.0001	<0.0001	<0.01	<0.01
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	82	0.00001	0.000012	0.0001	0.0001	0.01	0.01
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	334	0.000014	0.000015	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	EV_HC1	203	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	EV_MC2	136	<0.00001	<0.00001	<0.0001	0.00011	<0.01	<0.01
2017	Q4	FR_FRCP1	515	0.000011	0.000012	<0.0001	<0.0001	<0.01	<0.01
2017	Q2	GH_ERC	23	<0.00001	0.000043	<0.0001	<0.0001	<0.01	0.011
2017	Q4	GH_ERC	24	<0.00001	<0.00001	<0.0001	0.00011	<0.01	<0.01
2017	Q4	GH_FR1	267	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01
2017	Q4	LC_LCDSSLCC	257	0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; WQG = water quality guideline; ug/l = micrograms per litre; % = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>									
2015	Q2	Reference (FR_UFR1)	143	0.092	2.0	1.9	1.4	0.00031	0.00032
2015	Q4	Reference (FR_UFR1)	217	0.065	0.6	1.0	0.22	0.00045	0.00045
2015	Q2	Reference (GH_ER2)	181	0.086	1.4	5.9	4.1	0.00077	0.00079
2015	Q4	Reference (GH_ER2)	176	0.05	0.62	1.3	0.37	0.00074	0.00075
2016	Q2	Reference (FR_UFR1)	147	0.077	2.0	1.5	0.82	0.00032	0.00033
2016	Q4	Reference (FR_UFR1)	197	0.065	1.3	<1	0.69	0.00043	0.00045
2016	Q2	Reference (GH_ER2)	180	0.075	1.6	10	2.8	0.00075	0.00077
2016	Q4	Reference (GH_ER2)	181	0.055	0.67	<1	0.36	0.00077	0.00078
2017	Q4	Reference (CM_MC1)	171	0.11	1.2	1.3	0.48	0.00022	0.00023
2017	Q2	Reference (FR_UFR1)	131	0.096	2.9	10	6.0	0.00027	0.0003
2017	Q4	Reference (FR_UFR1)	235	0.075	0.8	1.0	0.37	0.00052	0.00049
2017	Q2	Reference (GH_ER2)	166	0.23	4.1	79	42	0.00069	0.00083
2017	Q4	Reference (GH_ER2)	192	0.16	0.66	1.5	0.73	0.00077	0.00075
<b>Tests categorized as no adverse response</b>									
2015	Q2	CM_MC2	316	0.16	1.9	29	15	0.0011	0.0011
2015	Q2	EV_MC2	208	0.29	3.6	57	15	0.00062	0.00067
2015	Q4	EV_MC2	387	0.17	1.6	3.1	2.5	0.0014	0.0014
2015	Q2	FR_FRCP1	382	0.05	1.8	5.2	1.4	0.0016	0.0017
2015	Q2	GH_ERC	192	0.12	1.7	17	6.9	0.0008	0.00081
2015	Q2	GH_FR1	399	0.068	1.6	4.1	1.8	0.0016	0.0016
2015	Q2	LC_LCDSSLCC	280	0.075	1.3	5.3	1.7	0.0016	0.0017
2015	Q4	LC_LCDSSLCC	651	0.13	0.77	1.0	0.45	0.004	0.0042
2016	Q4	EV_MC2	261	0.17	2.4	3.6	2.9	0.00083	0.00084
2017	Q2	CM_MC2	348	0.21	2.6	37	23	0.0013	0.0013
2017	Q2	EV_HC1	290	0.19	3.4	13	12	0.0014	0.0014
2017	Q2	EV_MC2	178	0.27	5.1	66	38	0.00049	0.00057
2017	Q2	FR_FRCP1	362	0.56	2.7	27	13	0.0015	0.0016
2017	Q2	GH_FR1	331	0.38	4.2	34	17	0.0015	0.0015
2017	Q2	LC_LCDSSLCC	327	0.56	1.9	3.5	1.9	0.0017	0.0019
<b>Tests categorized as possible or likely response</b>									
2016	Q4	GH_ERC	202	<0.05	0.69	1.7	0.55	0.00084	0.00084
<b>Tests categorized as possible or likely response</b>									
2015	Q4	FR_FRCP1	836	0.1	0.88	1.1	0.37	0.0042	0.0043
2015	Q4	GH_FR1	545	0.11	0.7	1.0	0.27	0.002	0.0021
2016	Q2	FR_FRCP1	377	0.16	2.0	6.0	0.98	0.0017	0.0017
<b>Tests categorized as possible or likely response</b>									
2015	Q4	GH_ERC	211	0.051	0.58	3.2	0.5	0.00082	0.00084
2015	Q4	CM_MC2	571	0.14	1.4	4.1	2.0	0.0024	0.0023
2015	Q4	EV_HC1	519	0.1	1.2	1.1	0.69	0.0027	0.0028
2016	Q2	CM_MC2	366	0.2	1.8	14	6.6	0.0014	0.0014
2016	Q2	EV_HC1	351	0.11	1.7	3.1	1.7	0.0019	0.002
2016	Q4	EV_HC1	478	0.11	1.4	1.4	1.2	0.0026	0.0026
2016	Q2	EV_MC2	173	0.18	3.0	23	8.2	0.00058	0.0006
2016	Q4	FR_FRCP1	626	0.073	1.4	1.4	1.2	0.0031	0.0032
2016	Q2	GH_ERC	189	0.12	1.6	16	3.4	0.00083	0.00082
2016	Q2	GH_FR1	394	0.17	1.8	4.4	1.4	0.0016	0.0016
2016	Q4	GH_FR1	553	0.21	1.8	2.2	0.79	0.0023	0.0023
2016	Q2	LC_LCDSSLCC	362	0.17	1.5	1.1	0.55	0.0022	0.0023
2016	Q4	LC_LCDSSLCC	525	0.11	0.89	1.3	1.1	0.0033	0.0033
<b>Tests categorized as possible or likely response</b>									
2016	Q4	CM_MC2	482	0.13	1.9	4.2	2.2	0.0018	0.0019
<b>Tests categorized as possible or likely response</b>									
2015	Q2	EV_HC1	241	0.11	1.3	2.2	1.3	0.0013	0.0013
<b>Tests categorized as possible or likely response</b>									
2017	Q4	CM_MC2	748	0.38	0.99	2.8	1.3	0.003	0.0032
2017	Q4	EV_HC1	494	0.099	1.0	1.2	0.3	0.0027	0.0027
2017	Q4	EV_MC2	413	0.2	0.99	1.3	0.47	0.0011	0.0012
2017	Q4	FR_FRCP1	1058	0.38	0.98	1.3	0.63	0.0058	0.0057
2017	Q2	GH_ERC	184	0.29	4.4	104	55	0.00077	0.00093
2017	Q4	GH_ERC	202	0.066	0.72	1.3	0.55	0.00083	0.00081
2017	Q4	GH_FR1	672	0.36	1.3	8.3	9.3	0.0029	0.0029
2017	Q4	LC_LCDSSLCC	677	0.41	0.94	1.0	0.44	0.0041	0.004

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "TU" = toxic unit; "WQG" = water quality guideline; "ug/l" = micrograms per litre; "%" = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration for a parameter categorized as no adverse response.

**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	VANADIUM-D-mg/l	VANADIUM-T-mg/l	ZINC-D-mg/l	ZINC-T-mg/l	∑TU-WQGs	∑TU-WQGs/Benchmarks	PCA Factor 1 (2015 to 2017)	PCA Factor 2 (2015 to 2017)
<b>Reference</b>										
2015	Q2	Reference (FR_UFR1)	0.0005	0.0005	0.003	0.003	-	-	-6.9	-3.1
2015	Q4	Reference (FR_UFR1)	0.0005	0.0005	0.003	0.003	-	-	-3.7	-5.8
2015	Q2	Reference (GH_ER2)	0.0005	0.00061	0.003	0.003	-	-	-4.4	-2.1
2015	Q4	Reference (GH_ER2)	0.0005	0.0005	0.003	0.003	-	-	-3.4	-4.6
2016	Q2	Reference (FR_UFR1)	<0.0005	0.0005	<0.003	<0.003	-	-	-6.8	-4.0
2016	Q4	Reference (FR_UFR1)	<0.0005	0.0005	<0.003	<0.00375	-	-	-4.9	-4.6
2016	Q2	Reference (GH_ER2)	<0.0005	0.00079	<0.003	<0.003	-	-	-4.7	-2.1
2016	Q4	Reference (GH_ER2)	<0.0005	<0.0005	0.0034	0.0035	-	-	-3.4	-5.1
2017	Q4	Reference (CM_MC1)	<0.0005	<0.0005	<0.003	<0.003	1.3	1.2	-3.9	-3.9
2017	Q2	Reference (FR_UFR1)	<0.0005	0.00083	0.001	0.0031	2.4	2.2	-8.5	-0.43
2017	Q4	Reference (FR_UFR1)	<0.0005	<0.0005	<0.003	<0.003	1.5	1.2	-3.7	-5.7
2017	Q2	Reference (GH_ER2)	<0.0005	0.0033	<0.0026	0.0094	6.0	5.6	-6.6	5.4
2017	Q4	Reference (GH_ER2)	<0.0005	<0.0005	<0.003	<0.003	1.7	1.3	-3.5	-5.1
<b>Tests categorized as no adverse response</b>										
2015	Q2	CM_MC2	0.0014	0.0023	0.0058	0.01	-	-	-2.1	14
2015	Q2	EV_MC2	0.0005	0.0029	0.003	0.0087	-	-	-4.5	7.3
2015	Q4	EV_MC2	0.0005	0.00071	0.003	0.003	-	-	3.6	1.1
2015	Q2	FR_FRCP1	0.0005	0.00051	0.003	0.003	-	-	2.8	-0.5
2015	Q2	GH_ERC	0.0005	0.0011	0.003	0.0038	-	-	-4.4	-0.017
2015	Q2	GH_FR1	0.0005	0.00054	0.003	0.003	-	-	2.3	-1.1
2015	Q2	LC_LCDSSLCC	0.0005	0.00056	0.0052	0.007	-	-	0.23	-0.17
2015	Q4	LC_LCDSSLCC	0.0005	0.0005	0.0085	0.0092	-	-	8.9	-0.68
2016	Q4	EV_MC2	<0.0005	0.00076	<0.003	<0.003	-	-	-1.3	0.65
2017	Q2	CM_MC2	<0.0005	0.0016	0.0071	0.015	12	8.3	0.66	9.9
2017	Q2	EV_HC1	<0.0005	0.0014	<0.003	0.004	14	3.9	-2.9	2.5
2017	Q2	EV_MC2	<0.0005	0.0043	<0.003	0.010	9.1	6.9	-6.7	9.6
2017	Q2	FR_FRCP1	<0.0005	0.0013	0.0023	0.0062	22	5.7	0.74	4.1
2017	Q2	GH_FR1	<0.0005	0.0018	0.0027	0.0064	19	5.9	-0.26	4.6
2017	Q2	LC_LCDSSLCC	<0.0005	<0.0005	0.011	0.011	15	4.2	2.7	0.79
<b>Tests categorized as possible or likely response</b>										
2016	Q4	GH_ERC	<0.0005	<0.0005	<0.003	<0.003	-	-	-2.7	-4.9
<b>Tests categorized as possible or likely response</b>										
2015	Q4	FR_FRCP1	0.0005	0.0005	0.003	0.003	-	-	8.5	-0.84
2015	Q4	GH_FR1	0.0005	0.0005	0.003	0.003	-	-	4.9	-3.0
2016	Q2	FR_FRCP1	<0.0005	0.00053	<0.003	0.0031	-	-	2.1	-0.45
<b>Tests categorized as possible or likely response</b>										
2015	Q4	GH_ERC	0.0005	0.0005	0.003	0.003	-	-	-2.5	-4.6
2015	Q4	CM_MC2	0.0005	0.00053	0.003	0.003	-	-	5.6	2.6
2015	Q4	EV_HC1	0.0005	0.00052	0.003	0.003	-	-	2.7	-1.9
2016	Q2	CM_MC2	<0.0005	0.00088	0.0059	0.011	-	-	1.4	7.0
2016	Q2	EV_HC1	<0.0005	0.00057	<0.003	<0.003	-	-	-0.35	-1.2
2016	Q4	EV_HC1	<0.0005	<0.0005	<0.003	<0.003	-	-	2.1	-2.1
2016	Q2	EV_MC2	<0.0005	0.0018	<0.003	0.0046	-	-	-5.1	4.6
2016	Q4	FR_FRCP1	<0.0005	<0.0005	<0.003	<0.0045	-	-	6.3	-1.0
2016	Q2	GH_ERC	<0.0005	0.001	<0.003	0.0032	-	-	-4.2	-0.64
2016	Q2	GH_FR1	<0.0005	0.00053	<0.003	<0.003	-	-	2.1	-1.0
2016	Q4	GH_FR1	<0.0005	<0.0005	<0.003	<0.003	-	-	5.0	-1.7
2016	Q2	LC_LCDSSLCC	<0.0005	<0.0005	0.0088	0.0097	-	-	4.8	-1.1
2016	Q4	LC_LCDSSLCC	<0.0005	0.00056	0.006	0.008	-	-	6.7	-0.37
<b>Tests categorized as possible or likely response</b>										
2016	Q4	CM_MC2	<0.0005	<0.0005	0.0032	0.004	-	-	3.5	2.7
<b>Tests categorized as possible or likely response</b>										
2015	Q2	EV_HC1	0.0005	0.00058	0.003	0.0031	-	-	-3.3	-1.8
<b>Tests categorized as possible or likely response</b>										
2017	Q4	CM_MC2	<0.0005	<0.0005	<0.003	<0.003	11	6.5	8.5	2.9
2017	Q4	EV_HC1	<0.0005	<0.0005	<0.003	<0.003	22	4.1	2.3	-2.6
2017	Q4	EV_MC2	<0.0005	<0.0005	<0.003	<0.003	12	2.9	2.7	-2.0
2017	Q4	FR_FRCP1	<0.0005	0.00052	<0.003	0.0032	75	12	8.8	0.12
2017	Q2	GH_ERC	<0.0005	0.0039	<0.0026	0.011	8.2	7.2	-5.9	7.0
2017	Q4	GH_ERC	<0.0005	<0.0005	<0.003	0.0031	2.0	1.3	-2.7	-4.9
2017	Q4	GH_FR1	<0.0005	<0.0005	<0.003	<0.003	38	6.4	5.3	-1.3
2017	Q4	LC_LCDSSLCC	<0.0005	<0.0005	0.0061	0.0081	33	6.4	8.1	-0.46

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "Ca" = calcium carbonate; TU = toxic unit; WQG = water quality guideline; ug/l = micrograms per litre; % = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration categorized as no adverse response.



**Appendix D: Concentration-Response Analysis**

**Table D-4: Rainbow Trout Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	PCA Factor 3 (2015 to 2017)	PCA Factor 1 (2017)	PCA Factor 2 (2017)	PCA Factor 3 (2017)
<b>Reference</b>						
2015	Q2	Reference (FR_UFR1)	-0.057	-	-	-
2015	Q4	Reference (FR_UFR1)	-1.9	-	-	-
2015	Q2	Reference (GH_ER2)	-1.4	-	-	-
2015	Q4	Reference (GH_ER2)	-2.7	-	-	-
2016	Q2	Reference (FR_UFR1)	-0.12	-	-	-
2016	Q4	Reference (FR_UFR1)	-0.35	-	-	-
2016	Q2	Reference (GH_ER2)	-0.78	-	-	-
2016	Q4	Reference (GH_ER2)	-2.6	-	-	-
2017	Q4	Reference (CM_MC1)	-2.4	-1.8	-5.6	-2.8
2017	Q2	Reference (FR_UFR1)	2.0	-6.9	-3.2	-0.25
2017	Q4	Reference (FR_UFR1)	-1.4	-1.7	-7.0	-0.18
2017	Q2	Reference (GH_ER2)	2.1	-6.5	2.1	-0.5
2017	Q4	Reference (GH_ER2)	-2.6	-1.4	-6.5	-1.5
<b>Tests categorized as no adverse response</b>						
2015	Q2	CM_MC2	-13	-	-	-
2015	Q2	EV_MC2	2.2	-	-	-
2015	Q4	EV_MC2	0.88	-	-	-
2015	Q2	FR_FRCP1	1.3	-	-	-
2015	Q2	GH_ERC	-0.45	-	-	-
2015	Q2	GH_FR1	0.99	-	-	-
2015	Q2	LC_LCDSSLCC	1.1	-	-	-
2015	Q4	LC_LCDSSLCC	-0.57	-	-	-
2016	Q4	EV_MC2	1.8	-	-	-
2017	Q2	CM_MC2	-1.0	-0.18	7.3	-5.9
2017	Q2	EV_HC1	3.5	-3.1	0.88	2.6
2017	Q2	EV_MC2	3.8	-7.8	6.0	0.74
2017	Q2	FR_FRCP1	4.2	0.1	3.4	2.4
2017	Q2	GH_FR1	4.0	-0.96	3.4	2.6
2017	Q2	LC_LCDSSLCC	2.4	2.3	0.86	2.2
<b>Tests categorized as possible or likely response</b>						
2016	Q4	GH_ERC	-2.2	-	-	-
<b>Tests categorized as possible or likely response</b>						
2015	Q4	FR_FRCP1	0.047	-	-	-
2015	Q4	GH_FR1	-0.72	-	-	-
2016	Q2	FR_FRCP1	2.0	-	-	-
<b>Tests categorized as possible or likely response</b>						
2015	Q4	GH_ERC	-2.6	-	-	-
2015	Q4	CM_MC2	-3.7	-	-	-
2015	Q4	EV_HC1	0.78	-	-	-
2016	Q2	CM_MC2	-2.0	-	-	-
2016	Q2	EV_HC1	1.7	-	-	-
2016	Q4	EV_HC1	1.2	-	-	-
2016	Q2	EV_MC2	2.8	-	-	-
2016	Q4	FR_FRCP1	1.3	-	-	-
2016	Q2	GH_ERC	-0.2	-	-	-
2016	Q2	GH_FR1	1.6	-	-	-
2016	Q4	GH_FR1	0.96	-	-	-
2016	Q2	LC_LCDSSLCC	2.8	-	-	-
2016	Q4	LC_LCDSSLCC	1.2	-	-	-
<b>Tests categorized as possible or likely response</b>						
2016	Q4	CM_MC2	-1.9	-	-	-
<b>Tests categorized as possible or likely response</b>						
2015	Q2	EV_HC1	0.89	-	-	-
<b>Tests categorized as possible or likely response</b>						
2017	Q4	CM_MC2	-4.7	8.4	2.9	-6.0
2017	Q4	EV_HC1	0.77	2.5	-2.3	2.4
2017	Q4	EV_MC2	-0.71	3.3	-1.9	0.42
2017	Q4	FR_FRCP1	0.82	8.2	1.8	1.8
2017	Q2	GH_ERC	2.7	-6.2	3.7	-0.089
2017	Q4	GH_ERC	-3.0	-0.74	-6.2	-1.8
2017	Q4	GH_FR1	0.82	5.2	-0.55	2.1
2017	Q4	LC_LCDSSLCC	0.52	7.4	0.93	1.8

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "C" = calcium carbonate; TU = toxic unit; WQG = water quality guideline; ug/l = micrograms per litre; % = percent

**Screening**

Concentrations of parameters in 2017 tests categorized as possible or likely response where the concentration is greater than the maximum concentration for a parameter categorized as no adverse response.

### Appendix D: Concentration-Response Analysis

**Table D-5: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	Reference or Test Site	Mean Survival (Control Normalized)	Mean Biomass (Control Normalized)	ALKALINITY, TOTAL (As CaCO <sub>3</sub> ), 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
<b>Reference</b>															
2016	Q2	Reference (FR_UFR1)	Reference	104	95	116	0.0056	0.059	< 0.0001	< 0.0001	0.0001	0.00012	0.042	0.044	< 0.000036
2016	Q3	Reference (FR_UFR1)	Reference	96	100	156	< 0.003	0.0063	< 0.0001	< 0.0001	< 0.0001	0.00011	0.076	0.077	< 0.00002
2016	Q4	Reference (FR_UFR1)	Reference	58	58	141	0.0073	0.038	< 0.0001	< 0.0001	< 0.0001	0.00012	0.063	0.063	< 0.00002
2017	Q3	Reference (CM_MC1)	Reference	92	128	142	0.0029	0.012	< 0.0001	0.0001	0.00021	0.00022	0.052	0.052	< 0.00002
2017	Q4	Reference (CM_MC1)	Reference	78	91	136	< 0.003	0.0067	< 0.0001	< 0.0001	0.00015	0.00018	0.051	0.051	< 0.00002
2017	Q1	Reference (FR_UFR1)	Reference	100	91	139	0.0014	0.0076	< 0.0001	0.00013	< 0.0001	0.00011	0.074	0.082	< 0.00002
2017	Q2	Reference (FR_UFR1)	Reference	98	111	116	0.026	0.13	< 0.0001	0.00011	0.00013	0.00018	0.046	0.046	< 0.00002
2017	Q3	Reference (FR_UFR1)	Reference	98	130	147	0.0027	0.0057	< 0.0001	0.0001	< 0.0001	0.00012	0.075	0.073	< 0.00002
2017	Q4	Reference (FR_UFR1)	Reference	98	98	144	< 0.003	0.0033	< 0.0001	< 0.0001	< 0.0001	0.00011	0.074	0.073	< 0.00002
2017	Q2	Reference (GH_ER2)	Reference	98	105	150	0.0035	0.27	< 0.0001	< 0.0001	0.00012	0.00027	0.047	0.049	< 0.00002
2017	Q3	Reference (GH_ER2)	Reference	83	130	140	0.0029	0.014	< 0.0001	0.00012	0.00011	0.00012	0.048	0.047	< 0.00002
2017	Q4	Reference (GH_ER2)	Reference	96	85	147	< 0.003	0.0068	< 0.0001	< 0.0001	< 0.0001	0.00011	0.048	0.047	< 0.00002
<b>Tests categorized as no adverse response</b>															
2016	Q2	CM_MC2	Test Site	107	100	144	0.0062	0.34	0.00015	0.00016	0.00017	0.00028	0.044	0.045	< 0.000036
2016	Q4	CM_MC2	Test Site	105	92	174	0.0065	0.1	0.00021	0.00022	0.00024	0.00028	0.053	0.056	< 0.000036
2016	Q2	FR_FRCP1	Test Site	104	86	155	< 0.003	0.064	0.00017	0.00022	< 0.0001	0.00013	0.058	0.059	< 0.000036
2016	Q3	FR_FRCP1	Test Site	92	111	201	< 0.003	0.015	0.00021	0.00024	< 0.0001	0.00011	0.077	0.077	< 0.00002
2016	Q4	FR_FRCP1	Test Site	87	95	197	0.0036	0.023	0.00019	0.0002	< 0.0001	0.00013	0.075	0.075	< 0.00002
2016	Q2	GH_FR1	Test Site	100	91	168	< 0.003	0.065	0.00016	0.00019	0.0001	0.00015	0.079	0.08	< 0.000036
2016	Q3	GH_FR1	Test Site	102	89	199	< 0.003	0.0072	0.00013	0.00015	0.0001	0.00013	0.11	0.11	< 0.00002
2016	Q4	GH_FR1	Test Site	89	92	194	< 0.003	0.01	0.00016	0.00022	0.0001	0.00014	0.10	0.099	< 0.00002
2017	Q1	CM_MC2	Test Site	113	103	196	0.0032	0.036	0.00031	0.00041	0.00015	0.0002	0.068	0.07	< 0.00002
2017	Q2	CM_MC2	Test Site	95	111	170	0.005	0.31	0.00023	0.00026	0.00017	0.00036	0.055	0.058	< 0.00002
2017	Q3	CM_MC2	Test Site	96	119	190	0.003	0.029	0.00031	0.00036	0.00019	0.00024	0.067	0.066	< 0.00002
2017	Q4	CM_MC2	Test Site	82	95	202	< 0.003	0.0081	0.00025	0.00028	0.00017	0.0002	0.079	0.077	< 0.00002
2017	Q1	FR_FRCP1	Test Site	81	72	250	0.0011	0.011	0.00026	0.00037	< 0.0001	0.00013	0.077	0.077	< 0.00002
2017	Q2	FR_FRCP1	Test Site	98	97	175	0.006	0.22	0.00019	0.00023	0.00012	0.00027	0.067	0.069	< 0.00002
2017	Q3	FR_FRCP1	Test Site	83	98	204	0.0026	0.0056	0.00024	0.00027	< 0.00012	0.00012	0.074	0.073	< 0.000024
2017	Q4	FR_FRCP1	Test Site	96	109	190	< 0.003	0.016	0.00024	0.00026	< 0.0001	0.00013	0.074	0.075	< 0.00002
2017	Q1	GH_FR1	Test Site	115	106	204	< 0.003	0.012	0.00012	0.00013	< 0.0001	0.00011	0.12	0.12	< 0.00002
2017	Q3	GH_FR1	Test Site	92	117	194	0.0027	0.0067	0.00016	0.00018	< 0.0001	0.00011	0.11	0.1	< 0.00002
2017	Q4	GH_FR1	Test Site	94	101	181	< 0.003	0.0055	0.00017	0.00019	0.0001	0.00012	0.11	0.11	< 0.00002
<b>Tests categorized as possible or likely response for hatch</b>															
2016	Q3	CM_MC2	Test Site	73	89	200	0.0034	0.012	0.00026	0.00029	0.00025	0.00026	0.077	0.076	< 0.000036
<b>Tests categorized as possible or likely response for survival and biomass</b>															
2017	Q2	GH_FR1	Test Site	64	84	175	0.0046	0.36	0.00018	0.00022	0.00013	0.00031	0.078	0.085	< 0.00002

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;

**Screening**

Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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	CHROMIUM-D-mg/l	CHROMIUM-T-mg/l	COBALT-D-mg/l
<b>Reference</b>																
2016	Q2	Reference (FR_UFR1)	< 0.000036	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.000006	0.000012	39	1.7	0.1	0.00012	0.00021	< 0.0001
2016	Q3	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000079	0.00001	51	0.8	0.14	0.0001	0.00016	< 0.0001
2016	Q4	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000063	0.0000089	48	1.1	0.19	0.00011	0.00018	< 0.0001
2017	Q3	Reference (CM_MC1)	< 0.00002	< 0.00005	< 0.00005	0.016	0.015	< 0.05	0.0000099	0.000012	40	1.4	< 0.5	0.00012	0.00025	< 0.0001
2017	Q4	Reference (CM_MC1)	< 0.00002	< 0.00005	< 0.00005	0.013	0.014	< 0.09	0.0000077	0.0000086	41	1.2	1.1	0.00018	0.00019	< 0.0001
2017	Q1	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000084	0.000011	50	0.68	< 0.5	0.0001	0.00014	< 0.0001
2017	Q2	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.000011	0.000022	32	2.9	< 0.5	0.00012	0.00049	< 0.0001
2017	Q3	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000083	0.000012	50	1.3	0.27	0.0001	0.0002	< 0.0001
2017	Q4	Reference (FR_UFR1)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	0.052	0.0000068	0.0000098	51	0.71	< 0.5	0.0001	0.00018	< 0.0001
2017	Q2	Reference (GH_ER2)	0.000028	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000078	0.000043	50	1.3	0.4	0.0002	0.00082	< 0.0001
2017	Q3	Reference (GH_ER2)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000068	0.0000085	45	0.83	0.35	0.00021	0.00024	< 0.0001
2017	Q4	Reference (GH_ER2)	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.0000052	0.0000075	43	0.63	< 0.5	0.00025	0.00028	< 0.0001
<b>Tests categorized as no adverse response</b>																
2016	Q2	CM_MC2	0.000039	< 0.00005	< 0.00005	0.016	0.017	< 0.05	0.000059	0.000096	68	1.4	1.3	0.00018	0.00058	0.002
2016	Q4	CM_MC2	< 0.000036	< 0.00009	< 0.00009	0.025	0.026	< 0.09	0.000029	0.000037	83	1.6	1.8	0.00023	0.00037	0.0011
2016	Q2	FR_FRCP1	< 0.000036	< 0.00005	0.000051	< 0.01	< 0.01	< 0.05	0.000027	0.000044	76	1.5	0.51	0.0001	0.00023	< 0.0001
2016	Q3	FR_FRCP1	< 0.00002	< 0.00005	< 0.00005	0.011	0.011	< 0.25	0.00002	0.000051	113	0.94	1.7	< 0.0001	0.00013	0.0001
2016	Q4	FR_FRCP1	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000044	0.000052	110	1.0	1.4	< 0.0001	0.00015	< 0.0001
2016	Q2	GH_FR1	< 0.000036	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.05	0.00002	0.000033	80	1.4	0.98	0.00012	0.00023	< 0.0001
2016	Q3	GH_FR1	< 0.00002	< 0.00005	< 0.00005	< 0.01	0.01	< 0.25	0.000015	0.000018	95	0.85	1.6	0.00011	0.00017	< 0.0001
2016	Q4	GH_FR1	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000016	0.000019	100	0.85	1.6	0.00011	0.00015	< 0.0001
2017	Q1	CM_MC2	< 0.00002	< 0.00005	< 0.00005	0.03	0.031	< 0.17	0.000037	0.000044	120	1.0	3.5	0.00014	0.00027	0.0039
2017	Q2	CM_MC2	0.00003	< 0.00005	< 0.00005	0.023	0.025	< 0.05	0.000071	0.00012	82	1.9	1.6	0.00013	0.00062	0.0029
2017	Q3	CM_MC2	< 0.00002	< 0.00005	< 0.00005	0.032	0.033	< 0.09	0.000061	0.000019	113	1.4	1.6	0.00014	0.00024	0.0016
2017	Q4	CM_MC2	< 0.00002	< 0.00005	< 0.00005	0.033	0.035	0.099	0.000012	0.000014	121	1.1	4.4	0.00012	0.00019	0.0011
2017	Q1	FR_FRCP1	< 0.00002	< 0.00005	< 0.00005	0.01	0.011	< 0.25	0.000045	0.000061	186	1.2	2.8	< 0.0001	0.00025	< 0.0001
2017	Q2	FR_FRCP1	0.000025	< 0.00005	< 0.00005	< 0.01	0.01	< 0.05	0.000057	0.00011	82	2.1	0.64	0.0001	0.0006	< 0.0001
2017	Q3	FR_FRCP1	< 0.00002	< 0.00006	< 0.00005	0.013	0.011	< 0.21	0.000019	0.000049	130	1.4	1.6	0.00012	0.00026	< 0.00012
2017	Q4	FR_FRCP1	< 0.00002	< 0.00005	< 0.00005	0.011	0.011	0.29	0.000012	0.000056	151	0.97	< 2.5	< 0.0001	0.00018	< 0.0001
2017	Q1	GH_FR1	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.25	0.000017	0.000019	118	0.87	2.1	0.0001	0.00014	< 0.0001
2017	Q3	GH_FR1	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.13	0.000019	0.000019	99	1.0	1.3	0.00011	0.00014	< 0.0001
2017	Q4	GH_FR1	< 0.00002	< 0.00005	< 0.00005	< 0.01	< 0.01	0.05	0.000017	0.00002	106	1.1	1.3	0.00012	0.00015	< 0.0001
<b>Tests categorized as possible or likely response for hatch</b>																
2016	Q3	CM_MC2	< 0.000036	< 0.00009	< 0.00009	0.033	0.034	< 0.21	0.00001	0.000012	113	1.0	3.2	0.00021	0.00024	0.00037
<b>Tests categorized as possible or likely response for survival and biomass</b>																
2017	Q2	GH_FR1	0.000028	< 0.00005	< 0.00005	< 0.01	< 0.01	< 0.13	0.000028	0.000075	78	2.5	1.3	< 0.0001	0.00077	< 0.0001

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;  
**Screening**  
 Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality

Year	Quarter	Sample ID	COBALT-T- mg/l	CONDUCTIVI TY, LAB-N- us/cm	COPPER-D- mg/l	COPPER-T- mg/l	FLUORIDE-D- mg/l	Hardness, Total or Dissolved CaCO <sub>3</sub> -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
<b>Reference</b>																
2016	Q2	Reference (FR_UFR1)	< 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
2016	Q3	Reference (FR_UFR1)	< 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
2016	Q4	Reference (FR_UFR1)	< 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
2017	Q3	Reference (CM_MC1)	< 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
2017	Q4	Reference (CM_MC1)	< 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	Q1	Reference (FR_UFR1)	< 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
2017	Q2	Reference (FR_UFR1)	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
2017	Q3	Reference (FR_UFR1)	< 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
2017	Q4	Reference (FR_UFR1)	< 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	Q2	Reference (GH_ER2)	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
2017	Q3	Reference (GH_ER2)	< 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
2017	Q4	Reference (GH_ER2)	< 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
<b>Tests categorized as no adverse response</b>																
2016	Q2	CM_MC2	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
2016	Q4	CM_MC2	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
2016	Q2	FR_FRCP1	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
2016	Q3	FR_FRCP1	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
2016	Q4	FR_FRCP1	< 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
2016	Q2	GH_FR1	< 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
2016	Q3	GH_FR1	< 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
2016	Q4	GH_FR1	< 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
2017	Q1	CM_MC2	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
2017	Q2	CM_MC2	0.0039	652	0.00022	0.00082	0.098	327	< 0.01	0.42	< 0.00005	0.00027	0.013	0.013	34	0.017
2017	Q3	CM_MC2	0.0027	893	< 0.00044	0.00052	0.11	502	< 0.01	0.044	< 0.00005	0.00007	0.018	0.018	55	0.0017
2017	Q4	CM_MC2	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	Q1	FR_FRCP1	0.0001	1482	< 0.0002	< 0.0005	0.15	926	< 0.01	0.032	< 0.00005	0.00005	0.059	0.059	113	0.0071
2017	Q2	FR_FRCP1	0.00022	678	0.00026	0.0008	0.15	362	0.012	0.31	< 0.00005	0.00023	0.027	0.027	37	0.0038
2017	Q3	FR_FRCP1	< 0.0001	1015	< 0.00044	< 0.0005	0.19	601	< 0.012	0.023	< 0.00006	< 0.00005	0.037	0.035	70	0.0051
2017	Q4	FR_FRCP1	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	Q1	GH_FR1	< 0.0001	876	< 0.0005	< 0.0005	0.14	507	< 0.01	0.015	< 0.00005	< 0.00005	0.017	0.017	50	0.0014
2017	Q3	GH_FR1	< 0.0001	766	< 0.00044	< 0.0005	0.16	436	< 0.01	0.011	< 0.00005	< 0.00005	0.019	0.019	45	0.001
2017	Q4	GH_FR1	< 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
<b>Tests categorized as possible or likely response for hatch</b>																
2016	Q3	CM_MC2	0.00047	896	0.00062	0.011	0.11	489	< 0.018	0.019	< 0.00009	< 0.00009	0.016	0.017	54	0.00069
<b>Tests categorized as possible or likely response for survival and biomass</b>																
2017	Q2	GH_FR1	0.00027	601	< 0.0005	0.00096	0.15	344	0.011	0.41	< 0.00005	0.00033	0.014	0.014	35	0.0015

Notes:

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;  
**Screening**  
 Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	MANGANES E-T-mg/l	MERCURY-D- mg/l	MERCURY-T- mg/l	MOLYBDEN UM-D-mg/l	MOLYBDEN UM-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)-N- mg/l	ORTHO- PHOSPHATE- N-mg/l	pH, LAB-N- ph units	PHOSPHOR US-N-mg/l	POTASSIUM- T-mg/l
<b>Reference</b>																
2016	Q2	Reference (FR_UFR1)	0.0016	< 0.000005	0.00000096	0.00063	0.00065	< 0.0005	< 0.0005	0.016	< 0.001	< 0.005	0.0026	8.3	0.0047	0.36
2016	Q3	Reference (FR_UFR1)	0.00066	< 0.000005	< 0.0000005	0.00061	0.00062	< 0.0005	< 0.0005	0.041	< 0.001	< 0.005	0.0026	8.3	0.0048	0.45
2016	Q4	Reference (FR_UFR1)	0.00052	< 0.000005	0.00000056	0.00057	0.00058	< 0.0005	< 0.0005	0.1	< 0.001	< 0.005	0.0023	8.3	0.0044	0.37
2017	Q3	Reference (CM_MC1)	0.00052	< 0.000005	0.00000054	0.00089	0.0009	< 0.0005	< 0.0005	0.018	< 0.001	0.0063	0.005	8.3	0.018	0.5
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
2017	Q1	Reference (FR_UFR1)	0.00034	< 0.000005	< 0.0000005	0.00058	0.00062	< 0.0005	< 0.0005	0.21	0.0012	< 0.005	0.0064	8.2	0.015	0.43
2017	Q2	Reference (FR_UFR1)	0.0054	< 0.000005	0.00000024	0.00049	0.00052	0.0005	0.0006	0.078	0.0019	0.0066	0.0072	8.3	0.022	0.39
2017	Q3	Reference (FR_UFR1)	0.00071	< 0.000005	< 0.0000005	0.00063	0.00067	< 0.0005	< 0.0005	0.014	< 0.001	0.0061	0.0026	8.4	0.0043	0.46
2017	Q4	Reference (FR_UFR1)	0.00047	< 0.000005	< 0.0000005	0.00057	0.00059	< 0.0005	< 0.0005	0.031	0.001	0.0052	0.0015	8.4	0.0028	0.39
2017	Q2	Reference (GH_ER2)	0.021	< 0.000005	0.00000018	0.00091	0.00094	< 0.0005	0.0009	0.12	< 0.001	< 0.005	0.0012	8.3	0.026	0.48
2017	Q3	Reference (GH_ER2)	0.0038	< 0.000005	0.00000052	0.00099	0.001	< 0.0005	< 0.0005	0.043	< 0.001	0.0061	0.0014	8.2	0.0037	0.38
2017	Q4	Reference (GH_ER2)	0.0015	< 0.000005	< 0.0000005	0.0011	0.001	< 0.0005	< 0.0005	0.05	< 0.001	0.0069	< 0.001	8.4	0.0017	0.36
<b>Tests categorized as no adverse response</b>																
2016	Q2	CM_MC2	0.023	< 0.000005	0.00000096	0.00086	0.00089	0.015	0.016	1.9	0.008	0.02	0.002	8.3	0.018	1.1
2016	Q4	CM_MC2	0.014	< 0.000005	0.00000086	0.00092	0.00095	0.011	0.012	2.1	0.0096	0.012	0.0015	8.3	0.0071	1.3
2016	Q2	FR_FRCP1	0.0074	< 0.000005	0.00000086	0.0011	0.0011	0.0019	0.0024	8.3	0.0026	0.0057	0.0015	8.3	0.0086	1.2
2016	Q3	FR_FRCP1	0.0077	< 0.000005	< 0.0000005	0.0013	0.0013	0.0055	0.0058	13	0.0065	0.0056	0.0013	8.3	0.0051	1.7
2016	Q4	FR_FRCP1	0.0087	< 0.000005	< 0.0000005	0.0013	0.0013	0.0051	0.0054	13	< 0.005	< 0.005	< 0.001	8.3	0.0036	1.6
2016	Q2	GH_FR1	0.0047	< 0.000005	0.00000012	0.001	0.001	0.0018	0.002	7.6	0.0027	0.0052	0.0012	8.3	0.0089	1.1
2016	Q3	GH_FR1	0.0018	< 0.000005	< 0.00000095	0.00095	0.00097	0.0016	0.0017	10	0.0056	< 0.005	0.001	8.3	0.0041	1.2
2016	Q4	GH_FR1	0.0017	< 0.000005	< 0.00000014	0.0011	0.0011	0.0024	0.0025	9.6	< 0.005	0.0053	0.0011	8.3	0.01	1.3
2017	Q1	CM_MC2	0.021	0.00000057	0.0000005	0.0016	0.0016	0.029	0.03	4.1	0.019	0.042	0.0026	8.3	0.0057	1.9
2017	Q2	CM_MC2	0.033	< 0.000005	0.00000017	0.0011	0.0012	0.017	0.02	2.3	0.0092	0.045	0.0021	8.3	0.042	1.5
2017	Q3	CM_MC2	0.01	< 0.000005	0.00000069	0.0015	0.0015	0.026	0.027	3.5	0.018	0.015	0.0011	8.4	0.011	1.8
2017	Q4	CM_MC2	0.0054	< 0.000005	< 0.0000005	0.0013	0.0014	0.016	0.017	3.9	0.014	0.02	< 0.001	8.3	0.0029	1.9
2017	Q1	FR_FRCP1	0.0089	< 0.000005	0.00000055	0.0018	0.0018	0.011	0.011	22	0.011	0.0059	0.0043	8.2	0.015	2.5
2017	Q2	FR_FRCP1	0.018	< 0.000005	0.00000025	0.0012	0.0013	0.0037	0.0047	11	0.0038	0.013	0.0023	8.3	0.033	1.5
2017	Q3	FR_FRCP1	0.0088	< 0.000005	< 0.0000005	0.0013	0.0014	0.0068	0.007	11	0.0062	0.0063	0.0013	8.3	0.0037	2.0
2017	Q4	FR_FRCP1	0.013	< 0.000005	< 0.0000005	0.0013	0.0014	0.0086	0.0092	15	0.0067	0.0063	< 0.001	8.2	0.0022	2.2
2017	Q1	GH_FR1	0.0019	< 0.000005	0.00000052	0.00084	0.00087	0.0015	0.0015	13	< 0.005	0.0056	0.002	8.3	0.0036	1.2
2017	Q3	GH_FR1	0.0021	< 0.000005	0.0000005	0.00097	0.00099	0.0025	0.0026	10	0.0067	0.0058	0.001	8.3	0.0035	1.3
2017	Q4	GH_FR1	0.002	< 0.000005	0.00000011	0.0011	0.0011	0.0026	0.0028	10	0.0056	0.0068	< 0.001	8.4	0.0019	1.3
<b>Tests categorized as possible or likely response for hatch</b>																
2016	Q3	CM_MC2	0.002	< 0.000005	< 0.0000005	0.0012	0.0012	0.014	0.014	3.0	0.0064	< 0.005	0.001	8.2	0.0056	1.8
<b>Tests categorized as possible or likely response for survival and biomass</b>																
2017	Q2	GH_FR1	0.016	< 0.000005	0.00000063	0.0011	0.0011	0.0022	0.0034	6.5	0.0033	< 0.005	0.0033	8.3	0.024	1.3

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;  
**Screening**  
 Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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	TITANIUM-T-mg/l
<b>Reference</b>																
2016	Q2	Reference (FR_UFR1)	0.00051	0.00055	< 0.00001	< 0.00001	0.65	0.066	0.068	15	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2016	Q3	Reference (FR_UFR1)	0.0006	0.00065	< 0.00001	< 0.00001	0.74	0.096	0.098	39	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2016	Q4	Reference (FR_UFR1)	0.00067	0.00067	< 0.00001	< 0.00001	0.68	0.089	0.09	38	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q3	Reference (CM_MC1)	0.00018	0.00022	< 0.00001	< 0.00001	2.4	0.15	0.15	13	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q4	Reference (CM_MC1)	0.0002	0.00022	< 0.00001	< 0.00001	3.0	0.16	0.16	28	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q1	Reference (FR_UFR1)	0.001	0.00095	< 0.00001	< 0.00001	0.85	0.093	0.096	46	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q2	Reference (FR_UFR1)	0.00068	0.00064	< 0.00001	0.000012	0.58	0.064	0.063	16	< 0.00001	0.000011	0.0001	< 0.0001	< 0.01	< 0.01
2017	Q3	Reference (FR_UFR1)	0.00054	0.00058	< 0.00001	< 0.00001	0.68	0.097	0.096	37	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q4	Reference (FR_UFR1)	0.00059	0.00061	< 0.00001	< 0.00001	0.69	0.099	0.099	46	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q2	Reference (GH_ER2)	0.00084	0.00087	< 0.00001	0.000012	0.77	0.2	0.21	18	< 0.00001	0.000016	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q3	Reference (GH_ER2)	0.00065	0.00066	< 0.00001	< 0.00001	0.61	0.21	0.21	16	< 0.00001	< 0.00001	0.0001	< 0.0001	< 0.01	< 0.01
2017	Q4	Reference (GH_ER2)	0.00084	0.00081	< 0.00001	< 0.00001	0.7	0.21	0.2	19	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
<b>Tests categorized as no adverse response</b>																
2016	Q2	CM_MC2	0.0043	0.0042	< 0.00001	< 0.00001	6.0	0.19	0.19	132	0.000012	0.000021	< 0.0001	< 0.0001	0.011	0.015
2016	Q4	CM_MC2	0.0054	0.0055	< 0.000018	< 0.000018	7.6	0.24	0.24	187	0.000019	0.000022	< 0.00018	< 0.00018	< 0.01	< 0.01
2016	Q2	FR_FRCP1	0.03	0.031	< 0.00001	< 0.00001	1.1	0.099	0.1	119	< 0.00001	0.000011	< 0.0001	< 0.0001	0.011	0.011
2016	Q3	FR_FRCP1	0.068	0.067	< 0.00001	< 0.00001	1.8	0.15	0.15	284	< 0.00001	0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2016	Q4	FR_FRCP1	0.06	0.059	< 0.00001	< 0.00001	1.6	0.15	0.15	256	0.000011	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2016	Q2	GH_FR1	0.029	0.03	< 0.00001	< 0.00001	1.5	0.11	0.11	130	< 0.00001	0.00001	< 0.0001	< 0.0001	0.01	0.011
2016	Q3	GH_FR1	0.039	0.04	< 0.00001	< 0.00001	2.0	0.14	0.14	190	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2016	Q4	GH_FR1	0.043	0.043	< 0.00001	< 0.00001	2.1	0.14	0.15	214	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q1	CM_MC2	0.0066	0.0062	< 0.00001	< 0.00001	15	0.41	0.42	320	0.000016	0.00002	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q2	CM_MC2	0.0066	0.006	< 0.00001	< 0.00001	10	0.28	0.29	188	0.000013	0.000031	< 0.0001	0.00012	< 0.01	< 0.01
2017	Q3	CM_MC2	0.0086	0.0084	< 0.00001	< 0.00001	12	0.38	0.39	319	0.00002	0.000021	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q4	CM_MC2	0.0084	0.0079	< 0.00001	< 0.00001	14	0.41	0.41	334	0.000014	0.000015	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q1	FR_FRCP1	0.17	0.17	< 0.00001	< 0.00001	2.4	0.2	0.2	620	0.000014	0.000015	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q2	FR_FRCP1	0.051	0.044	< 0.00001	0.000014	1.4	0.12	0.12	172	0.00001	0.000018	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q3	FR_FRCP1	0.091	0.091	< 0.000012	< 0.00001	1.6	0.15	0.15	359	0.000013	0.000011	< 0.00012	< 0.0001	< 0.01	< 0.01
2017	Q4	FR_FRCP1	0.14	0.13	< 0.00001	< 0.00001	2.0	0.18	0.18	515	0.000011	0.000012	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q1	GH_FR1	0.053	0.053	< 0.00001	< 0.00001	2.4	0.17	0.17	238	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
2017	Q3	GH_FR1	0.052	0.049	< 0.00001	< 0.00001	1.9	0.14	0.14	208	< 0.00001	< 0.00001	0.0001	< 0.0001	< 0.01	< 0.01
2017	Q4	GH_FR1	0.065	0.063	< 0.00001	< 0.00001	2.2	0.16	0.16	267	< 0.00001	< 0.00001	< 0.0001	< 0.0001	< 0.01	< 0.01
<b>Tests categorized as possible or likely response for hatch</b>																
2016	Q3	CM_MC2	0.0063	0.0065	< 0.000018	< 0.000018	11	0.35	0.35	295	0.000023	0.000022	< 0.00018	< 0.00018	< 0.01	< 0.01
<b>Tests categorized as possible or likely response for survival and biomass</b>																
2017	Q2	GH_FR1	0.033	0.032	< 0.00001	0.000015	1.8	0.12	0.12	133	< 0.00001	0.000018	< 0.0001	< 0.0001	< 0.01	< 0.011

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;  
**Screening**  
 Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	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
<b>Reference</b>															
2016	Q2	Reference (FR_UFR1)	147	0.081	2.0	1.7	0.89	0.00033	0.00034	< 0.0005	0.0005	< 0.003	< 0.003	-	-
2016	Q3	Reference (FR_UFR1)	221	0.068	0.92	1.6	0.29	0.00044	0.00044	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-
2016	Q4	Reference (FR_UFR1)	198	0.063	1.3	< 1	0.65	0.00043	0.00044	< 0.0005	0.0005	< 0.003	< 0.0036	-	-
2017	Q3	Reference (CM_MC1)	163	0.061	1.1	1.0	0.38	0.00022	0.00022	< 0.0005	< 0.0005	< 0.0026	< 0.003	1.3	1.1
2017	Q4	Reference (CM_MC1)	171	0.11	1.2	1.3	0.48	0.00022	0.00023	< 0.0005	< 0.0005	< 0.003	< 0.003	1.3	1.2
2017	Q1	Reference (FR_UFR1)	196	0.069	0.71	< 1	0.33	0.00045	0.00049	< 0.0005	< 0.0005	< 0.001	0.0035	1.7	1.2
2017	Q2	Reference (FR_UFR1)	143	0.12	3.1	6.5	4.2	0.0003	0.00033	0.00051	0.00079	0.0011	< 0.003	2.7	2.4
2017	Q3	Reference (FR_UFR1)	204	0.06	1.4	1.1	0.28	0.00044	0.00042	< 0.0005	< 0.0005	< 0.0026	< 0.003	1.5	1.2
2017	Q4	Reference (FR_UFR1)	235	0.075	0.8	1.0	0.37	0.00052	0.00049	< 0.0005	< 0.0005	< 0.003	< 0.003	1.5	1.2
2017	Q2	Reference (GH_ER2)	180	0.13	2.5	24	11	0.00078	0.00082	< 0.0005	0.0014	< 0.003	0.0046	3.0	2.6
2017	Q3	Reference (GH_ER2)	164	0.063	0.86	1.2	0.6	0.00064	0.00065	< 0.0005	< 0.0005	< 0.0026	< 0.003	1.5	1.2
2017	Q4	Reference (GH_ER2)	192	0.16	0.66	1.5	0.73	0.00077	0.00075	< 0.0005	< 0.0005	< 0.003	< 0.003	1.7	1.3
<b>Tests categorized as no adverse response</b>															
2016	Q2	CM_MC2	365	0.19	1.8	12	5.9	0.0014	0.0014	< 0.0005	0.00082	0.0054	0.0099	-	-
2016	Q4	CM_MC2	462	0.14	1.9	4.6	2.9	0.0017	0.0018	< 0.0009	< 0.0009	0.0035	0.0062	-	-
2016	Q2	FR_FRCP1	377	0.15	1.9	6.3	1.0	0.0017	0.0018	< 0.0005	0.00052	< 0.003	0.0031	-	-
2016	Q3	FR_FRCP1	700	0.14	1.1	2.1	1.8	0.0033	0.0034	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-
2016	Q4	FR_FRCP1	636	0.095	1.3	1.3	1.1	0.0031	0.0032	< 0.0005	< 0.0005	< 0.003	< 0.0042	-	-
2016	Q2	GH_FR1	401	0.18	1.8	15	2.6	0.0017	0.0017	< 0.0005	0.00052	< 0.003	0.003	-	-
2016	Q3	GH_FR1	522	0.13	1.1	< 1	0.36	0.0021	0.0021	< 0.0005	0.00051	< 0.003	< 0.003	-	-
2016	Q4	GH_FR1	562	0.2	1.6	2.0	0.71	0.0023	0.0023	< 0.0005	< 0.0005	< 0.003	< 0.003	-	-
2017	Q1	CM_MC2	668	0.14	1.1	1.9	1.2	0.0034	0.0033	< 0.0005	< 0.0005	0.0041	0.0048	14	10
2017	Q2	CM_MC2	448	0.22	2.5	19	12	0.0018	0.0018	< 0.0005	0.001	0.0063	0.011	12	8.6
2017	Q3	CM_MC2	653	0.26	1.2	3.2	1.2	0.003	0.003	< 0.0005	< 0.0005	< 0.0026	0.0037	14	9.5
2017	Q4	CM_MC2	748	0.38	0.99	2.8	1.3	0.003	0.0032	< 0.0005	< 0.0005	< 0.003	< 0.003	11	6.5
2017	Q1	FR_FRCP1	1231	0.29	1.3	1.3	1.1	0.0067	0.0069	< 0.0005	0.00052	0.002	0.0031	98	16
2017	Q2	FR_FRCP1	462	0.6	2.7	17	10	0.002	0.0021	< 0.0005	0.0016	0.0024	0.0066	30	6.7
2017	Q3	FR_FRCP1	817	0.48	1.6	1.4	0.55	0.0041	0.004	< 0.0006	< 0.0005	< 0.0026	< 0.003	53	9.1
2017	Q4	FR_FRCP1	1058	0.38	0.98	1.3	0.63	0.0058	0.0057	< 0.0005	0.00052	< 0.003	0.0032	75	12
2017	Q1	GH_FR1	623	0.095	1.1	1.1	0.77	0.0024	0.0024	< 0.0005	< 0.0005	< 0.003	< 0.003	33	5.4
2017	Q3	GH_FR1	571	0.36	1.2	1.5	0.38	0.0023	0.0023	< 0.0005	< 0.0005	< 0.0026	< 0.003	30	5.4
2017	Q4	GH_FR1	672	0.36	1.3	8.3	9.3	0.0029	0.0029	< 0.0005	< 0.0005	< 0.003	< 0.003	38	6.4
<b>Tests categorized as possible or likely response for hatch</b>															
2016	Q3	CM_MC2	674	0.2	1.1	1.5	0.51	0.0027	0.0028	< 0.0009	< 0.0009	< 0.0034	< 0.0054	-	-
<b>Tests categorized as possible or likely response for survival and biomass</b>															
2017	Q2	GH_FR1	404	0.31	4.4	22	16	0.0018	0.0018	< 0.0005	0.0017	< 0.003	0.0059	22	6.1

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;

**Screening**

Concentrations of parameters in 2017 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: Fathead Minnow Endpoints Paired with Water Quality**

Year	Quarter	Sample ID	PCA Factor 1 (2015 to 2017)	PCA Factor 2 (2015 to 2017)	PCA Factor 3 (2015 to 2017)	PCA Factor 4 (2015 to 2017)	PCA Factor 5 (2015 to 2017)	PCA Factor 1 (2017)	PCA Factor 2 (2017)	PCA Factor 3 (2017)	PCA Factor 4 (2017)	PCA Factor 5 (2017)
<b>Reference</b>												
2016	Q2	Reference (FR_UFR1)	-8.2	2.0	0.37	0.68	-1.6	-	-	-	-	-
2016	Q3	Reference (FR_UFR1)	-7.0	-1.3	-1.3	0.048	-0.13	-	-	-	-	-
2016	Q4	Reference (FR_UFR1)	-7.4	0.16	-0.61	0.41	-0.5	-	-	-	-	-
2017	Q3	Reference (CM_MC1)	-6.4	2.4	-1.7	-2.9	1.2	-6.0	0.4	-3.0	1.0	1.8
2017	Q4	Reference (CM_MC1)	-6.0	1.2	-2.3	-2.5	0.79	-5.6	-0.79	-2.5	0.85	0.44
2017	Q1	Reference (FR_UFR1)	-7.0	-1.3	-0.9	-0.53	2.4	-6.2	-1.9	0.52	-1.3	3.3
2017	Q2	Reference (FR_UFR1)	-7.1	6.3	2.9	2.3	1.6	-6.5	5.6	2.2	1.7	4.0
2017	Q3	Reference (FR_UFR1)	-7.0	-0.69	-0.69	-0.37	0.77	-6.3	-1.3	0.38	-0.55	0.079
2017	Q4	Reference (FR_UFR1)	-7.0	-1.5	-1.6	-0.78	0.28	-6.4	-2.3	-0.12	-0.84	-0.71
2017	Q2	Reference (GH_ER2)	-3.4	5.8	3.6	0.63	-0.61	-3.0	6.2	0.58	0.6	-3.6
2017	Q3	Reference (GH_ER2)	-5.9	0.54	-1.5	-1.8	0.17	-5.6	-0.9	-1.5	1.0	-1.7
2017	Q4	Reference (GH_ER2)	-5.9	-0.17	-1.8	-2.1	-0.22	-5.7	-1.6	-1.6	0.73	-3.6
<b>Tests categorized as no adverse response</b>												
2016	Q2	CM_MC2	3.4	6.3	3.2	-1.8	-4.6	-	-	-	-	-
2016	Q4	CM_MC2	6.2	8.9	-7.3	4.5	-0.032	-	-	-	-	-
2016	Q2	FR_FRCP1	-0.065	-0.84	2.6	1.9	-1.3	-	-	-	-	-
2016	Q3	FR_FRCP1	2.8	-3.9	1.0	1.0	0.8	-	-	-	-	-
2016	Q4	FR_FRCP1	2.6	-3.5	1.3	1.2	0.34	-	-	-	-	-
2016	Q2	GH_FR1	-0.002	-0.91	2.6	1.9	-0.98	-	-	-	-	-
2016	Q3	GH_FR1	0.3	-4.3	-0.21	1.0	0.37	-	-	-	-	-
2016	Q4	GH_FR1	1.2	-3.5	0.51	1.0	0.82	-	-	-	-	-
2017	Q1	CM_MC2	7.6	1.7	-0.1	-6.3	0.32	7.4	-0.013	-5.2	0.65	0.86
2017	Q2	CM_MC2	6.2	7.5	4.0	-3.3	-0.12	6.4	7.7	-3.5	0.94	0.46
2017	Q3	CM_MC2	5.9	1.5	-1.1	-4.7	1.2	5.7	-0.38	-4.7	0.91	-0.12
2017	Q4	CM_MC2	5.6	-0.57	-2.0	-4.7	1.2	5.3	-2.3	-4.3	0.057	-0.1
2017	Q1	FR_FRCP1	6.4	-4.0	1.9	0.099	3.5	6.5	-3.1	1.9	-2.2	2.3
2017	Q2	FR_FRCP1	3.2	4.0	6.3	2.5	1.8	3.5	5.9	3.5	-1.2	0.27
2017	Q3	FR_FRCP1	4.3	-2.6	-0.66	2.0	2.3	5.0	-4.7	5.8	8.4	-0.2
2017	Q4	FR_FRCP1	4.7	-4.0	0.66	0.18	1.7	4.7	-3.5	1.4	-1.8	-0.26
2017	Q1	GH_FR1	0.56	-4.4	-0.18	0.61	1.3	0.97	-4.0	1.8	-2.7	0.09
2017	Q3	GH_FR1	0.82	-4.2	0.19	0.63	1.8	1.2	-3.8	2.0	-2.0	-0.45
2017	Q4	GH_FR1	1.5	-3.3	1.1	0.47	1.6	1.7	-2.7	1.8	-2.3	-1.6
<b>Tests categorized as possible or likely response for hatch</b>												
2016	Q3	CM_MC2	7.2	5.2	-10	4.2	0.97	-	-	-	-	-
<b>Tests categorized as possible or likely response for survival and biomass</b>												
2017	Q2	GH_FR1	2.5	4.4	6.2	3.3	0.51	3.0	7.3	4.4	-1.9	-1.3

**Notes:**

"-D-" = dissolved concentration; "-T-" = total concentration; "-N-" = normal concentration; CaCO<sub>3</sub> = calcium carbonate; TU = toxic unit; WQG = water quality guideline; Σ = sum of;

**Screening**

Concentrations of parameters in 2017 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 E**

**Principal Component Analysis**

**Table E-1: PCA Results for *C. dubia* Tests**

	2015 to 2017 Dataset			2017 Dataset		
	PC1	PC2	PC3	PC1	PC2	PC3
<b>Percent of Total Variance Explained</b>						
	31.4	15.7	11.1	35.0	19.1	10.7
<b>Component Loadings by Water Quality Parameter</b>						
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	0.809	-0.262	-0.061	0.784	-0.157	0.086
ALUMINUM-D-mg/l	-0.211	0.608	0.07	-0.176	0.748	0.092
ALUMINUM-T-mg/l	-0.2	0.799	0.327	0.068	0.9	-0.093
ANTIMONY-D-mg/l	0.871	0.058	-0.002	0.906	-0.014	-0.178
ANTIMONY-T-mg/l	0.817	0.056	0.086	0.797	-0.036	-0.176
ARSENIC-D-mg/l	0.292	0.582	-0.134	0.068	0.415	-0.332
ARSENIC-T-mg/l	0.257	0.82	0.138	0.279	0.785	-0.201
BARIUM-D-mg/l	0.408	-0.313	0.013	0.481	-0.159	0.426
BARIUM-T-mg/l	0.418	-0.249	0.011	0.506	-0.105	0.397
BERYLLIUM-D-mg/l	0.071	0.128	-0.58	n/a	n/a	n/a
BERYLLIUM-T-mg/l	0.08	0.161	-0.572	0.237	0.676	0.326
BISMUTH-D-mg/l	0.12	0.035	-0.685	n/a	n/a	n/a
BISMUTH-T-mg/l	0.12	0.035	-0.685	n/a	n/a	n/a
BORON-D-mg/l	0.568	0.276	-0.14	0.504	0.01	-0.789
BORON-T-mg/l	0.607	0.254	-0.119	0.552	-0.005	-0.771
BROMIDE-D-mg/l	0.585	-0.322	-0.053	0.385	-0.039	0.358
CADMIUM-D-mg/l	0.666	0.157	0.073	0.679	0.109	0.277
CADMIUM-T-mg/l	0.646	0.322	0.148	0.742	0.247	0.303
CALCIUM-T-mg/l	0.932	-0.25	-0.048	0.915	-0.281	0.174
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.044	0.651	0.364	0.029	0.721	0.176
CHLORIDE-D-mg/l	0.706	-0.12	0.04	0.749	-0.189	0.106
CHROMIUM-D-mg/l	-0.198	0.267	-0.574	-0.491	0.032	-0.311
CHROMIUM-T-mg/l	-0.189	0.725	0.065	0.094	0.676	0.022
COBALT-D-mg/l	0.403	0.365	0.119	0.501	0.134	-0.782
COBALT-T-mg/l	0.388	0.51	0.181	0.549	0.314	-0.703
CONDUCTIVITY, LAB-N-us/cm	0.946	-0.199	0.05	0.94	-0.185	0.185
COPPER-D-mg/l	0.006	-0.035	-0.468	-0.121	-0.12	0.36
COPPER-T-mg/l	0.258	0.759	-0.381	0.207	0.871	0.265
FLUORIDE-D-mg/l	0.365	-0.294	-0.244	0.318	-0.264	0.483
Hardness, Total or Dissolved CaCO3-N-mg/l	0.934	-0.214	-0.003	0.91	-0.228	0.239
IRON-D-mg/l	0.113	0.585	-0.359	-0.163	0.676	0.181
IRON-T-mg/l	-0.072	0.826	0.322	0.22	0.873	0.001
LEAD-D-mg/l	0.35	0.354	-0.648	0.144	-0.128	0.116
LEAD-T-mg/l	0.028	0.862	0.025	0.226	0.898	0.184
LITHIUM-D-mg/l	0.924	-0.082	0.169	0.911	-0.143	0.195
LITHIUM-T-mg/l	0.927	-0.071	0.172	0.914	-0.137	0.19
MAGNESIUM-T-mg/l	0.922	-0.17	0.049	0.901	-0.201	0.247
MANGANESE-D-mg/l	0.547	0.174	0.406	0.712	0.261	-0.153
MANGANESE-T-mg/l	0.306	0.471	0.55	0.648	0.471	-0.151
MERCURY-D-mg/l	-0.044	-0.004	-0.305	-0.01	-0.011	-0.267
MERCURY-T-mg/l	-0.033	0.246	-0.452	0.198	0.825	-0.11
MOLYBDENUM-D-mg/l	0.79	-0.132	0.047	0.77	-0.236	-0.117
MOLYBDENUM-T-mg/l	0.797	-0.104	0.07	0.804	-0.17	-0.108
NICKEL-D-mg/l	0.884	0.128	0.172	0.919	0.03	-0.293
NICKEL-T-mg/l	0.883	0.181	0.203	0.935	0.083	-0.26
NITRATE NITROGEN (NO3), AS N-N-mg/l	0.877	-0.073	0.104	0.879	-0.094	0.334

**Table E-1: PCA Results for *C. dubia* Tests**

	2015 to 2017 Dataset			2017 Dataset		
	PC1	PC2	PC3	PC1	PC2	PC3
NITRITE NITROGEN (NO2), AS N-N-mg/l	0.835	-0.066	0.186	0.835	-0.029	-0.253
NITROGEN, AMMONIA (AS N)-N-mg/l	0.188	0.32	0.388	0.35	0.382	-0.424
ORTHO-PHOSPHATE-N-mg/l	-0.309	0.214	0.141	-0.26	0.389	0.314
pH, LAB-N-ph units	0.056	-0.099	0.083	-0.088	-0.103	-0.006
PHOSPHORUS-N-mg/l	-0.239	0.741	0.341	-0.025	0.795	-0.059
POTASSIUM-T-mg/l	0.949	0	0.202	0.966	-0.031	0.088
SELENIUM-D-mg/l	0.819	-0.112	0.096	0.783	-0.126	0.537
SELENIUM-T-mg/l	0.819	-0.115	0.089	0.786	-0.13	0.536
SILVER-D-mg/l	0.342	0.396	-0.703	n/a	n/a	n/a
SILVER-T-mg/l	0.233	0.668	-0.444	0.077	0.798	0.312
SODIUM-T-mg/l	0.761	0.089	0.18	0.77	-0.085	-0.391
STRONTIUM-D-mg/l	0.522	-0.061	0.047	0.563	-0.233	-0.644
STRONTIUM-T-mg/l	0.524	-0.057	0.035	0.557	-0.228	-0.654
SULFATE (AS SO4)-D-mg/l	0.922	-0.147	0.08	0.917	-0.151	0.227
THALLIUM-D-mg/l	0.563	0.369	-0.49	0.595	0.057	-0.684
THALLIUM-T-mg/l	0.452	0.728	-0.1	0.569	0.582	-0.35
TIN-D-mg/l	0.326	0.383	-0.71	-0.244	0.162	0.051
TIN-T-mg/l	0.303	0.361	-0.67	-0.008	-0.077	0.039
TITANIUM-D-mg/l	0.324	-0.184	-0.267	n/a	n/a	n/a
TITANIUM-T-mg/l	0.299	0.01	-0.175	0.171	0.496	0.27
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.94	-0.194	0.04	0.928	-0.218	0.192
TOTAL KJELDAHL NITROGEN-N-mg/l	0.273	0.297	0.565	0.57	0.229	0.219
TOTAL ORGANIC CARBON-T-mg/l	-0.033	0.685	0.426	0.106	0.777	0.171
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.123	0.75	0.379	0.195	0.82	-0.103
TURBIDITY, LAB-N-ntu	-0.108	0.741	0.511	0.216	0.862	-0.036
URANIUM-D-mg/l	0.91	-0.146	0.049	0.885	-0.194	0.26
URANIUM-T-mg/l	0.913	-0.136	0.053	0.894	-0.191	0.241
VANADIUM-D-mg/l	0.237	0.201	-0.832	-0.253	0.397	0.078
VANADIUM-T-mg/l	0.087	0.735	-0.345	0.155	0.887	0.288
ZINC-D-mg/l	0.354	-0.021	-0.204	0.462	-0.259	0.071
ZINC-T-mg/l	0.422	0.423	-0.085	0.551	0.317	0.095

**Notes:**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre; PC = principle component.

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 *H. azteca* Tests

	2015 to 2017 Dataset				2017 Dataset		
	PC1	PC2	PC3	PC4	PC1	PC2	PC3
<b>Percent of Total Variance Explained</b>							
	35.7	19.4	10.2	7.4	41.4	21.1	13.0
<b>Component Loadings by Water Quality Parameter</b>							
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	0.847	-0.407	0	-0.029	0.878	-0.318	0.173
ALUMINUM-D-mg/l	-0.165	0.655	0.205	0.036	-0.127	0.675	0.056
ALUMINUM-T-mg/l	0.12	0.87	0.295	-0.029	0.252	0.914	-0.013
ANTIMONY-D-mg/l	0.902	-0.107	-0.002	0.042	0.958	-0.04	-0.102
ANTIMONY-T-mg/l	0.909	-0.115	-0.005	0.129	0.94	-0.076	-0.054
ARSENIC-D-mg/l	0.265	0.578	-0.605	-0.169	0.181	0.385	-0.705
ARSENIC-T-mg/l	0.357	0.824	-0.19	-0.061	0.4	0.74	-0.4
BARIUM-D-mg/l	0.362	-0.671	0.23	-0.044	0.423	-0.429	0.52
BARIUM-T-mg/l	0.379	-0.627	0.269	-0.062	0.44	-0.386	0.523
BERYLLIUM-D-mg/l	0.078	-0.045	0.369	-0.672	n/a	n/a	n/a
BERYLLIUM-T-mg/l	0.09	-0.007	0.385	-0.659	0.334	0.762	0.248
BISMUTH-D-mg/l	0.088	0.081	0.399	-0.722	n/a	n/a	n/a
BISMUTH-T-mg/l	0.088	0.081	0.4	-0.722	n/a	n/a	n/a
BORON-D-mg/l	0.498	0.308	-0.706	-0.293	0.506	0.011	-0.801
BORON-T-mg/l	0.528	0.311	-0.679	-0.302	0.522	0.008	-0.795
BROMIDE-D-mg/l	0.647	-0.489	0.063	0.019	0.557	-0.366	0.436
CADMIUM-D-mg/l	0.707	0.24	0.379	0.188	0.715	0.322	0.252
CADMIUM-T-mg/l	0.726	0.355	0.394	0.227	0.785	0.421	0.262
CALCIUM-T-mg/l	0.915	-0.371	0.062	-0.012	0.906	-0.36	0.196
CARBON, DISSOLVED ORGANIC-D-mg/l	0.033	0.684	0.317	0.198	0.164	0.811	0.264
CHLORIDE-D-mg/l	0.811	-0.126	-0.049	-0.26	0.877	-0.23	-0.024
CHROMIUM-D-mg/l	-0.091	0.499	-0.362	-0.266	-0.368	0.094	-0.529
CHROMIUM-T-mg/l	0.161	0.769	0.15	0.075	0.129	0.916	-0.017
COBALT-D-mg/l	0.479	0.485	-0.588	-0.197	0.584	0.092	-0.726
COBALT-T-mg/l	0.506	0.589	-0.502	-0.185	0.636	0.212	-0.662
CONDUCTIVITY, LAB-N-us/cm	0.94	-0.306	0.068	0.041	0.926	-0.292	0.215
COPPER-D-mg/l	-0.053	-0.182	0.094	-0.45	-0.168	-0.242	-0.061
COPPER-T-mg/l	0.193	0.788	0.234	0.121	0.336	0.826	0.243
FLUORIDE-D-mg/l	0.1	-0.44	0.582	0.127	0.207	-0.057	0.563
Hardness, Total or Dissolved CaCO3-N-mg/l	0.927	-0.336	0.088	0.037	0.907	-0.322	0.246
IRON-D-mg/l	-0.153	0.474	0.211	0.259	-0.234	0.51	0.205
IRON-T-mg/l	0.284	0.83	0.37	0.095	0.377	0.859	0.108
LEAD-D-mg/l	-0.169	-0.05	0.003	-0.122	n/a	n/a	n/a
LEAD-T-mg/l	0.212	0.859	0.267	0.102	0.338	0.867	0.142
LITHIUM-D-mg/l	0.916	-0.217	0.153	0.163	0.905	-0.182	0.212
LITHIUM-T-mg/l	0.918	-0.208	0.153	0.16	0.909	-0.177	0.206
MAGNESIUM-T-mg/l	0.936	-0.302	0.097	0.062	0.912	-0.298	0.253
MANGANESE-D-mg/l	0.855	0.189	0.105	0.016	0.881	0.092	-0.041
MANGANESE-T-mg/l	0.756	0.448	0.179	0.09	0.806	0.339	-0.041
MERCURY-D-mg/l	0.088	0.081	0.399	-0.722	n/a	n/a	n/a
MERCURY-T-mg/l	0.103	0.258	0.505	-0.554	0.139	0.937	0.249
MOLYBDENUM-D-mg/l	0.868	-0.156	0.007	0.059	0.843	-0.133	-0.145
MOLYBDENUM-T-mg/l	0.886	-0.093	0.022	0.083	0.871	-0.09	-0.131
NICKEL-D-mg/l	0.943	0.149	-0.213	-0.032	0.96	-0.074	-0.198
NICKEL-T-mg/l	0.945	0.181	-0.187	-0.017	0.968	-0.032	-0.176
NITRATE NITROGEN (NO3), AS N-N-mg/l	0.879	-0.21	0.31	0.13	0.887	-0.11	0.378
NITRITE NITROGEN (NO2), AS N-N-mg/l	0.918	0.011	-0.132	-0.065	0.936	-0.124	-0.07
NITROGEN, AMMONIA (AS N)-N-mg/l	0.479	0.449	-0.359	-0.086	0.596	0.226	-0.629
ORTHO-PHOSPHATE-N-mg/l	-0.508	0.292	-0.02	0.199	-0.273	0.317	0.127
pH, LAB-N-ph units	-0.086	0.033	0.229	-0.36	-0.146	0.075	0.001
PHOSPHORUS-N-mg/l	0.023	0.778	0.199	0.209	0.147	0.739	-0.028
POTASSIUM-T-mg/l	0.976	-0.128	0.052	0.067	0.967	-0.154	0.119
SELENIUM-D-mg/l	0.812	-0.313	0.42	0.21	0.812	-0.172	0.536
SELENIUM-T-mg/l	0.809	-0.319	0.424	0.203	0.808	-0.18	0.54
SILVER-D-mg/l	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SILVER-T-mg/l	0.038	0.548	0.372	0.374	0.115	0.768	0.455

**Table E-2: PCA Results for *H. azteca* Tests**

	2015 to 2017 Dataset				2017 Dataset		
	PC1	PC2	PC3	PC4	PC1	PC2	PC3
SODIUM-T-mg/l	0.758	0.229	-0.492	-0.213	0.746	-0.058	-0.555
STRONTIUM-D-mg/l	0.709	0.09	-0.589	-0.16	0.62	-0.194	-0.665
STRONTIUM-T-mg/l	0.712	0.093	-0.587	-0.171	0.62	-0.188	-0.671
SULFATE (AS SO4)-D-mg/l	0.937	-0.244	0.081	0.023	0.917	-0.265	0.227
THALLIUM-D-mg/l	0.579	0.064	-0.56	-0.095	0.688	-0.116	-0.545
THALLIUM-T-mg/l	0.527	0.656	-0.259	-0.048	0.794	0.389	-0.368
TIN-D-mg/l	-0.213	0.053	0.013	0.24	-0.295	0.089	0.146
TIN-T-mg/l	0.165	0.236	-0.087	0.062	n/a	n/a	n/a
TITANIUM-D-mg/l	0.332	-0.113	0.3	-0.364	0.296	0.378	-0.348
TITANIUM-T-mg/l	0.306	0.425	0.347	-0.386	0.16	0.498	0.345
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.933	-0.318	0.051	0.049	0.91	-0.33	0.217
TOTAL KJELDAHL NITROGEN-N-mg/l	0.538	0.19	-0.055	0.436	0.72	0.05	0.29
TOTAL ORGANIC CARBON-T-mg/l	0.117	0.663	0.392	0.274	0.204	0.817	0.344
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.226	0.813	0.258	0.071	0.311	0.837	-0.022
TURBIDITY, LAB-N-ntu	0.274	0.843	0.277	0.02	0.344	0.873	0.013
URANIUM-D-mg/l	0.943	-0.245	0.103	0.098	0.909	-0.255	0.235
URANIUM-T-mg/l	0.944	-0.239	0.107	0.101	0.914	-0.236	0.233
VANADIUM-D-mg/l	0.084	0.085	0.401	-0.719	-0.293	0.383	0.123
VANADIUM-T-mg/l	0.153	0.749	0.455	-0.036	0.221	0.852	0.307
ZINC-D-mg/l	0.345	0.244	-0.111	-0.279	0.467	0.054	-0.382
ZINC-T-mg/l	0.281	0.758	-0.016	0.152	0.514	0.622	-0.197

**Notes:**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre; PC = principle component.

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 *O. mykiss* Tests

	2015 to 2017 Dataset			2017 Dataset		
	PC1	PC2	PC3	PC1	PC2	PC3
<b>Percent of Total Variance Explained</b>	29.5	23.6	9.6	36.1	26.1	10.2
<b>Component Loadings by Water Quality Parameter</b>						
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	0.806	-0.181	-0.086	0.853	0.043	0.14
ALUMINUM-D-mg/l	-0.429	0.585	0.013	-0.621	0.491	-0.076
ALUMINUM-T-mg/l	-0.457	0.765	0.247	-0.654	0.717	0.056
ANTIMONY-D-mg/l	0.793	0.315	0.028	0.75	0.48	-0.021
ANTIMONY-T-mg/l	0.772	0.388	0.184	0.625	0.677	-0.026
ARSENIC-D-mg/l	-0.068	0.701	-0.121	-0.218	0.487	-0.305
ARSENIC-T-mg/l	-0.316	0.875	0.155	-0.608	0.735	-0.084
BARIUM-D-mg/l	0.555	-0.132	0.017	0.605	-0.097	0.126
BARIUM-T-mg/l	0.488	0.015	0.062	0.437	0.094	0.134
BERYLLIUM-D-mg/l	-0.009	0.004	-0.302	n/a	n/a	n/a
BERYLLIUM-T-mg/l	-0.141	0.226	-0.147	-0.642	0.646	-0.072
BISMUTH-D-mg/l	-0.061	0.454	-0.658	n/a	n/a	n/a
BISMUTH-T-mg/l	-0.06	0.453	-0.657	n/a	n/a	n/a
BORON-D-mg/l	0.384	0.423	-0.594	0.48	0.24	-0.731
BORON-T-mg/l	0.442	0.377	-0.533	0.495	0.24	-0.728
BROMIDE-D-mg/l	0.71	-0.109	-0.011	0.567	-0.024	-0.039
CADMIUM-D-mg/l	0.587	0.429	0.27	0.301	0.559	0.238
CADMIUM-T-mg/l	0.305	0.704	0.409	-0.116	0.83	0.306
CALCIUM-T-mg/l	0.953	0.028	-0.007	0.886	0.291	0.149
CARBON, DISSOLVED ORGANIC-D-mg/l	-0.283	0.652	0.473	-0.54	0.679	0.155
CHLORIDE-D-mg/l	0.646	0.203	-0.009	0.687	0.194	0.009
CHROMIUM-D-mg/l	-0.399	0.066	-0.559	-0.371	-0.248	-0.422
CHROMIUM-T-mg/l	-0.578	0.704	0.107	-0.766	0.58	-0.046
COBALT-D-mg/l	0.213	0.503	-0.435	0.258	0.438	-0.789
COBALT-T-mg/l	-0.043	0.823	-0.201	-0.212	0.772	-0.562
CONDUCTIVITY, LAB-N-us/cm	0.966	0.09	0.031	0.909	0.316	0.175
COPPER-D-mg/l	0.084	-0.271	-0.214	0.233	-0.353	0.146
COPPER-T-mg/l	-0.387	0.826	0.183	-0.665	0.706	0.001
FLUORIDE-D-mg/l	0.307	-0.434	0.388	0.114	-0.027	0.779
Hardness, Total or Dissolved CaCO3-N-mg/l	0.958	0.052	0.031	0.906	0.276	0.197
IRON-D-mg/l	-0.19	0.553	-0.237	-0.376	0.341	0.068
IRON-T-mg/l	-0.404	0.815	0.254	-0.633	0.728	0.088
LEAD-D-mg/l	-0.088	0.451	-0.671	n/a	n/a	n/a
LEAD-T-mg/l	-0.421	0.804	0.194	-0.662	0.647	0.002
LITHIUM-D-mg/l	0.902	0.245	0.211	0.82	0.421	0.235
LITHIUM-T-mg/l	0.891	0.289	0.232	0.786	0.499	0.24
MAGNESIUM-T-mg/l	0.935	0.125	0.085	0.875	0.335	0.217
MANGANESE-D-mg/l	0.461	0.479	-0.054	0.28	0.787	-0.108
MANGANESE-T-mg/l	-0.113	0.791	0.202	-0.366	0.825	0.069
MERCURY-D-mg/l	-0.008	-0.044	-0.299	0.209	-0.118	-0.337
MERCURY-T-mg/l	-0.27	0.326	-0.021	-0.585	0.602	0.28
MOLYBDENUM-D-mg/l	0.765	-0.008	0.004	0.743	0.195	0.007
MOLYBDENUM-T-mg/l	0.749	0.095	-0.015	0.681	0.308	-0.04
NICKEL-D-mg/l	0.75	0.505	-0.102	0.658	0.606	-0.217
NICKEL-T-mg/l	0.635	0.69	0.011	0.412	0.842	-0.171
NITRATE NITROGEN (NO3), AS N-N-mg/l	0.849	0.307	0.254	0.691	0.592	0.318

**Table E-3: PCA Results for *O. mykiss* Tests**

	2015 to 2017 Dataset			2017 Dataset		
	PC1	PC2	PC3	PC1	PC2	PC3
NITRITE NITROGEN (NO2), AS N-N-mg/l	0.744	0.305	-0.218	0.649	0.354	-0.37
NITROGEN, AMMONIA (AS N)-N-mg/l	0.255	0.367	-0.277	0.432	0.307	-0.718
ORTHO-PHOSPHATE-N-mg/l	-0.39	0.331	0.39	-0.637	0.305	0.135
pH, LAB-N-ph units	0.08	-0.084	-0.119	-0.099	-0.433	0.105
PHOSPHORUS-N-mg/l	-0.455	0.786	0.274	-0.694	0.683	0.042
POTASSIUM-T-mg/l	0.84	0.469	0.172	0.652	0.726	0.122
SELENIUM-D-mg/l	0.809	0.178	0.361	0.668	0.46	0.523
SELENIUM-T-mg/l	0.81	0.173	0.36	0.667	0.459	0.529
SILVER-D-mg/l	-0.061	0.454	-0.658	n/a	n/a	n/a
SILVER-T-mg/l	-0.38	0.705	0.104	-0.627	0.519	0.131
SODIUM-T-mg/l	0.707	0.437	-0.189	0.682	0.382	-0.371
STRONTIUM-D-mg/l	0.387	0.039	-0.49	0.543	0.032	-0.574
STRONTIUM-T-mg/l	0.374	0.062	-0.485	0.492	0.084	-0.589
SULFATE (AS SO4)-D-mg/l	0.923	0.18	0.049	0.872	0.352	0.163
THALLIUM-D-mg/l	0.153	0.628	-0.661	0.444	0.433	-0.717
THALLIUM-T-mg/l	-0.299	0.896	0.034	-0.554	0.758	-0.181
TIN-D-mg/l	-0.14	0.036	-0.141	n/a	n/a	n/a
TIN-T-mg/l	-0.089	0.444	-0.596	0.035	0.161	-0.532
TITANIUM-D-mg/l	0.049	0.105	-0.133	n/a	n/a	n/a
TITANIUM-T-mg/l	-0.197	0.637	-0.196	-0.449	0.386	0.064
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.964	0.089	0.016	0.927	0.267	0.153
TOTAL KJELDAHL NITROGEN-N-mg/l	0.285	0.59	0.315	0.376	0.708	0.274
TOTAL ORGANIC CARBON-T-mg/l	-0.334	0.715	0.491	-0.648	0.688	0.193
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	-0.404	0.798	0.212	-0.613	0.718	0.031
TURBIDITY, LAB-N-ntu	-0.355	0.816	0.25	-0.575	0.711	0.05
URANIUM-D-mg/l	0.917	0.098	0.094	0.824	0.356	0.268
URANIUM-T-mg/l	0.911	0.127	0.114	0.798	0.405	0.272
VANADIUM-D-mg/l	-0.061	0.454	-0.658	n/a	n/a	n/a
VANADIUM-T-mg/l	-0.448	0.801	0.197	-0.698	0.66	0.052
ZINC-D-mg/l	0.41	0.208	-0.157	0.406	0.258	-0.075
ZINC-T-mg/l	0.031	0.715	0.119	-0.308	0.743	-0.013

**Notes:**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre; PC = principle component.

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 *P. promelas* Tests

	2015 to 2017 Dataset					2017 Dataset				
	PC1	PC2	PC3	PC4	PC5	PC1	PC2	PC3	PC4	PC5
<b>Percent of Total Variance Explained</b>	36.4	19.6	12.3	7.7	5.6	38.1	21.3	12.5	7.5	4.7
<b>Component Loadings by Water Quality Parameter</b>										
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	0.828	-0.47	-0.062	0.053	0.064	0.873	-0.355	0.131	-0.138	-0.065
ALUMINUM-D-mg/l	-0.191	0.57	0.154	0.243	-0.244	-0.146	0.629	0.107	0.172	0.152
ALUMINUM-T-mg/l	0.16	0.745	0.515	0.143	-0.165	0.266	0.929	0.087	-0.029	-0.004
ANTIMONY-D-mg/l	0.95	-0.032	-0.013	-0.078	0.076	0.961	-0.054	-0.101	0.094	0.082
ANTIMONY-T-mg/l	0.936	-0.071	0.041	-0.068	0.134	0.95	-0.055	-0.078	0.032	0.163
ARSENIC-D-mg/l	0.388	0.695	-0.425	-0.212	0.031	0.218	0.37	-0.612	0.338	0.222
ARSENIC-T-mg/l	0.411	0.828	0.12	-0.12	0.024	0.33	0.84	-0.271	0.072	0.006
BARIUM-D-mg/l	0.313	-0.712	-0.051	0.201	0.08	0.402	-0.505	0.35	-0.451	0.018
BARIUM-T-mg/l	0.333	-0.68	-0.015	0.222	0.077	0.432	-0.432	0.366	-0.477	0.043
BERYLLIUM-D-mg/l	0.147	-0.13	-0.205	0.19	-0.835	0.214	-0.267	0.432	0.815	-0.024
BERYLLIUM-T-mg/l	0.172	-0.014	-0.089	0.195	-0.857	0.224	0.838	0.139	-0.056	-0.288
BISMUTH-D-mg/l	0.332	0.411	-0.693	0.459	0.095	0.214	-0.267	0.432	0.815	-0.024
BISMUTH-T-mg/l	0.307	0.441	-0.693	0.44	0.052	n/a	n/a	n/a	n/a	n/a
BORON-D-mg/l	0.567	0.438	-0.464	-0.45	-0.024	0.521	0.051	-0.754	0.25	0.124
BORON-T-mg/l	0.579	0.434	-0.454	-0.453	-0.049	0.523	0.07	-0.775	0.192	0.129
BROMIDE-D-mg/l	0.626	-0.518	-0.163	0.145	0.002	0.627	-0.442	0.238	-0.029	0.108
CADMIUM-D-mg/l	0.688	0.128	0.451	0.129	-0.025	0.702	0.336	0.229	-0.124	0.254
CADMIUM-T-mg/l	0.671	0.206	0.603	0.186	-0.022	0.727	0.506	0.34	0.014	0.074
CALCIUM-T-mg/l	0.88	-0.449	-0.011	0.065	-0.003	0.905	-0.358	0.142	-0.135	-0.001
CARBON, DISSOLVED ORGANIC-D-mg/l	0.1	0.655	0.445	0.205	0.285	0.215	0.736	0.272	0.176	0.286
CHLORIDE-D-mg/l	0.85	-0.199	-0.154	-0.1	-0.04	0.853	-0.265	-0.134	-0.074	0.125
CHROMIUM-D-mg/l	0.032	0.562	-0.455	-0.147	-0.151	-0.309	0.121	-0.414	0.373	-0.537
CHROMIUM-T-mg/l	0.227	0.634	0.396	0.091	-0.279	0.129	0.917	0.138	0.196	-0.153
COBALT-D-mg/l	0.565	0.487	-0.166	-0.535	-0.167	0.585	0.187	-0.696	0.165	0.088
COBALT-T-mg/l	0.582	0.572	-0.072	-0.476	-0.147	0.615	0.357	-0.625	0.104	0.035
CONDUCTIVITY, LAB-N-us/cm	0.905	-0.403	0.014	0.08	0.02	0.925	-0.311	0.155	-0.13	0.047
COPPER-D-mg/l	-0.029	-0.108	-0.385	0.168	-0.414	-0.13	-0.277	-0.1	0.073	-0.642
COPPER-T-mg/l	0.092	-0.106	-0.17	0.398	-0.693	0.236	0.888	0.256	-0.091	-0.125
FLUORIDE-D-mg/l	0.031	-0.507	0.291	0.487	-0.16	0.204	-0.104	0.655	0.006	-0.252
Hardness, Total or Dissolved CaCO3-N-mg/l	0.888	-0.433	0.019	0.088	0.032	0.906	-0.342	0.178	-0.139	0.018
IRON-D-mg/l	0.132	0.538	-0.374	0.503	0.181	-0.176	0.351	0.351	0.329	0.466
IRON-T-mg/l	0.304	0.672	0.595	0.206	-0.097	0.346	0.879	0.213	0.027	-0.035
LEAD-D-mg/l	0.339	0.429	-0.683	0.451	0.07	0.214	-0.267	0.432	0.815	-0.024
LEAD-T-mg/l	0.243	0.749	0.486	0.19	-0.069	0.217	0.925	0.209	-0.05	-0.148
LITHIUM-D-mg/l	0.881	-0.34	0.132	0.104	0.091	0.904	-0.22	0.177	-0.073	0.059
LITHIUM-T-mg/l	0.887	-0.328	0.14	0.115	0.081	0.914	-0.2	0.181	-0.075	0.053
MAGNESIUM-T-mg/l	0.897	-0.408	0.032	0.105	0.052	0.912	-0.319	0.188	-0.136	0.046
MANGANESE-D-mg/l	0.854	0.064	0.228	-0.075	-0.107	0.877	0.112	-0.008	0.101	-0.055
MANGANESE-T-mg/l	0.739	0.326	0.424	0.015	-0.067	0.747	0.481	0.088	0.132	-0.154
MERCURY-D-mg/l	-0.242	-0.074	0.006	0.439	-0.026	-0.315	0.001	0.391	-0.062	-0.105
MERCURY-T-mg/l	0.238	0.422	0.493	0.001	-0.146	0.299	0.774	0.086	-0.061	0.018
MOLYBDENUM-D-mg/l	0.84	-0.196	0.09	-0.151	0.103	0.843	-0.126	-0.138	0.082	-0.237
MOLYBDENUM-T-mg/l	0.85	-0.172	0.121	-0.15	0.127	0.87	-0.085	-0.127	0.087	-0.194
NICKEL-D-mg/l	0.958	0.077	-0.046	-0.171	-0.017	0.959	-0.047	-0.21	0.062	0.099
NICKEL-T-mg/l	0.965	0.116	0.003	-0.146	-0.017	0.97	0.028	-0.179	0.055	0.066
NITRATE NITROGEN (NO3), AS N-N-mg/l	0.848	-0.346	0.212	0.236	0.018	0.892	-0.13	0.32	-0.175	0.032
NITRITE NITROGEN (NO2), AS N-N-mg/l	0.925	-0.074	-0.037	-0.18	-0.011	0.934	-0.131	-0.155	-0.025	0.161
NITROGEN, AMMONIA (AS N)-N-mg/l	0.492	0.469	0.106	-0.61	-0.018	0.583	0.282	-0.618	0.142	0.109
ORTHO-PHOSPHATE-N-mg/l	-0.449	0.336	0.202	-0.069	0.239	-0.307	0.317	0.078	-0.047	0.79
pH, LAB-N-ph units	-0.211	-0.031	0.284	-0.05	-0.138	-0.161	0.084	0.089	-0.002	-0.575
PHOSPHORUS-N-mg/l	0.065	0.636	0.496	0.082	0.168	0.11	0.807	0.064	0.009	0.373
POTASSIUM-T-mg/l	0.962	-0.217	0.07	0.052	0.063	0.973	-0.143	0.096	-0.048	0.077
SELENIUM-D-mg/l	0.755	-0.468	0.284	0.325	0.076	0.815	-0.207	0.485	-0.189	-0.03
SELENIUM-T-mg/l	0.753	-0.474	0.277	0.33	0.074	0.812	-0.217	0.488	-0.186	-0.032
SILVER-D-mg/l	0.332	0.411	-0.693	0.459	0.095	0.214	-0.267	0.432	0.815	-0.024
SILVER-T-mg/l	0.27	0.616	-0.262	0.569	0.13	0.057	0.737	0.479	-0.142	-0.069
SODIUM-T-mg/l	0.795	0.211	-0.279	-0.38	-0.069	0.742	-0.014	-0.578	0.021	0.128
STRONTIUM-D-mg/l	0.718	0.13	-0.323	-0.481	-0.025	0.613	-0.106	-0.665	0.096	-0.323
STRONTIUM-T-mg/l	0.723	0.138	-0.322	-0.48	-0.026	0.617	-0.089	-0.67	0.097	-0.305
SULFATE (AS SO4)-D-mg/l	0.905	-0.359	0.005	0.078	0.023	0.915	-0.295	0.14	-0.145	0.085
THALLIUM-D-mg/l	0.66	0.379	-0.507	-0.119	0.098	0.705	-0.075	-0.489	0.252	0.143
THALLIUM-T-mg/l	0.677	0.656	0.015	-0.147	-0.066	0.702	0.601	-0.291	0.029	0.015
TIN-D-mg/l	0.324	0.414	-0.693	0.462	0.102	0.164	-0.261	0.454	0.822	0.001
TIN-T-mg/l	0.345	0.507	-0.638	0.38	0.052	0.272	0.442	-0.262	0.091	0.056
TITANIUM-D-mg/l	0.23	-0.261	0.056	0.111	-0.759	n/a	n/a	n/a	n/a	n/a



**Table E-4: PCA Results for *P. promelas* Tests**

	2015 to 2017 Dataset					2017 Dataset				
	PC1	PC2	PC3	PC4	PC5	PC1	PC2	PC3	PC4	PC5
TITANIUM-T-mg/l	0.241	-0.027	0.198	0.067	-0.756	0.13	0.42	0.333	-0.187	-0.153
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	0.896	-0.416	-0.001	0.075	0.038	0.91	-0.346	0.156	-0.124	0.021
TOTAL KJELDAHL NITROGEN-N-mg/l	0.685	0.041	0.294	0.089	0.342	0.772	0.045	0.342	0.047	-0.155
TOTAL ORGANIC CARBON-T-mg/l	0.161	0.577	0.566	0.366	0.165	0.251	0.8	0.419	0.093	0.06
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.239	0.61	0.587	0.16	0.006	0.294	0.841	0.174	-0.064	-0.235
TURBIDITY, LAB-N-ntu	0.308	0.586	0.582	0.123	0.052	0.361	0.782	0.192	-0.122	-0.198
URANIUM-D-mg/l	0.906	-0.35	0.089	0.099	0.035	0.913	-0.247	0.191	-0.104	-0.14
URANIUM-T-mg/l	0.909	-0.341	0.096	0.107	0.035	0.918	-0.228	0.193	-0.107	-0.125
VANADIUM-D-mg/l	0.329	0.415	-0.692	0.462	0.097	0.196	-0.246	0.443	0.826	0.008
VANADIUM-T-mg/l	0.214	0.719	0.362	0.349	0.039	0.144	0.886	0.34	-0.092	-0.164
ZINC-D-mg/l	0.394	0.181	-0.03	-0.202	-0.415	0.439	0.113	-0.358	0.024	-0.562
ZINC-T-mg/l	0.413	0.721	0.217	0.005	-0.101	0.427	0.772	-0.084	-0.04	-0.041

**Notes:**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre; PC = principle component.

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 <sup>1</sup>		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? <sup>2</sup>	Retain Parameter for Concentration-Response Analysis? <sup>3</sup>
	2015 to 2017 Dataset	2017 Dataset		
ALKALINITY, TOTAL (As CaCO <sub>3</sub> ), lab measured.-N-mg/l	<b>-0.185</b>	<b>-0.421</b>	No WQG	No - parameter included in TDS
ALUMINIUM-D-mg/l	<b>-0.306</b>	-0.193	No	-
ANTIMONY-T-mg/l	<b>-0.308</b>	<b>-0.450</b>	No	-
ARSENIC-T-mg/l	<b>-0.330</b>	<b>-0.362</b>	No	-
BARIUM-T-mg/l	0.116	-0.136	-	-
BERYLLIUM-T-mg/l	0.044	-0.245	-	-
BISMUTH-T-mg/l	-0.024	-	-	-
BORON-T-mg/l	-0.161	-0.213	-	-
BROMIDE-D-mg/l	-0.107	<b>-0.288</b>	No WQG	No - low detection frequency <sup>4</sup>
CADMIUM-D-mg/l	<b>-0.257</b>	-0.252	No	Yes
CALCIUM-T-mg/l	<b>-0.169</b>	<b>-0.362</b>	No WQG	No - parameter included in TDS
CARBON, DISSOLVED ORGANIC-D-mg/l	<b>-0.324</b>	-0.172	No WQG	Yes
CHLORIDE-D-mg/l	-0.092	-0.206	-	-
CHROMIUM-T-mg/l	<b>-0.280</b>	-0.241	No	-
COBALT-T-mg/l	<b>-0.512</b>	<b>-0.626</b>	No	-
CONDUCTIVITY, LAB-N-us/cm	<b>-0.248</b>	<b>-0.456</b>	No WQG	No - parameter included in TDS
COPPER-T-mg/l	<b>-0.385</b>	<b>-0.351</b>	No	-
FLUORIDE-D-mg/l	0.136	0.196	-	-
Hardness, Total or Dissolved CaCO <sub>3</sub> -N-mg/l	<b>-0.195</b>	<b>-0.361</b>	No WQG	No - parameter included in TDS
IRON-D-mg/l	<b>-0.231</b>	-0.201	No	-
IRON-T-mg/l	<b>-0.492</b>	<b>-0.512</b>	No	-
LEAD-T-mg/l	<b>-0.414</b>	<b>-0.397</b>	No	-
LITHIUM-T-mg/l	<b>-0.279</b>	<b>-0.373</b>	No WQG	Yes
MAGNESIUM-T-mg/l	<b>-0.208</b>	<b>-0.392</b>	No WQG	No - parameter included in TDS
MANGANESE-T-mg/l	<b>-0.556</b>	<b>-0.710</b>	No	-
MERCURY-T-mg/l	-0.102	<b>-0.387</b>	No	-
MOLYBDENUM-T-mg/l	<b>-0.201</b>	<b>-0.428</b>	No	-
NICKEL-T-mg/l	<b>-0.489</b>	<b>-0.589</b>	Yes	Yes
NITRATE NITROGEN (NO <sub>3</sub> ), AS N-N-mg/l	<b>-0.249</b>	<b>-0.326</b>	No	Yes
NITRITE NITROGEN (NO <sub>2</sub> ), AS N-N-mg/l	<b>-0.310</b>	<b>-0.563</b>	Yes	Yes
NITROGEN, AMMONIA (AS N)-N-mg/l	-0.127	<b>-0.369</b>	No	-
ORTHO-PHOSPHATE-N-mg/l	0.164	0.208	-	-
pH, LAB-N-ph units	-0.009	-0.162	-	-
PHOSPHORUS-N-mg/l	<b>-0.231</b>	<b>-0.279</b>	No WQG	Yes
POTASSIUM-T-mg/l	<b>-0.368</b>	<b>-0.560</b>	No WQG	No - parameter included in TDS
SELENIUM-T-mg/l	<b>-0.173</b>	-0.249	Yes	Yes
SILVER-T-mg/l	<b>-0.188</b>	-0.172	No	-
SODIUM-T-mg/l	<b>-0.230</b>	<b>-0.299</b>	No WQG	No - parameter included in TDS
STRONTIUM-T-mg/l	-0.164	-0.265	-	-
SULFATE (AS SO <sub>4</sub> )-D-mg/l	<b>-0.269</b>	<b>-0.451</b>	Yes	Yes
THALLIUM-T-mg/l	<b>-0.560</b>	<b>-0.745</b>	No	-
TIN-T-mg/l	0.045	0.231	-	-
TITANIUM-T-mg/l	-0.111	-0.101	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	<b>-0.233</b>	<b>-0.401</b>	No WQG	Yes
TOTAL KJELDAHL NITROGEN-N-mg/l	<b>-0.220</b>	-0.262	No WQG	Yes
TOTAL ORGANIC CARBON-T-mg/l	<b>-0.422</b>	<b>-0.269</b>	No WQG	Yes
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	<b>-0.443</b>	<b>-0.535</b>	No WQG	Yes
TURBIDITY, LAB-N-ntu	<b>-0.458</b>	<b>-0.521</b>	No WQG	Yes
URANIUM-T-mg/l	<b>-0.257</b>	<b>-0.358</b>	No	-
VANADIUM-T-mg/l	<b>-0.342</b>	<b>-0.357</b>	No WQG	Yes
ZINC-T-mg/l	<b>-0.252</b>	-0.176	No	-
X TU-WQGs (2017)	-	<b>-0.320</b>	No WQG	Yes
X TU-WQGs/Benchmarks (2017)	-	<b>-0.585</b>	No WQG	Yes
PC1 (all years)	<b>-0.335</b>	-	No WQG	Yes
PC2 (all years)	<b>-0.398</b>	-	No WQG	Yes
PC3 (all years)	<b>-0.413</b>	-	No WQG	Yes
PC1 (2017)	-	<b>-0.558</b>	No WQG	Yes
PC2 (2017)	-	<b>-0.332</b>	No WQG	Yes
PC3 (2017)	-	0.094	-	-

**Notes:**

- (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ( $\alpha < 0.05$ ;  $r_s < -0.165$ ) and 2017 dataset ( $\alpha < 0.05$ ;  $r_s < -0.267$ ) 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.
- (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 39 samples, one had a detected concentration of boron (Table D-1).

**Abbreviations**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.

**Table F-2: Spearman Rank Order Correlation for H. azteca Survival and Dry Weight**

Parameter	Survival Rs <sup>1</sup>		Dry Weight Rs <sup>1</sup>		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? <sup>2</sup>	Retain Parameter for Concentration-Response Analysis? <sup>3</sup>	
	2015 to 2017 Dataset	2017 Dataset	2015 to 2017 Dataset	2017 Dataset		Survival	Dry Weight
ALKALINITY, TOTAL (As CaCO3), lab measured -N-mg/l	-0.150	-0.161	-0.197	-0.222	-	-	-
ALUMINIUM-D-mg/l	0.326	0.367	0.177	0.037	-	-	-
ANTIMONY-T-mg/l	<b>-0.247</b>	<b>-0.408</b>	<b>-0.398</b>	<b>-0.387</b>	No	-	-
ARSENIC-T-mg/l	<b>-0.243</b>	-0.335	<b>-0.393</b>	<b>-0.404</b>	No	-	-
BARIIUM-T-mg/l	0.012	0.264	0.045	0.092	-	-	-
BERYLLIUM-T-mg/l	0.005	0.163	-0.206	0.075	-	-	-
BISMUTH-T-mg/l	-0.136	-	-0.112	-	-	-	-
BORON-T-mg/l	<b>-0.340</b>	<b>-0.641</b>	<b>-0.422</b>	<b>-0.720</b>	No	-	-
BROMIDE-D-mg/l	-0.029	0.034	0.024	0.030	-	-	-
CADMIUM-D-mg/l	-0.055	-0.071	<b>-0.257</b>	-0.028	No	Yes	Yes
CALCIUM-T-mg/l	-0.167	-0.150	<b>-0.267</b>	-0.268	No WQG	-	No - parameter included in TDS
CARBON, DISSOLVED ORGANIC-D-mg/l	0.145	0.094	-0.073	0.036	-	-	-
CHLORIDE-D-mg/l	-0.150	-0.194	<b>-0.317</b>	<b>-0.479</b>	No	-	-
CHROMIUM-T-mg/l	0.022	-0.098	-0.205	-0.074	-	-	-
COBALT-T-mg/l	-0.124	-0.349	<b>-0.343</b>	<b>-0.487</b>	Yes	-	Yes
CONDUCTIVITY, LAB-N-us/cm	-0.159	-0.160	<b>-0.252</b>	-0.273	No WQG	-	No - parameter included in TDS
COPPER-T-mg/l	0.126	0.051	-0.201	0.034	-	-	-
FLUORIDE-D-mg/l	0.054	0.146	0.298	0.745	-	-	-
Hardness, Total or Dissolved CaCO3-N-mg/l	-0.130	-0.083	<b>-0.256</b>	-0.222	No WQG	-	No - parameter included in TDS
IRON-D-mg/l	0.174	0.271	0.122	0.349	-	-	-
IRON-T-mg/l	0.078	-0.105	-0.192	-0.029	-	-	-
LEAD-T-mg/l	0.121	0.058	-0.198	0.006	-	-	-
LITHIUM-T-mg/l	-0.101	-0.220	<b>-0.256</b>	-0.243	No WQG	-	Yes
MAGNESIUM-T-mg/l	-0.121	-0.059	<b>-0.251</b>	-0.243	No WQG	-	No - parameter included in TDS
MANGANESE-T-mg/l	-0.081	-0.340	<b>-0.323</b>	-0.208	No	-	-
MERCURY-T-mg/l	-0.084	-0.012	-0.081	0.023	-	-	-
MOLYBDENUM-T-mg/l	-0.172	<b>-0.414</b>	<b>-0.352</b>	<b>-0.409</b>	No	-	-
NICKEL-T-mg/l	-0.202	-0.349	<b>-0.410</b>	<b>-0.446</b>	Yes	-	Yes
NITRATE NITROGEN (NO3), AS N-N-mg/l	0.029	0.131	-0.135	-0.040	-	Yes	Yes
NITRITE NITROGEN (NO2), AS N-N-mg/l	<b>-0.269</b>	-0.356	<b>-0.411</b>	<b>-0.464</b>	Yes	Yes	Yes
NITROGEN, AMMONIA (AS N)-N-mg/l	<b>-0.321</b>	<b>-0.465</b>	<b>-0.583</b>	<b>-0.645</b>	No	-	-
ORTHO-PHOSPHATE-N-mg/l	0.156	0.132	0.088	0.018	-	-	-
pH, LAB-N-no units	0.030	0.075	0.002	0.240	-	-	-
PHOSPHORUS-N-mg/l	0.073	-0.177	-0.100	-0.032	-	-	-
POTASSIUM-T-mg/l	-0.188	-0.306	<b>-0.316</b>	<b>-0.402</b>	No WQG	-	No - parameter included in TDS
SELENIUM-T-mg/l	0.015	0.105	-0.119	-0.025	-	Yes	Yes
SILVER-T-mg/l	0.226	0.271	0.176	0.345	-	-	-
SODIUM-T-mg/l	<b>-0.258</b>	<b>-0.394</b>	<b>-0.483</b>	<b>-0.761</b>	No WQG	-	No - parameter included in TDS
STRONTIUM-T-mg/l	-0.212	<b>-0.372</b>	<b>-0.440</b>	<b>-0.684</b>	No WQG	Yes	Yes
SULFATE (AS SO4)-D-mg/l	-0.156	-0.145	<b>-0.258</b>	-0.279	Yes	Yes	Yes
THALLIUM-T-mg/l	-0.149	-0.322	<b>-0.412</b>	<b>-0.399</b>	No	-	-
TIN-T-mg/l	<b>-0.307</b>	-0.335	<b>-0.260</b>	-0.333	No WQG	-	No - low detection frequency <sup>4</sup>
TITANIUM-T-mg/l	0.114	0.149	-0.162	0.222	-	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	-0.142	-0.133	<b>-0.253</b>	-0.271	No WQG	Yes	Yes
TOTAL KjELDAHL NITROGEN-N-mg/l	-0.107	-0.069	<b>-0.257</b>	-0.111	No WQG	-	Yes
TOTAL ORGANIC CARBON-T-mg/l	0.157	0.057	0.089	0.285	-	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.066	-0.140	-0.177	0.055	-	-	-
TURBIDITY, LAB-N-ntu	0.074	0.014	-0.175	-0.109	-	-	-
URANIUM-T-mg/l	-0.084	-0.094	<b>-0.232</b>	-0.253	Yes	-	Yes
VANADIUM-T-mg/l	0.111	0.243	-0.153	0.178	-	-	-
ZINC-T-mg/l	-0.180	-0.277	-0.152	-0.314	-	-	-
X TU-WQGs (2017)	-	0.077	-	0.005	-	-	-
X TU-WQGs/Benchmarks (2017)	-	-0.237	-	-0.313	-	-	-
PC1 (all years)	<b>-0.247</b>	-	<b>-0.446</b>	-	No WQG	Yes	Yes
PC2 (all years)	-0.046	-	-0.195	-	-	-	-
PC3 (all years)	0.230	-	0.165	-	-	-	-
PC4 (all years)	0.194	-	0.235	-	-	-	-
PC1 (2017)	-	<b>-0.375</b>	-	<b>-0.540</b>	No WQG	Yes	Yes
PC2 (2017)	-	-0.094	-	0.036	-	-	-
PC3 (2017)	-	0.493	-	0.687	-	-	-

**Notes:**

- (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ( $\alpha < 0.05$ ;  $r_s < -0.228$ ) and 2017 dataset ( $\alpha < 0.05$ ;  $r_s < -0.37$ ) 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.
- (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 21 samples, one had a detected concentration of tin (Table D-3).

**Abbreviations**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.

**Table F-3: Spearman Rank Order Correlation for O. mykiss Survival and Viability**

Parameter	Survival Rs <sup>1</sup>		Viability Rs <sup>1</sup>		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? <sup>2</sup>	Retain Parameter for Concentration-Response Analysis? <sup>3</sup>	
	2015 to 2017 Dataset	2017 Dataset	2015 to 2017 Dataset	2017 Dataset		Survival	Viability
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	<b>-0.395</b>	<b>-0.500</b>	<b>-0.421</b>	<b>-0.539</b>	No WQG	-	No - parameter included in TDS
ALUMINUM-D-mg/l	0.294	0.632	0.316	0.651	-	-	-
ANTIMONY-T-mg/l	-0.089	-0.003	-0.089	-0.008	-	-	-
ARSENIC-T-mg/l	0.228	0.584	0.260	0.605	-	-	-
BARIUM-T-mg/l	<b>-0.279</b>	<b>-0.494</b>	<b>-0.255</b>	<b>-0.438</b>	No	-	-
BERYLLIUM-T-mg/l	0.373	0.711	0.358	0.739	-	-	-
BISMUTH-T-mg/l	-0.015	-	0.013	-	-	-	-
BORON-T-mg/l	-0.137	-0.351	-0.170	-0.374	-	-	-
BROMIDE-D-mg/l	<b>-0.395</b>	<b>-0.664</b>	<b>-0.425</b>	<b>-0.664</b>	No WQG	-	No - low detection frequency <sup>4</sup>
CADMIUM-D-mg/l	0.062	0.353	0.048	0.304	-	Yes	Yes
CALCIUM-T-mg/l	<b>-0.326</b>	<b>-0.404</b>	<b>-0.352</b>	<b>-0.435</b>	No WQG	-	No - parameter included in TDS
CARBON, DISSOLVED ORGANIC-D-mg/l	0.375	0.723	0.398	0.725	-	-	-
CHLORIDE-D-mg/l	-0.211	<b>-0.412</b>	<b>-0.252</b>	<b>-0.404</b>	No	-	-
CHROMIUM-T-mg/l	0.439	0.697	0.479	0.716	-	-	-
COBALT-T-mg/l	0.201	0.546	0.246	0.555	-	-	-
CONDUCTIVITY, LAB-N-us/cm	<b>-0.335</b>	<b>-0.432</b>	<b>-0.365</b>	<b>-0.472</b>	No WQG	-	No - parameter included in TDS
COPPER-T-mg/l	0.361	0.793	0.403	0.814	-	-	-
FLUORIDE-D-mg/l	0.080	0.132	0.032	0.116	-	-	-
Hardness, Total or Dissolved CaCO3-N-mg/l	<b>-0.332</b>	<b>-0.443</b>	<b>-0.361</b>	<b>-0.478</b>	No WQG	-	No - parameter included in TDS
IRON-D-mg/l	0.199	0.344	0.221	0.387	-	-	-
IRON-T-mg/l	0.378	0.651	0.412	0.668	-	-	-
LEAD-T-mg/l	0.341	0.684	0.390	0.704	-	-	-
LITHIUM-T-mg/l	<b>-0.239</b>	-0.150	<b>-0.260</b>	-0.187	No WQG	Yes	Yes
MAGNESIUM-T-mg/l	<b>-0.345</b>	-0.378	<b>-0.368</b>	<b>-0.410</b>	No WQG	-	No - parameter included in TDS
MANGANESE-T-mg/l	0.196	0.548	0.233	0.564	-	-	-
MERCURY-T-mg/l	0.360	0.577	0.415	0.618	-	-	-
MOLYBDENUM-T-mg/l	-0.204	-0.370	-0.222	<b>-0.391</b>	No	-	-
NICKEL-T-mg/l	-0.026	0.160	-0.026	0.141	-	-	-
NITRATE NITROGEN (NO3), AS N-N-mg/l	-0.189	-0.172	-0.202	-0.188	-	Yes	Yes
NITRITE NITROGEN (NO2), AS N-N-mg/l	<b>-0.339</b>	<b>-0.444</b>	<b>-0.324</b>	<b>-0.437</b>	No	-	-
NITROGEN, AMMONIA (AS N)-N-mg/l	<b>-0.362</b>	<b>-0.579</b>	<b>-0.310</b>	<b>-0.591</b>	No	-	-
ORTHO-PHOSPHATE-N-mg/l	0.319	0.675	0.348	0.681	-	-	-
pH, LAB-N-ph units	-0.100	-0.137	-0.099	-0.126	-	-	-
PHOSPHORUS-N-mg/l	0.358	0.701	0.402	0.720	-	-	-
POTASSIUM-T-mg/l	<b>-0.259</b>	-0.172	<b>-0.253</b>	-0.190	No WQG	-	No - parameter included in TDS
SELENIUM-T-mg/l	<b>-0.235</b>	-0.170	<b>-0.256</b>	-0.205	Yes	Yes	Yes
SILVER-T-mg/l	0.209	0.604	0.263	0.633	-	-	-
SODIUM-T-mg/l	-0.175	-0.283	-0.216	-0.318	-	-	-
STRONTIUM-T-mg/l	-0.187	<b>-0.456</b>	-0.211	<b>-0.453</b>	No WQG	Yes	Yes
SULFATE (AS SO4)-D-mg/l	<b>-0.341</b>	<b>-0.410</b>	<b>-0.371</b>	<b>-0.447</b>	Yes	Yes	Yes
THALLIUM-T-mg/l	0.192	0.668	0.230	0.675	-	-	-
TIN-T-mg/l	-0.143	-0.232	-0.108	-0.261	-	-	-
TITANIUM-T-mg/l	0.104	0.396	0.097	0.449	-	-	-
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	<b>-0.370</b>	<b>-0.467</b>	<b>-0.397</b>	<b>-0.509</b>	No WQG	Yes	Yes
TOTAL KJELDAHL NITROGEN-N-mg/l	-0.141	0.152	-0.132	0.141	-	-	-
TOTAL ORGANIC CARBON-T-mg/l	0.326	0.683	0.356	0.713	-	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.256	0.618	0.300	0.637	-	-	-
TURBIDITY, LAB-N-ntu	0.271	0.599	0.311	0.617	-	-	-
URANIUM-T-mg/l	<b>-0.295</b>	-0.257	<b>-0.328</b>	-0.296	No	-	-
VANADIUM-T-mg/l	0.318	0.688	0.366	0.723	-	-	-
ZINC-T-mg/l	0.252	0.652	0.267	0.643	-	-	-
ZTU-WQGs (2017)	-	-0.085	-	-0.111	-	-	-
ZTU-WQGs/Benchmarks (2017)	-	0.090	-	0.095	-	-	-
PC1 (all years)	<b>-0.331</b>	-	<b>-0.364</b>	-	No WQG	Yes	Yes
PC2 (all years)	0.174	-	0.206	-	-	-	-
PC3 (all years)	0.216	-	0.239	-	-	-	-
PC1 (2017)	-	<b>-0.629</b>	-	<b>-0.668</b>	No WQG	Yes	Yes
PC2 (2017)	-	0.419	-	0.423	-	-	-
PC3 (2017)	-	0.290	-	0.276	-	-	-

**Notes:**

(1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ( $\alpha < 0.05$ ;  $r_s < -0.224$ ) and 2017 dataset ( $\alpha < 0.05$ ;  $r_s < -0.391$ ) 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.

(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 19 samples, five had detected concentrations of boron (Table D-4).

**Abbreviations**

% = percent; CaCO<sub>3</sub> = 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 P. promelas Survival**

Parameter	Survival Rs <sup>1</sup>		Biomass Rs <sup>1</sup>		Is parameter greater than the chronic BC WQG or lowest L1 benchmark from EVWQP in at least one test categorized as possible or likely? <sup>2</sup>	Retain Parameter for Concentration-Response Analysis? <sup>3</sup>	
	2015 to 2017 Dataset	2017 Dataset	2015 to 2017 Dataset	2017 Dataset		Survival	Biomass
ALKALINITY, TOTAL (As CaCO3), lab measured.-N-mg/l	-0.271	-0.126	-0.181	-0.155	-	-	-
ALUMINUM-D-mg/l	0.080	0.270	-0.247	-0.083	-	-	-
ANTIMONY-T-mg/l	-0.128	-0.165	-0.025	-0.097	-	-	-
ARSENIC-T-mg/l	0.150	-0.203	0.106	0.013	-	-	-
BARIIUM-T-mg/l	-0.254	-0.055	<b>-0.279</b>	-0.260	No	-	-
BERYLLIUM-T-mg/l	-0.125	0.000	<b>-0.504</b>	-0.125	No	-	-
BISMUTH-T-mg/l	0.147	-	-0.202	-	-	-	-
BORON-T-mg/l	-0.127	-0.311	0.041	0.027	-	-	-
BROMIDE-D-mg/l	<b>-0.339</b>	-0.251	-0.225	-0.262	No WQG	No - low detection frequency <sup>4</sup>	-
CADMIUM-D-mg/l	0.133	-0.080	-0.053	-0.189	-	Yes	Yes
CALCIUM-T-mg/l	-0.267	-0.102	-0.185	-0.179	-	-	-
CARBON, DISSOLVED ORGANIC-D-mg/l	0.314	-0.230	0.302	0.144	-	-	-
CHLORIDE-D-mg/l	-0.272	-0.206	-0.249	-0.299	-	-	-
CHROMIUM-T-mg/l	0.019	-0.070	-0.071	-0.112	-	-	-
COBAL-T-mg/l	0.163	0.076	0.125	-0.055	-	-	-
CONDUCTIVITY, LAB-N-us/cm	-0.267	-0.087	-0.167	-0.186	-	-	-
COPPER-T-mg/l	-0.161	0.075	<b>-0.560</b>	-0.001	No	-	-
FLUORIDE-D-mg/l	-0.048	0.096	-0.270	-0.090	-	-	-
Hardness, Total or Dissolved CaCO3-N-mg/l	-0.231	-0.105	-0.141	-0.174	-	-	-
IRON-D-mg/l	0.007	-0.035	-0.042	-0.169	-	-	-
IRON-T-mg/l	0.239	0.055	0.073	0.100	-	-	-
LEAD-T-mg/l	0.361	0.106	0.088	-0.042	-	-	-
LITHIUM-T-mg/l	-0.140	-0.315	-0.032	-0.144	-	-	-
MAGNESIUM-T-mg/l	-0.271	-0.150	-0.154	-0.266	-	-	-
MANGANESE-T-mg/l	0.171	0.048	0.166	0.043	-	-	-
MERCURY-T-mg/l	0.171	0.086	-0.128	-0.051	-	-	-
MOLYBDENUM-T-mg/l	-0.212	-0.338	-0.031	-0.214	-	-	-
NICKEL-T-mg/l	-0.032	-0.086	0.011	-0.077	-	-	-
NITRATE NITROGEN (NO3), AS N-N-mg/l	-0.170	-0.082	-0.209	-0.313	-	Yes	Yes
NITRITE NITROGEN (NO2), AS N-N-mg/l	-0.054	-0.116	-0.010	-0.112	-	-	-
NITROGEN, AMMONIA (AS N)-N-mg/l	0.214	-0.044	0.396	0.080	-	-	-
ORTHO-PHOSPHATE-N-mg/l	0.208	0.090	0.123	-0.077	-	-	-
pH, LAB-N-ph units	0.224	0.115	0.067	0.054	-	-	-
PHOSPHORUS-N-mg/l	0.317	0.152	0.192	0.125	-	-	-
POTASSIUM-T-mg/l	-0.228	-0.279	-0.034	-0.166	-	-	-
SELENIUM-T-mg/l	-0.168	-0.120	-0.162	-0.257	-	Yes	Yes
SILVER-T-mg/l	0.082	0.114	-0.049	-0.186	-	-	-
SODIUM-T-mg/l	-0.145	-0.238	-0.075	-0.112	-	-	-
STRONTIUM-T-mg/l	-0.118	-0.109	0.079	0.048	-	-	-
SULFATE (AS SO4)-D-mg/l	-0.270	-0.154	-0.167	-0.255	-	Yes	Yes
THALLIUM-T-mg/l	0.092	0.005	-0.020	-0.099	-	-	-
TIN-T-mg/l	0.029	-0.037	-0.013	0.166	-	-	-
TITANIUM-T-mg/l	-0.228	-0.370	<b>-0.535</b>	-0.333	No WQG	-	No - low detection frequency <sup>5</sup>
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)-N-mg/l	<b>-0.275</b>	-0.148	-0.146	-0.244	No WQG	Yes	-
TOTAL KJELDAHL NITROGEN-N-mg/l	0.007	-0.293	0.033	-0.365	-	-	-
TOTAL ORGANIC CARBON-T-mg/l	0.314	-0.096	0.197	0.042	-	-	-
TOTAL SUSPENDED SOLIDS, LAB-N-mg/l	0.350	-0.083	0.258	-0.148	-	-	-
TURBIDITY, LAB-N-ntu	0.246	-0.020	0.112	-0.207	-	-	-
URANIUM-T-mg/l	-0.219	-0.109	-0.089	-0.194	-	-	-
VANADIUM-T-mg/l	0.243	-0.019	-0.124	-0.205	-	-	-
ZINC-T-mg/l	0.208	0.193	-0.005	-0.170	-	-	-
XTU-WQGs (2017)	-	-0.077	-	-0.190	-	-	-
XTU-WQGs/Benchmarks (2017)	-	-0.105	-	-0.172	-	-	-
PC1 (all years)	-0.144	-	-0.069	-	-	-	-
PC2 (all years)	0.255	-	0.212	-	-	-	-
PC3 (all years)	0.258	-	0.128	-	-	-	-
PC4 (all years)	-0.026	-	<b>-0.309</b>	-	No WQG	-	Yes
PC5 (all years)	0.047	-	0.402	-	-	-	-
PC1 (2017)	-	-0.253	-	-0.188	-	-	-
PC2 (2017)	-	0.095	-	0.097	-	-	-
PC3 (2017)	-	-0.063	-	-0.222	-	-	-
PC4 (2017)	-	-0.090	-	0.339	-	-	-
PC5 (2017)	-	0.189	-	-0.003	-	-	-

**Notes:**

- (1) Statistical significance is based on one-tailed comparisons. Significant negative correlations for combined dataset ( $\alpha < 0.05$ ;  $r_s < -0.275$ ) and 2017 dataset ( $\alpha < 0.05$ ;  $r_s < -0.37$ ) 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.
- (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 21 samples, four had detected concentrations of boron (Table D-5).
- (5) Of 21 samples, zero had detected concentrations of titanium (Table D-5).

**Abbreviations**

% = percent; CaCO<sub>3</sub> = calcium carbonate; "-D-" = dissolved concentration; mg/l = milligrams per litre; "-T-" = total concentration; ug/l = micrograms per litre.



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