Appendix 6.3-B

Testing in Support of Development of a Science Based Environmental Benchmark for Sulphate for the Ajax Mine

Nautilus Environmental

Testing in support of development of a science based environmental benchmark for sulphate for the Ajax Mine

Final Report

Report date:
July 9, 2015

Submitted to:

KGHM International Ltd., AJAX Mine
Vancouver, BC

8664 Commerce Court
Burnaby, BC
V5A 4N7

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF APPENDICES

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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.

1.0 INTRODUCTION

The BC water quality guideline for sulphate has been established for water with hardnesses of up to 250 mg/L (as $CaCO_3$). At higher hardness values, the guideline indicates that site-specific testing is necessary using several species, since higher concentrations of water hardness in combination with sulphate may result in osmotic stress (BCMoE, 2013).

Nautilus Environmental conducted testing for the AJAX Mine (KGHM International Ltd.), to evaluate the effects of sulphate and water hardness on the survival and reproduction of *Ceriodaphnia dubia*, growth of the alga *Pseudokirchneriella subcapitata* and development of rainbow trout (*Oncorhynchus mykiss*) through the embryo-alevin stages. The purpose of the tests was to evaluate the sensitivity of these species to sulphate under the relatively high water hardness conditions that occur naturally at the Ajax Mine. This report describes the results of these toxicity tests.

2.0 METHODS

Water samples were collected from Jacko Lake on October 30, 2014, for using in the *C. dubia* and *P. subcapitata* tests and arrived at the Nautilus Environmental laboratory on October 31, 2014. Additional samples were sampled on January 20 and 28 and February 4, 2015, for the *O. mykiss* embryo-alevin development test and arrived at the Nautilus Environmental laboratory on January 21, 29 and February 5, 2015. Samples were collected in 20-L plastic buckets and were transported by overnight courier.

Upon arrival, a portion of the water was amended with sulphate to ~1500 mg/L SO_4 by addition of $Ca_2SO_4*2H_2O$, $MgSO_4*7H_20$, Na_2SO_4 and K_2SO_4 in proportions that produced waters with ionic concentrations that are expected for the site; this amended samples was considered to be the 100% treatment. *C. dubia*, *P.subcapitata* and *O. mykiss* were each exposed to a range of concentrations of sulphate by diluting this sulphate amended sample with untreated Jacko Lake water. Six nominal concentrations of sulphate were tested using *C. dubia* and *P. subcapitata* tests using a 0.67 times dilution series (i.e., 100, 67, 44, 30, 20, and 13%) and three concentrations were tested using *O. mykiss* (i.e., 100, 50 and 20%).

Toxicity tests were performed following procedures described in Environment Canada (2007a; 2007b; 1998) which are summarized in Tables 1, 2 and 3.

The *O. mykiss* embryo development test was performed on three concentrations and involved the 100% sulphate treated sample, a 50% dilution and a 20% dilution with unaltered Jacko site water.

The unaltered Jacko Lake water was used as the negative control in all three tests (identified as the site control); however, a laboratory control was also tested in each test using the water that is usually used for culturing the test organisms.

The *C. dubia* and *P. subcapitata* tests were conducted at 25 ± 1°C under 16:8 h light:dark photoperiod. The *O. mykiss* embryo-alevin test was conducted at 15 ± 1°C. Solutions were renewed daily, at which time temperature, pH, dissolved oxygen and conductivity were measured, with the exception of the *P. subcapitata* test, which had no solution renewal.

Test concentrations were analyzed for sulphate, calcium and magnesium at test initiation by ALS Environmental. These same constituents were analyzed weekly in the *O. mykiss* test, and at test termination in both the *O. mykiss* and the *C. dubia* tests. Statistical analyses were conducted on the basis of averaged measured sulphate concentrations using CETIS (Tidepool Scientific Software, 2007).

Table 1. Summary of test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test organism	*Ceriodaphnia dubia*
Test organism source	In-house culture
Test organism age	<24 hr old neonates produced within 12 hr
Test type	Static-renewal (daily)
Test duration	7 ± 1 day
Test chamber	20 mL glass test tube
Test solution volume	15 mL
Number of replicates	10
Number of organisms/chamber	1
Control/dilution water	Jacko Lake water used for control and dilution; 20% Perrier water used as a second laboratory control
Test solution renewal	Daily
Feeding	Daily, with 0.1 ml *Pseudokirchneriella subcapitata* and 0.05 mL digested yeast, cerophyll and trout chow (YCT)
Light intensity	100 to 500 lux at water surface
Test temperature	25 ± 1°C
Light intensity	100 to 600 lux
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test protocol	Environment Canada (2007), EPS 1/RM/21
Test endpoints	Survival and reproduction
Test acceptability criterion for controls	≥80% survival; ≥15 young per surviving control; ≥60% of controls producing three or more broods
Reference Toxicant	Sodium chloride

Table 2. Summary of test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test organism	*Pseudokirchneriella subcapitata*
Test organism source	In-house culture, obtained from Canadian Phycological Culture Centre, and originally isolated from Nitelva River, Norway.
Test organism age	4 to 7 day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test replicates	4 replicates per treatment; 8 replicates for control
No. of organisms	10, 000 cells/mL
Control water	Deionized water with nutrients added
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test protocol	Environment Canada (2007b), EPS 1/RM/25
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

Table 3. Summary of test conditions: rainbow trout embryo viability test.

Test organism	*Oncorhynchus mykiss*
Test organism source	Vancouver Island Trout Hatchery, Duncan, BC
Test organism age	<30 min post fertilization, <24 h old gametes
Test type	Static renewal
Test duration	7 days
Test vessel	2 L plastic containers
Test volume	2 L
Test replicates	4 test replicates per treatment
No. of organisms	30 eggs per container
Control water	Dechlorinated water (hardness 12 mg/L $CaCO_3$)
Test solution renewal	Daily
Test temperature	14 ± 1°C
Feeding	None
Light intensity	Dark
Photoperiod	24 h dark
Aeration	6.5 ± 1 mL/min/L
Test protocol	Environment Canada (1998), EPS 1/RM/28; Canaria et al. (1999)
Test endpoint	Embryo viability
Test acceptability criteria for controls	Embryo viability ≥70%
Reference toxicant	Sodium dodecyl sulphate

3.0 RESULTS

There were no adverse effects on *C. dubia* survival or reproduction or *P. subcapitata* growth across the range of sulphate concentrations tested, resulting in IC20 values that were greater than the highest test concentration (i.e., >1460 and >1470 mg/L SO_4 respectively).

Adverse effects were observed on survival and the percentage of normally-developed surviving alevins in the rainbow trout embryo-alevin test in all test solutions relative to the laboratory control. However, there was an adverse effect in the unamended Jacko Lake water, regardless of addition of sulphate; Jacko Lake water produced 62.1% normal surviving alevins, compared with 89.9% in the laboratory control. Thus, the performance of the test solutions was compared with the Jacko Lake water, and not with the laboratory control, in order to control for the underlying adverse effect associated with the Jacko Lake water. Fungal growth associated with the site water appears to have been a likely cause of impairment of egg development in the Jacko Lake water.

In the sulphate amended solutions, the 714 and 1428 mg/L sulphate solutions produced 45.5 and 41.1% normal surviving alevins, compared with 62.1% in the Jacko Lake water and 62.9% in the 323 mg/L sulphate solution. Thus, the EC20 appears to have fallen in between the 323 and 714 mg/L sulphate test concentrations. A dose-response could not be effectively modelled with the dataset using preferred statistical models such as probit, and linear interpolation was the only statistical test that would produce an EC20, which resulted in estimates of 548 mg/L for survival and 563 mg/L for normal surviving alevins. It is likely that these reported EC20s over-estimate the potential for adverse effects on development of rainbow trout eggs, since they were under stress from another stressor in the Jacko lake water.

The current water quality guideline for water with hardness of between 181 and 250 mg/L is 429 mg/L sulphate. The results of the tests presented here demonstrate that no adverse effects would be expected to *C. dubia* and *P. subcapitata* at concentrations of sulphate that are significantly higher than this value under the water quality conditions associated with the site. However, results for rainbow trout indicate that adverse effects might occur at a concentration of 548 mg/L, which corresponds to a water hardness of approximately 800 mg/L. Thus, a site specific water quality benchmark for sulphate that extends the water quality guideline of 429 mg/L sulphate across a range of water hardnesses of up to 800 mg/L would appear to provide an appropriate level of protection to this species under the water quality conditions of the site.

In areas where early life stages of trout do not occur, or during times of year that developing eggs would not be expected, a higher limit for sulphate may be appropriate without risk of adverse effects. Since no adverse effects were observed using either *C. dubia* or *P. subcapitata* at concentrations of up to 1460 mg/L sulphate (corresponding to a water hardness of 1377 mg/L as $CaCO_3$), a site-specific benchmark of 730 mg/L would provide greater than a two-fold safety margin for these species. It should be noted that an occasional exceedence of this benchmark would not be expected to result in adverse effects, since there is a safety margin incorporated into this value.

Thus, a site-specific science based environmental benchmark of 429 mg/L sulphate (for up to 800 mg/L hardness) in areas and time periods during which spawning and developing rainbow trout might occur (e.g., May and June), and 730 mg/L sulphate (for up to 1377 mg/L hardness) for the remainder of the year and in areas with no fish populations would be expected to provide a suitable degree of protection.

Table 4. Test results: *Ceriodaphnia dubia* survival and reproduction test.

Treatment	Measured SO_4 (mg/L)	Hardness (mg/L $CaCO_3$)	Survival (%)	Reproduction (young/organism) (mean ± SD)
Lab control	8	93	100	24.5 ± 5.4
Site Control	50	253	100	22.8 ± 3.4
13%	241	411	90	25.3 ± 3.6
20%	337	482	100	24.8 ± 3.3
30%	474	605	100	22.9 ± 5.3
44%	678	765	100	21.6 ± 3.6
67%	1015	1059	80	19.4 ± 7.8
100%	1460	1377	100	22.9 ± 4.7
Test endpoints (mg/L SO_4)				
LC50			>1460	--
IC20			--	>1460
IC50			--	>1460

SD Standard Deviation.
LC50 Lethal concentratrion associated with an effect on 20% of organisms
IC20 Inhibitory concentration associated with a 20% reduction in reproduction

Table 5. Test results: *Pseudokirchneriella subcapitata* algal growth inhibition test.

Treatment	Measured SO_4 (mg/L)	Hardness (mg/L $CaCO_3$)	Cell yield (cell/mL x 10^4) (mean ± SD)	Percent effect (%)
Lab Control	8	NT	39.0 ± 3.8	--
Site Control	51	256	76.7 ± 6.1	0.00
13%	242	416	87.0 ± 6.3	-13.54
20%	336	493	94.5 ± 15.8	-23.33
30%	475	600	108.8 ± 11.4	-41.92
44%	684	749	97.3 ± 9.4	-26.92
67%	1000	1000	103.3 ± 11.0	-34.75
100%	1470	1392	102.0 ± 11.9	-33.12
Test endpoints (mg/L SO_4)				
IC20 (relative to site control)			>1470	
IC50 (relative to site control)			>1470	

SD Standard Deviation.
NT Not tested
IC50 Inhibitory concentration associated with a 50% reduction in reproduction
IC20 Inhibitory concentration associated with a 20% reduction in reproduction

Table 6. Test results: Rainbow trout embryo-alevin development test.

Treatment	Measured SO_4 (mg/L)	Hardness (mg/L $CaCO_3$)	Survival (%)	Normal surviving alevins (%)
Lab Control	1	9	91.6 ± 4.2	89.9 ± 4.2
Site Control	52	303	63.8 ± 11.4	62.1 ± 13.1
20% spiked	323	573	64.7 ± 15.8	63.8 ± 15.0
50% spiked	714	978	45.0 ± 15.5	45.5 ± 15.5
100% spiked	1428	1688	43.6 ± 12.6	41.1 ± 12.7
Test endpoints (mg/L SO_4)				
EC50 (relative to site control)			>1428	>1428
EC20 (relative to site control)			548.2 (201.6 – NC)	562.6 (135.9 – 1744)

SD Standard Deviation.
LC20 Lethal concentration associated with a lethal effect on 50% of organisms
EC20 Inhibitory concentration associated with a 20% reduction in normally developed alevins
NC Not calculable

4.0 QA/QC

The health history of the test organisms used in the exposures was acceptable and met the requirements of the Environment Canada protocols. The tests met all control acceptability criteria. Water quality parameters remained within ranges specified in the protocols throughout the tests. Sulphate, calcium and magnesium concentrations were not measured for the *P. subcapitata* laboratory control water. All statistical analyzes were based on the site control results and therefore the missing data did not affect interpretations of test results.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 7. Results for these tests fell within the range for acceptable organism performance of mean ± 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.

Table 7. Reference toxicant test results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
C. dubia	Survival LC50: 2.1 g/L NaCl	1.9 (1.4 – 2.5)	15.6	October 22, 2014
	Reproduction IC50: 1.8 g/L NaCl	1.4 (1.0 – 1.9)	17.8	October 22, 2014
P. subcapitata	Cell growth IC50: 19.8 mg/L Zn	25.0 (14.8 - 42.3)	30.0	November 4, 2014
O. mykiss	Normal development IC50: 4.1 mg/L SDS	3.9 (2.1 – 7.1)	35.0	January 22, 2015

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

5.0 REFERENCES

Environment Canada. 1998. Biological test method: toxicity tests using early life stages of salmonid fish (rainbow trout). Environmental Protection Series EPS 1/RM/28. Second Edition, July 1998. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 102 pp.

Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. Environmental Protection Series. Report EPS 1/RM/21, Second Edition, February 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 74 pp.

Environment Canada. 2007b. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25. Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system. Tidepool Scientific Software, McKinleyville, CA.

APPENDIX A – Toxicity test results

Ceriodaphnia dubia Summary Sheet

Client: Ajax mine
Work Order No.: 14891

Start Date/Time: Nov 6/14 @12:00
Set up by: EMM

Sample Information:

Sample ID: Jacko BTC ~~Ajax lab prepared spike~~
Sample Date: Oct. 30/14
Date Received: Oct. 31/14
Sample Volume: 20L x 17

Test Validity Criteria:

1) Mean survival of first generation controls is ≥80 %
2) At least 60% of controls have produced three broods within 8 days
3) An average of ≥15 live young produced per surviving female in the control solutions during the first three broods.
4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T (°C) = 25 ± 1; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.:	102914 (#23-30)
Age of young (Day 0):	<24-h (within 12-h)
Avg No. young in first 3 broods of previous 7 d:	22.9
Mortality (%) in previous 7 d:	0.1
Individual female # used ≥8 young on test day	#23-30

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cd120
Stock Solution ID: 14Na02
Date Initiated: Nov 19/14

7-d LC50 (95% CL): 1.8 (1.6-2.2) g/L NaCl
7-d IC50 (95% CL): 1.2 (0.9-1.5) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 1.9 (1.5-2.4) g/L NaCl CV (%): 12
7-d IC50 Reference Toxicant Mean and Historical Range: 1.4 (1.0-2.0) g/L NaCl CV (%): 19

Test Results:

mg/L BTC SO4	Survival	Reproduction
LC50 ~~% (v/v)~~ (95% CL)	>1460	
IC25 ~~% (v/v)~~ mg/L SO4 BTC (95% CL)		>1460
IC50 ~~% (v/v)~~ (95% CL) mg/L SO4 BTC		>1460

Reviewed by: JGL
Date reviewed: Feb. 25/15

Chronic Freshwater Toxicity Test
Initial and Final Water Quality Measurements

Client: AJAX
Sample ID: ~~AJAX LAB PREPARED SPIKE~~ Jacko BTC
Work Order #: 14891
Start Date & Time: NOV 6/14 @ 1200
Stop Date & Time: NOV 12/14 @ 1200
Test Species: *Ceriodaphnia dubia*

EC

Control Concentration (LAB)	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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	7.8	7.9	7.6	8.2	7.5	8.2	7.4	7.8	7.9	~~7.8~~ 8.0	7.5			
pH	8.0	7.5	8.2	7.7	8.1	7.7	8.2	7.8	7.8	7.9	~~7.8~~ 8.0	7.3			
Cond. (µS/cm)	215	219		220		219		220		EC ~~220~~ 217		214			
Initials	EC	EC		A		A		EC		EC		EC			

EC

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	final	
Temperature (°C)	24.0	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	7.9	8.2	7.5	8.1	7.6	8.2	7.4	7.7	7.9	8.2	7.1			
pH	8.1	8.0	8.2	7.9	8.1	8.0	8.1	8.0	~~7.8~~ 8.0	7.9	7.9	7.9			
Cond. (µS/cm)	682	702		700		705		701		671		667			
Initials	EC	EC		A		A		EC		EC		EC			

EC

13% (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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	8.0	8.4	7.5	8.2	7.5	8.2	7.3	7.7	7.9	8.3	7.2			
pH	8.0	8.2	8.2	8.1	8.1	8.1	8.1	8.1	~~7.8~~ 8.0	7.9	7.9	8.1			
Cond. (µS/cm)	982	1024		1015		1014		1006		1000		1001			
Initials	EC	EC		A		A		EC		EC		EC			

EC

20% (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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.6	8.0	8.3	~~7.5~~ 7.5	8.2	7.6	8.3	7.3	7.6	7.9	8.2	7.2			
pH	8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.1	~~7.8~~ 8.0	7.9	7.9	8.1			
Cond. (µS/cm)	EC 1401129	1158		1145		1148		1152		1155		1157			
Initials	EC	EC		A		A		EC		EC		EC			

	Control	100 (v/v)		
Hardness*	100	400		
Alkalinity*	84	206		

Analysts: EC, AWD
Reviewed by: JOL
Date reviewed: Jan. 15/15

* mg/L as CaCO3

WQ Ranges: T (°C) = 25 ± 1; DO (mg/L) = 3.3 to 8.4 (mg/L) ; pH = 6 to 8.5

Sample Description: sample "100%" prepd in house and diluted 2/3 w/ dilution siteWater

Comments: **Broodboard Used:** 102914 (CH# 23 to 30)

Chronic Freshwater Toxicity Test
Initial and Final Water Quality Measurements

Client: AJAX
Sample ID: ~~AJAX LAB PREPARED SPIKE~~ Jacko 8TX
Work Order #: 14891
Start Date & Time: NOV 6/14 @ 1200
Stop Date & Time: NOV 12/14 @ 1200
Test Species: *Ceriodaphnia dubia*

EC

30% (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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	8.0	8.3	7.5	8.2	7.5	8.2	7.3	7.6	7.9	8.2	7.2			
pH	8.0	8.2	8.1	8.1	8.1	8.2	8.1	8.1	8.0	8.0	7.9	8.1			
Cond. (µS/cm)	1339	1360		1339		1341		1351		1345		EC 1336	1359		
Initials	EC	EC		A		A		EC		EC		EC			

EC

44% (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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	7.9	8.3	7.6	8.2	7.6	8.2	7.3	7.7	7.9	8.3	7.2			
pH	EC ~~8.0~~ ① 8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.1	8.0	8.0	7.9	8.1			
Cond. (µS/cm)	EC ~~2080~~ ② 1629	1644		1627		1630		1627		1627		1629			
Initials	EC	EC		A		A		EC		EC		EC			

EC

67% (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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.1	8.0	8.3	7.6	8.2	7.5	8.1	7.4	7.7	7.9	8.3	7.3			
pH	8.0	8.2	8.1	8.2	8.1	8.3	8.1	8.1	8.0	8.0	7.9	8.1			
Cond. (µS/cm)	2080	2100		2080		2085		2080		2080		2070			
Initials	EC	EC		A		A		EC		EC		EC			

EC

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	24.0	24.0	24.5	24.0	24.5	24.0	24.0	24.0	24.0	24.0	24.0			
DO (mg/L)	8.0	8.0	8.3	7.6	8.2	7.5	8.2	7.3	7.6	7.9	8.2	7.5			
pH	7.9	8.2	8.0	8.3	8.0	8.4	8.1	8.1	7.9	8.0	7.8	8.1			
Cond. (µS/cm)	2660	2660		2610		2600		2630		2620		2580			
Initials	EC	EC		A		A		EC		EC		EC			

	Control	100% (v/v)		
Hardness*	100	400		
Alkalinity*	84	206		

Analysts: EC, AWD
Reviewed by: JOE
Date reviewed: Jan 15/15

* mg/L as CaCO3
WQ Ranges: T (°C) = 25 ± 1; DO (mg/L) = 3.3 to 8.4 (mg/L) ; pH = 6 to 8.5
Sample Description:

Comments: **Broodboard Used:**

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

Client: AJAX
Sample ID: ~~AJAX LAB PREPARED SPIKE~~ Jacko BTL
Work Order: 14891

Start Date & Time: NOV 6/14 @ 1200
Stop Date & Time: NOV 12/14 @ 1200
Set up by: EMM

Concentration: control (LAB)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	7	5	5	5	6	3	7	4	7	3	GL
5	9	12	10	12	12	2	EC 7 2	EC 7 7	✓	10	GL
6	14	14	12	14	9	9	9	12	14	10	GL
7											
8											
Total	30	31	27	31	27	14	18	23	21	23	GL

Concentration: Site Control

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	4	5	7	4	9	8	7	4	4	7	GL
5	8	14	✓	12	✓	✓	14	✓	12	✓	GL
6	14	✓	14	10	14	16	✓	13	13	15	GL
7											
8											
Total	26	19	21	26	23	24	21	17	29	22	GL

Concentration: 13% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	3	6	8	9	8	4	4	4	4	4	GL
5	12	16	12	15	14	8	9	10	14	12	GL
6	12	✓	X	✓	✓	11	13	14	14	13	GL
7			|								
8											
Total	27	22	20X	24	22	23	26	28	32	29	GL

Concentration: 20% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	4	4	4	4	7	4	5	8	8	7	GL
5	10	9	12	8	10	10	✓	✓	✓	✓	GL
6	15	14	12	13	10	14	14	13	14	15	GL
7											
8											
Total	29	27	28	25	27	28	19	21	22	22	GL

Concentration: 30% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	4	7	7	7	4	5	5	7	4	4	GL
5	12	✓	12	10	1	11	12	8	10	10	GL
6	14	15	✓	✓	14	14	12	✓	8	12	GL
7											
8											
Total	30	22	19	17	19	30	29	15	22	26	GL

Concentration: 44% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	4	5	8	8	4	6	3	7	8	7	GL
5	10	✓	14	✓	8	✓	11	✓	✓	✓	GL
6	14	14	✓	11	14	11	12	13	13	11	GL
7											
8											
Total	28	19	22	19	26	17	26	20	21	18	GL

Concentration: 67% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	|	✓	✓	✓	~
4	5	6	7	6	4	4	|	4	6	4	GL
5	11	12	✓	✓	8	11	|	12	✓	10	GL
6	12	✓	13	11	10	12	|	X	12	14	GL
7							|	✓			
8							|				
Total	28	18	20	17	22	27	0X	16X	18	28	GL

Concentration: 100% (v/v)

Days	A	B	C	D	E	F	G	H	I	J	Init
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	GL
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	m
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	~
4	3	2	3	2	3	4	8	6	4	4	GL
5	10	11	10	9	7	8	10	✓	9	10	GL
6	12	14	11	11	13	✓	11	11	11	12	GL
7											
8											
Total	25	27	24	22	23	12	29	17	24	26	GL

Concentration:

Days	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:
Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: JGL
Date reviewed: Jan. 8/15

Version 2.1 Issued July 29, 2009

Nautilus Environmental

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	20-5116-7380	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~ 6d BTC	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Control Threshold	1E-07	Yes	Yes	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
7	-12.19	38.38	30.22	10.3	4.572					Lack of Fit Not Tested

Point Estimates

Level	mg/L	95% LCL	95% UCL
EC5	599.4	N/A	N/A
EC10	27470	N/A	N/A
EC15	362800	N/A	N/A
EC20	2821000	N/A	N/A
EC25	16390000	N/A	N/A
EC40	13810000	N/A	N/A
EC50	19890000	N/A	N/A

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Threshold	1.01E-07	0.000101	-0.0002	0.000197	0.001005	0.9992	Non-Significant Parameter
Slope	0.2187	1.016	-1.773	2.211	0.2152	0.8401	Non-Significant Parameter
Intercept	-2.252	2.844	-7.827	3.322	-0.7919	0.4727	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	1.756666	1.756666	1	0.9628	0.3820	Non-Significant
Residual	7.29806	1.824515	4			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	7.298	9.488	0.1210	Non-Significant Heterogenity
	Likelihood Ratio GOF	7.873	9.488	0.0963	Non-Significant Heterogenity
Distribution	Shapiro-Wilk W Normality	0.7069	0.6146	0.0044	Non-normal Distribution

6d Survival Rate Summary

			Calculated Variate(A/B)								
C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
50	Negative Control	10	1	1	1	0	0	0.0%	0.0%	10	10
241		10	0.9	0	1	0.1	0.3162	35.14%	10.0%	9	10
337		10	1	1	1	0	0	0.0%	0.0%	10	10
474		10	1	1	1	0	0	0.0%	0.0%	10	10
679		10	1	1	1	0	0	0.0%	0.0%	10	10
1015 ✓		10	0.8	0	1	0.1333	0.4216	52.7%	20.0%	8	10
1460 ✓		10	1	1	1	0	0	0.0%	0.0%	10	10

* negative control = site water control (Jacko)

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	20-5116-7380	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes

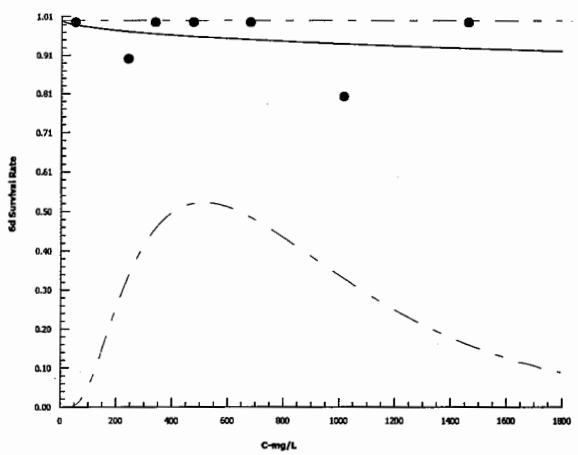
6d Survival Rate Detail

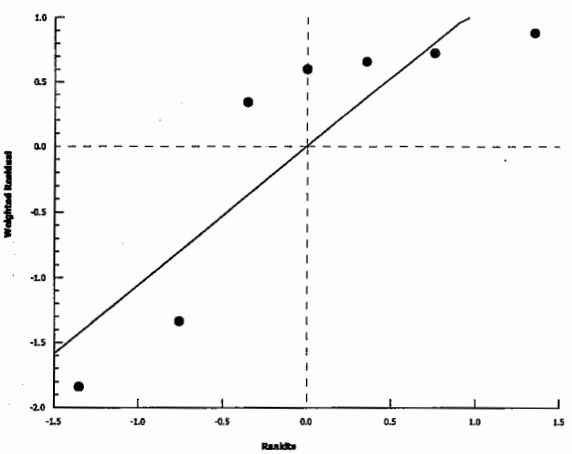
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	1	1	1	1	1	1	1	1	1	1
241		1	1	0	1	1	1	1	1	1	1
337		1	1	1	1	1	1	1	1	1	1
474		1	1	1	1	1	1	1	1	1	1
679		1	1	1	1	1	1	1	1	1	1
1015		1	1	1	1	1	1	0	0	1	1
1460		1	1	1	1	1	1	1	1	1	1

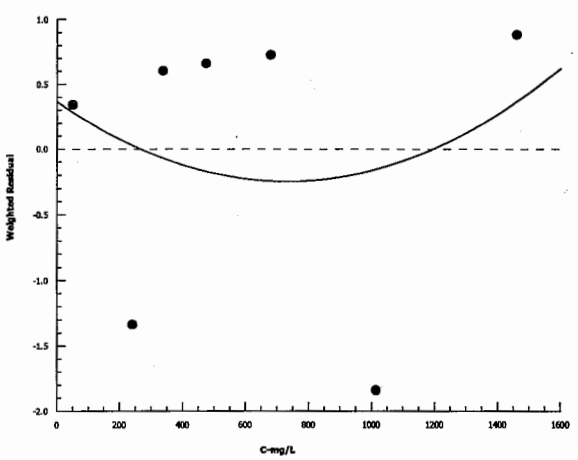
6d Survival Rate Binomials

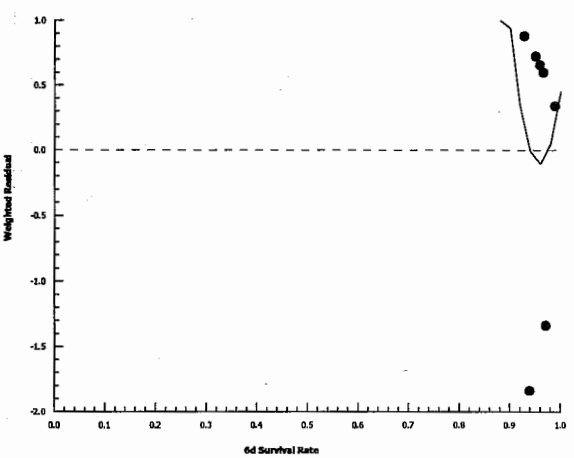
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
241		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
337		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
474		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
679		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1015		1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1
1460		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics — Log-Normal [NED=A+B*log(X)]









CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	09-4883-9011	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~ 6d BTC	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	1460	>1460	NA	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
50		241	0.5	1.0000	Exact	Non-Significant Effect
50		337	1	1.0000	Exact	Non-Significant Effect
50		474	1	1.0000	Exact	Non-Significant Effect
50		679	1	1.0000	Exact	Non-Significant Effect
50		1015	0.2368	1.0000	Exact	Non-Significant Effect
50		1460	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
50	Negative Contr	10	0	10	1	0	0.0%
241		9	1	10	0.9	0.1	10.0%
337		10	0	10	1	0	0.0%
474		10	0	10	1	0	0.0%
679		10	0	10	1	0	0.0%
1015		8	2	10	0.8	0.2	20.0%
1460		10	0	10	1	0	0.0%

6d Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	1	1	1	1	1	1	1	1	1	1
241		1	1	0	1	1	1	1	1	1	1
337		1	1	1	1	1	1	1	1	1	1
474		1	1	1	1	1	1	1	1	1	1
679		1	1	1	1	1	1	1	1	1	1
1015		1	1	1	1	1	1	0	0	1	1
1460		1	1	1	1	1	1	1	1	1	1

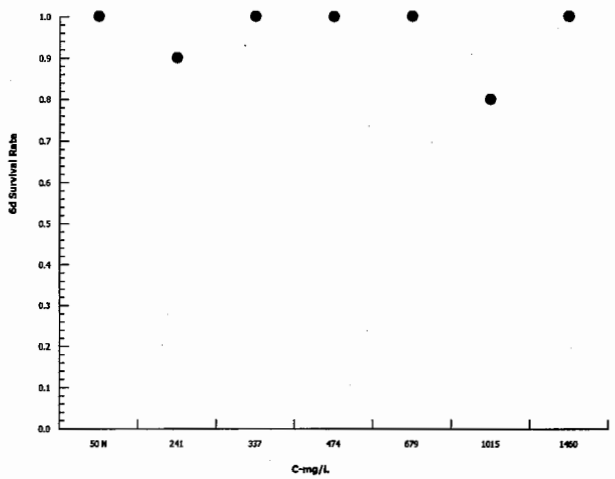
6d Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
241		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
337		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
474		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
679		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1015		1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1
1460		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

* negative control = site water control (Jacko)

Analysis ID:	09-4883-9011	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Graphics



CETIS Analytical Report

Test Code: 14891 | 07-1528-8788

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	00-2501-6743	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Jan-15 11:57	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~ 6d BSL	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes 6d survival rate

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
50		8	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
8	Lab Water	10	0	10	1	0	0.0%
50	Negative Contr	10	0	10	1	0	0.0%

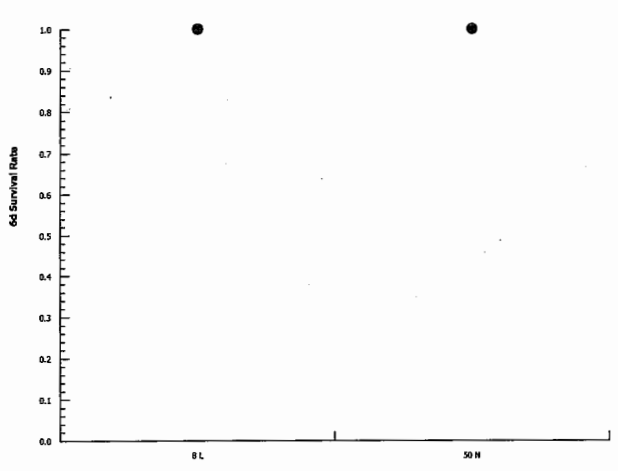
6d Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
8	Lab Water	1	1	1	1	1	1	1	1	1	1
50	Negative Control	1	1	1	1	1	1	1	1	1	1

6d Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
8	Lab Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50	Negative Control	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	07-2279-0637	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Nonlinear Regression	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~(6d) BTC	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Non-Linear Regression Options

Model Function	X Transform	Y Transform	Weighting Function	PTBS Function
3P Log-Logistic EV [Y=A/(1+(X/D)^C)]	None	None	Normal [W=1]	Off [Y*=Y]

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	Optimize	F Stat	Critical	P-Value	Decision(α:5%)
38	-148	302.4	308.8	0.0040	Yes	1.703	2.518	0.1606	Non-Significant Lack of Fit

Point Estimates

Level	mg/L	95% LCL	95% UCL
IC5	449.7	N/A	1301
IC10	1049	233.4	2122
IC15	1773	N/A	5448
IC20	2632	N/A	15700
IC25	3647	N/A	62670
IC40	8004	N/A	N/A
IC50	12680	N/A	N/A

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
A	24.29	2.431	19.53	29.06	9.992	<0.0001	Significant Parameter
C	0.8819	1.57	-2.195	3.959	0.5618	0.5761	Non-Significant Parameter
D	12680	44400	-74350	99700	0.2855	0.7762	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	60.17566	60.17566	1	2.28	0.1358	Non-Significant
Lack of Fit	172.5101	43.12751	4	1.703	0.1606	Non-Significant
Pure Error	1595.9	25.33175	63			
Residual	1768.41	26.39418	67			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Variances	Mod Levene Equality of Variance	1.025	2.246	0.4173	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9219	0.9654	0.0003	Non-normal Distribution
	Anderson-Darling A2 Normality	0.8038	2.492	0.0372	Non-normal Distribution

Reproduction Summary

			Calculated Variate						
C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
50	Negative Control	10	22.8	17	29	1.133	3.584	15.72%	0.0%
241		10	25.3	20	32	1.184	3.743	14.8%	-10.96%
337		10	24.8	19	29	1.114	3.521	14.2%	-8.77%
474		10	22.9	15	30	1.754	5.547	24.22%	-0.44%
679		10	21.6	17	28	1.204	3.806	17.62%	5.26%
1015		10	19.4	0	28	2.604	8.235	42.45%	14.91%
1460		10	22.9	12	29	1.581	4.999	21.83%	-0.44%

* negative control = site water control (Jacko)

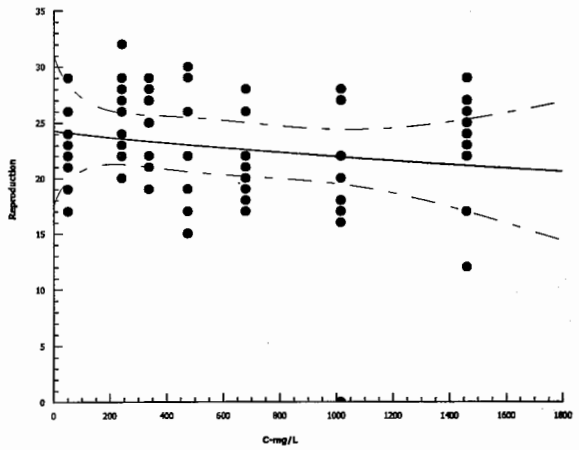
Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

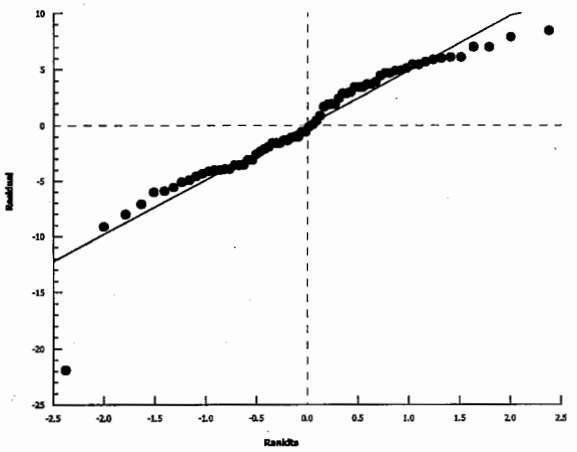
Analysis ID:	07-2279-0637	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Nonlinear Regression	**Official Results:**	Yes

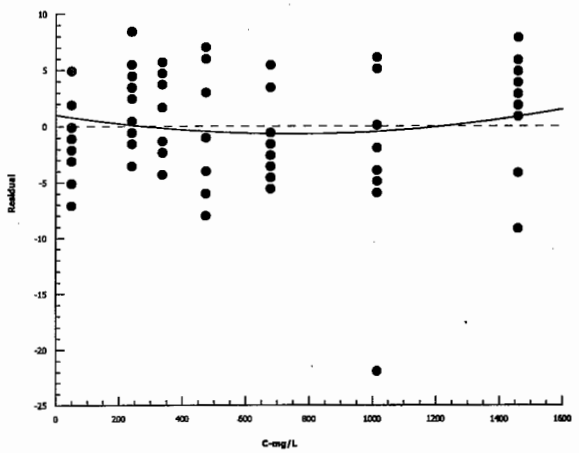
Reproduction Detail

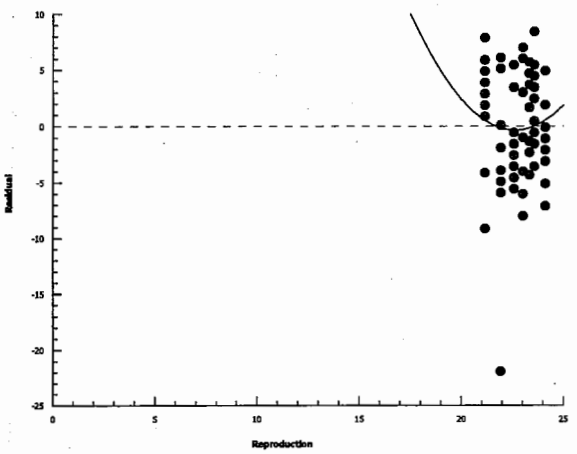
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	26	19	21	26	23	24	21	17	29	22
241		27	22	20	24	22	23	26	28	32	29
337		29	27	28	25	27	28	19	21	22	22
474		30	22	19	17	19	30	29	15	22	26
679		28	19	22	19	26	17	26	20	21	18
1015		28	18	20	17	22	27	0	16	18	28
1460		25	27	24	22	23	12	29	17	24	26

Graphics — 3P Log-Logistic EV [Y=A/(1+(X/D)^C)]









CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	16-8607-8903	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~ 6d BTC	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	23.1%	1460	>1460	NA	

Steel Many-One Rank Sum Test

Control	vs	C-mg/L	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
50		241	123.5	74	5	18	0.9973	Asymp	Non-Significant Effect
50		337	121	74	4	18	0.9945	Asymp	Non-Significant Effect
50		474	105	74	5	18	0.8571	Asymp	Non-Significant Effect
50		679	94	74	5	18	0.5272	Asymp	Non-Significant Effect
50		1015	91	74	2	18	0.4201	Asymp	Non-Significant Effect
50		1460	112	74	6	18	0.9564	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	232.6857	38.78095	6	1.531	0.1827	Non-Significant Effect
Error	1595.9	25.33175	63			
Total	1828.586		69			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	11.91	16.81	0.0641	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9481	0.9526	0.0058	Non-normal Distribution

Reproduction Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
50	Negative Control	10	22.8	20.24	25.36	22.5	17	29	1.133	15.72%	0.0%
241		10	25.3	22.62	27.98	25	20	32	1.184	14.8%	-10.96%
337		10	24.8	22.28	27.32	26	19	29	1.114	14.2%	-8.77%
474		10	22.9	18.93	26.87	22	15	30	1.754	24.22%	-0.44%
679		10	21.6	18.88	24.32	20.5	17	28	1.204	17.62%	5.26%
1015		10	19.4	13.51	25.29	19	0	28	2.604	42.45%	14.91%
1460		10	22.9	19.32	26.48	24	12	29	1.581	21.83%	-0.44%

Reproduction Detail

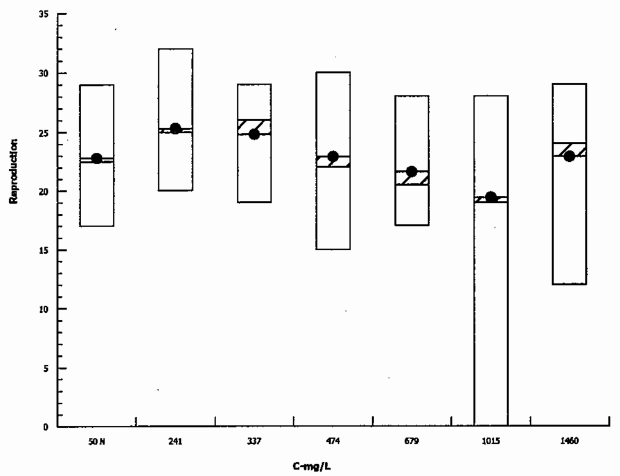
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
50	Negative Control	26	19	21	26	23	24	21	17	29	22
241		27	22	20	24	22	23	26	28	32	29
337		29	27	28	25	27	28	19	21	22	22
474		30	22	19	17	19	30	29	15	22	26
679		28	19	22	19	26	17	26	20	21	18
1015		28	18	20	17	22	27	0	16	18	28
1460		25	27	24	22	23	12	29	17	24	26

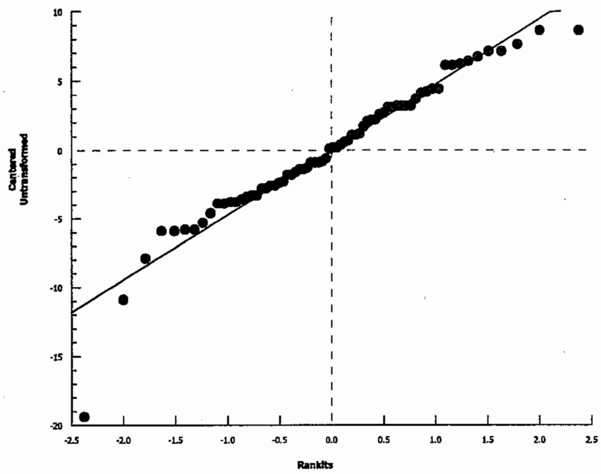
* negative control = site water control (Jacko)

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	16-8607-8903	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Nov-14 17:31	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Test Code: 14891 | 07-1528-8788

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	02-0682-2543	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Jan-15 11:56	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	01-9145-7353	**Test Type:**	Reproduction-Survival ~~(7d)~~ 6d BTC	**Analyst:**	
Start Date:	06 Nov-14 12:00	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	Site Water
Ending Date:	12 Nov-14 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 0h	**Source:**	In-House Culture	**Age:**	
Sample ID:	13-4939-4417	**Code:**	506E1FF1	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	7d 12h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	16.3%	Passes reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
50		8	-0.7945	1.734	3.711	18	0.7814	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	14.45	14.45	1	0.6312	0.4373	Non-Significant Effect
Error	412.1	22.89444	18			
Total	426.55		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.565	6.541	0.1768	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9593	0.866	0.5296	Normal Distribution

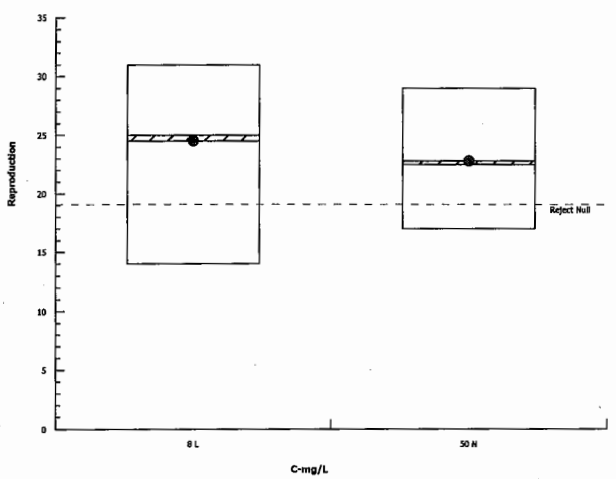
Reproduction Summary

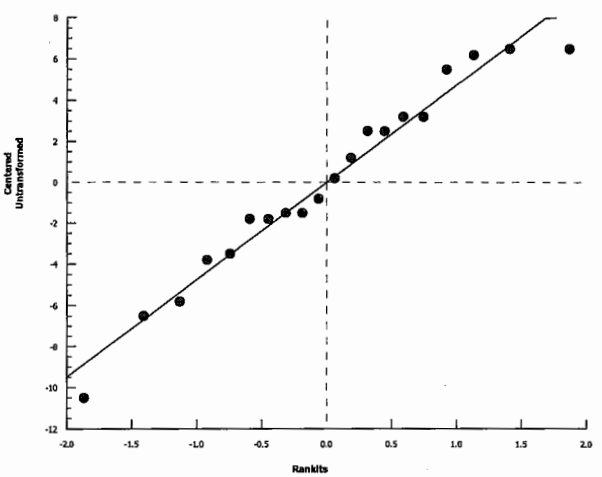
C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
8	Lab Water	10	24.5	20.39	28.61	25	14	31	1.815	23.43%	0.0%
50	Negative Control	10	22.8	20.24	25.36	22.5	17	29	1.133	15.72%	6.94%

Reproduction Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
8	Lab Water	30	31	27	31	27	14	18	23	21	23
50	Negative Control	26	19	21	26	23	24	21	17	29	22

Graphics





Pseudokirchneriella subcapitata Summary Sheet

Client: Ajax Mine
Work Order No.: 14892

Start Date: Nov 7/14
Set up by: EMM

Sample Information:

Sample ID: Jacko
Sample Date: Oct. 30/14
Date Received: Oct. 31/14
Sample Volume: 20L x 17

Test Organism Information:

Culture Date: Oct. 31/14
Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC120
Stock Solution ID: 14Zn01
Date Initiated: Nov 4/14 @ 17:30

72-h IC50 (95% CL): 19.8 (17.2-24.6)

72-h IC50 Reference Toxicant Mean and Range: 25.0 (14.8-42.3) CV (%): 30.0

Test Results:

	Algal Growth
IC25 ~~%(v/v) (95% CL)~~ BTC mg/L SO_4	~~>1460~~ >1470 BTC
IC50 ~~%(v/v) (95% CL)~~ BTC mg/L SO_4	~~>1460~~ >1470 BTC

Reviewed by: JCu

Date reviewed: Apr. 10/15

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: AJAX **Setup by:** EMM

Sample ID: ~~AJAX spiked H2O~~ Jucko BTC **Test Date/Time:** NOV 7/14 @ 700

Work Order No.: 14892 **Test Species:** *Pseudokirchneriella subcapitata*

Culture Date: Oct 31/14 **Age of Culture:** 7d **Culture Health:** Good.

Culture Count: 1 465 2 439 **Average:** 452 **Culture Cell Density (c1):** 452 x10^4 cells/mL

v1 = 220,000 cells/ml x 100 ml / (c1) 452x10^4 cells/ml = 5mL

Time Zero Counts: 1 19 2 23 **Average:** 21

No. of Cells/mL: 210,000 **Initial Density:** # cells/mL ÷ 220 µL x 10 µL = 9545.45 BTC

Concentration %(v/v)	Water Quality		Incubator Temperature (°C)				Microplates rotated 2X per day?			
	pH	Temp (°C)								
	0 h	0 h	0 h	24 h	48 h	72 h	0 h	24 h	48 h	72 h
Control	6.8	24.0	24.0	24.5	25.0	25.0	✓	✓	✓	✓
Site control	7.6	24.0					✓	✓	✓	✓
13%	7.6	24.0					✓	✓	✓	✓
20%	7.6	24.0					✓	✓	✓	✓
30% ~~44%~~ 44%	7.7	24.0					✓	✓	✓	✓
44% ~~67%~~ 67%	7.7	24.0					✓	✓	✓	✓
67%	7.7	24.0					✓	✓	✓	✓
100%	7.6	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	EMM	EMM	EMM	~	~	EMM	EMM	~	~	EMM

Initial control pH: Well 1: 6.8 Well 2: 6.8

Final control pH: Well 1: 6.5 Well 2: 6.5

Light intensity (lux): 4000 **Date measured:** Nov 7/14

Instruments: Thermometer 1 pH meter 1 Light meter 1

Sample Description: sample prepd in-house.

Comments:

Reviewed: JGH **Date reviewed:** Jan. 8/15

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

Client: AJAX
Start Date/Time: NOV 7/14 @ 0700
Work Order #: 14892
Termination Date: NOV 10/14 @ 0700
Sample ID: ~~AJAX spiked H2O~~ Jacko BTC
Test set up by: Emm
%(v/v)
"site control"

Concentration	Rep	Count 1	Count 2	~~Count 3~~ Rep	Count 4	count 2	Comments	Initials
Control 1ab	A	36		A	69			Emm
	B	44		B	74			
	C	35		C	88			
	D	43		D	75			
	E	44		E	79			
	F	42		F	84			
	G	40		G	78			
	H	36		H	74			
13	A	96						
	B	90						
	C	82						
	D	84						
20	A	108						
	B	85						
	C	110						
	D	79						
30	A	116						
	B	112						
	C	93						
	D	118						
44	A	111						
	B	94						
	C	89						
	D	99						
67	A	116						
	B	111						
	C	97						
	D	93						
100	A	118						
	B	107						
	C	95						
	D	92						
	A							
	B							
	C							
	D							

Comments:

Reviewed by: JGu
Date Reviewed: Jan. 8/15

Pseudokirchneriella subcapitata Algal Counts

Client: Ajax
WO#: 14892
Sample ID: Jacko

Start Date/Time: 07-Nov-14 7:00
Termination Date: 10-Nov-14 7:00

Initial Cell Density: 9545 cell/mL

									210000
									0.22
									0.01
Concentration % v/v	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		9545.455
Control site	A	69				69	68.0	mean	76.7
	B	74				74	73.0	SD	6.069538
	C	88				88	87.0	CV	7.916397
	D	75				75	74.0		
	E	79				79	78.0		
	F	84				84	83.0		
	G	78				78	77.0		
	H	74				74	73.0		
13	A	96				96	95.0	mean	87.0
	B	90				90	89.0	SD	6.324555
	C	82				82	81.0		
	D	84				84	83.0		
20	A	108				108	107.0	mean	94.5
	B	85				85	84.0	SD	15.80084
	C	110				110	109.0		
	D	79				79	78.0		
30	A	116				116	115.0	mean	108.8
	B	112				112	111.0	SD	11.44188
	C	93				93	92.0		
	D	118				118	117.0		
44	A	111				111	110.0	mean	97.3
	B	94				94	93.0	SD	9.429563
	C	89				89	88.0		
	D	99				99	98.0		
67	A	116				116	115.0	mean	103.3
	B	111				111	110.0	SD	10.99621
	C	97				97	96.0		
	D	93				93	92.0		
100	A	118				118	117.0	mean	102.0
	B	107				107	106.0	SD	11.91638
	C	95				95	94.0		
	D	92				92	91.0		
Control lab	A	36				36	35.0	mean	39.0
	B	44				44	43.0	SD	3.817254
	C	35				35	34.0	CV	9.776436
	D	43				43	42.0		
	E	44				44	43.0		
	F	42				42	41.0		
	G	40				40	39.0		
	H	36				36	35.0		

JOA
Appr. 10/15

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	11-6466-7188	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.8.7
Analyzed:	13 Jan-15 17:04	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	01-6684-2921	**Test Type:**	Cell Growth	**Analyst:**	Brett Lucas
Start Date:	07 Nov-14 07:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Site Water
Ending Date:	10 Nov-14 07:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Duration:	72h	**Source:**		**Age:**	
Sample ID:	14-2332-7656	**Code:**	54D641A8	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	8d 7h	**Station:**	Jacko		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	906846	200	Yes	Two-Point Interpolation

Residual Analysis

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

Point Estimates

Level	mg/L	95% LCL	95% UCL
IC5	>1470	N/A	N/A
IC10	>1470	N/A	N/A
IC15	>1470	N/A	N/A
IC20	>1470	N/A	N/A
IC25	>1470	N/A	N/A
IC40	>1470	N/A	N/A
IC50	>1470	N/A	N/A

Cell Yield Summary

			Calculated Variate						
C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
51	Negative Control	8	76.63	68	87	2.146	6.07	7.92%	0.0%
242		4	87	81	95	3.162	6.325	7.27%	-13.54%
336		4	94.5	78	109	7.9	15.8	16.72%	-23.33%
475		4	108.8	92	117	5.721	11.44	10.52%	-41.92%
684		4	97.25	88	110	4.715	9.43	9.7%	-26.92%
1000		4	103.3	92	115	5.498	11	10.65%	-34.75%
1470		4	102	91	117	5.958	11.92	11.68%	-33.12%

Cell Yield Detail

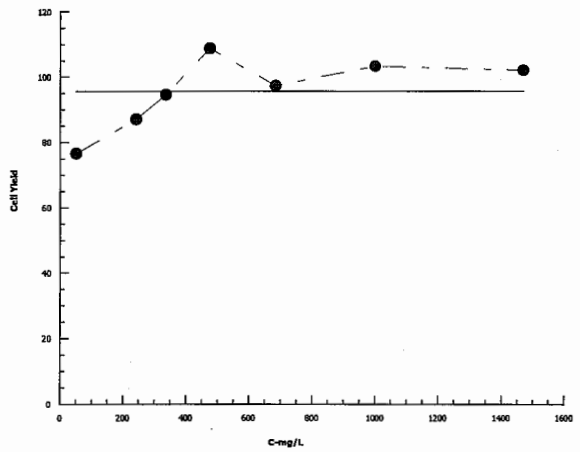
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
51	Negative Control	68	73	87	74	78	83	77	73
242		95	89	81	83				
336		107	84	109	78				
475		115	111	92	117				
684		110	93	88	98				
1000		115	110	96	92				
1470		117	106	94	91				

* negative control = site water control (Jacko)

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	11-6466-7188	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.8.7
Analyzed:	13 Jan-15 17:04	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	15-2135-2771	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.8.7
Analyzed:	13 Jan-15 17:04	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	01-6684-2921	**Test Type:**	Cell Growth	**Analyst:**	Brett Lucas
Start Date:	07 Nov-14 07:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Site Water
Ending Date:	10 Nov-14 07:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Duration:	72h	**Source:**		**Age:**	
Sample ID:	14-2332-7656	**Code:**	54D641A8	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	8d 7h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C < T	NA	NA	20.1%	242	336	285.2	

Dunnett Multiple Comparison Test

Control	vs	C-mg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
51		242	1.669	2.483	15.43	10	0.2218	CDF	Non-Significant Effect
51		336*	2.876	2.483	15.43	10	0.0213	CDF	Significant Effect
51		475*	5.169	2.483	15.43	10	<0.0001	CDF	Significant Effect
51		684*	3.319	2.483	15.43	10	0.0076	CDF	Significant Effect
51		1000*	4.284	2.483	15.43	10	0.0007	CDF	Significant Effect
51		1470*	4.083	2.483	15.43	10	0.0011	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	4104.875	684.1458	6	6.642	0.0003	Significant Effect
Error	2575.125	103.005	25			
Total	6680		31			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	5.065	16.81	0.5355	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9641	0.9081	0.3535	Normal Distribution

Cell Yield Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
51	Negative Control	8	76.63	71.55	81.7	75.5	68	87	2.146	7.92%	0.0%
242		4	87	76.94	97.06	86	81	95	3.162	7.27%	-13.54%
336		4	94.5	69.36	119.6	95.5	78	109	7.9	16.72%	-23.33%
475		4	108.8	90.54	127	113	92	117	5.721	10.52%	-41.92%
684		4	97.25	82.25	112.3	95.5	88	110	4.715	9.7%	-26.92%
1000		4	103.3	85.75	120.7	103	92	115	5.498	10.65%	-34.75%
1470		4	102	83.04	121	100	91	117	5.958	11.68%	-33.12%

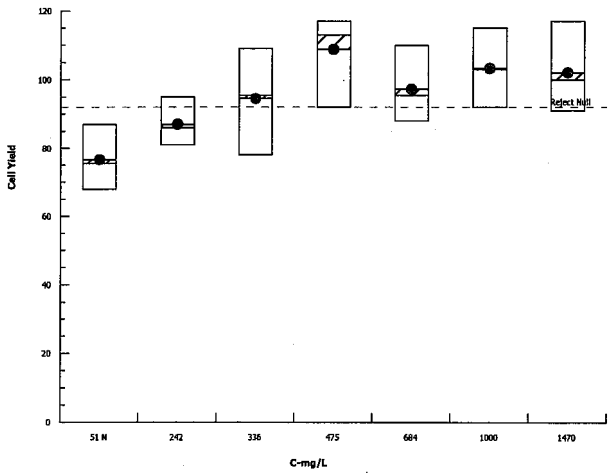
Cell Yield Detail

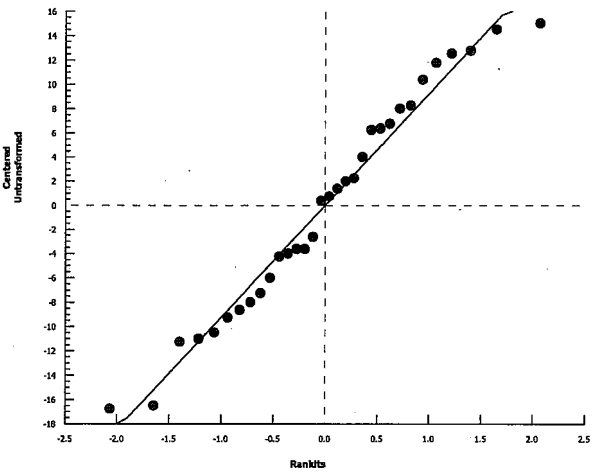
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
51 ✓	Negative Control	68	73	87	74	78	83	77	73
242 ✓		95	89	81	83				
336 ✓		107	84	109	78				
475 ✓		115	111	92	117				
684 ✓		110	93	88	98				
1000 ✓		115	110	96	92				
1470 ✓		117	106	94	91				

*negative control = site water control (Jacko)

Analysis ID:	15-2135-2771	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.8.7
Analyzed:	13 Jan-15 17:04	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	02-6358-5699	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.8.7
Analyzed:	10 Apr-15 10:03	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	01-6684-2921	**Test Type:**	Cell Growth	**Analyst:**	Brett Lucas
Start Date:	07 Nov-14 07:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Site Water
Ending Date:	10 Nov-14 07:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Duration:	72h	**Source:**		**Age:**	
Sample ID:	14-2332-7656	**Code:**	54D641A8	**Client:**	AJAX
Sample Date:	30 Oct-14	**Material:**	Sulphate	**Project:**	Ajax sulphate testing
Receive Date:	31 Oct-14	**Source:**	AJAX sulphate testing		
Sample Age:	8d 7h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C < T	NA	NA	11.4%	Fails cell yield

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
8		51*	14.84	1.761	4.465	14	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	5662.563	5662.563	1	220.3	<0.0001	Significant Effect
Error	359.875	25.70536	14			
Total	6022.438		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.528	8.885	0.2442	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9704	0.8408	0.8445	Normal Distribution

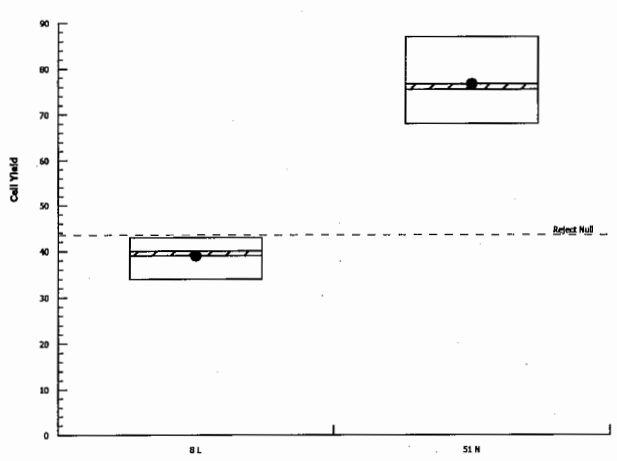
Cell Yield Summary

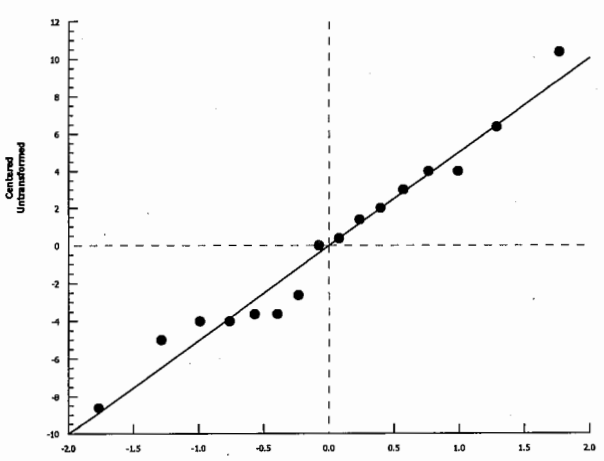
C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
8	Lab Water	8	39	35.81	42.19	40	34	43	1.35	9.79%	0.0%
51	Negative Control	8	76.63	71.55	81.7	75.5	68	87	2.146	7.92%	-96.47%

Cell Yield Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
8	Lab Water	35	43	34	42	43	41	39	35
51	Negative Control	68	73	87	74	78	83	77	73

Graphics





* lab water = dechlorinated tap water
negative control = Jacko site water (unamended)

Rainbow Trout Embryo Summary Sheet

Client: AJAX Start Date/Time: January 22, 2015 @ 1500h

Work Order No.: 14841 Test Species: *Oncorhynchus mykiss*

Sample Information:

Sample ID: Jacko
Sample Date: January 20, January 28, February 4, ~~February~~ 11, 2015
Date Received: January 21, January 29, February 5, February 13, 2015
Sample Volume: 10 x 20 L per refresh

Dilution Water:

Type: ~~Dechlorinated Tap Water~~ Jacko site water BTC
Hardness (mg/L $CaCO_3$): 312
Alkalinity (mg/L $CaCO_3$): 267

Test Organism Information:

Batch No.: 012215
Source: Trout Lodge, Sumner, WA
Loading Density: 0.89 g/L

SDS Reference Toxicant Results:

Reference Toxicant ID: RTE69
Stock Solution ID: 14504
Date Initiated: January 22, 2015
7-d EC50 (95% CL): 4.1 (4.0-4.2) mg/L SDS

Reference Toxicant Mean and Range: 3.9 (2.1-7.1) mg/L SDS
Reference Toxicant CV (%): 35

Test Results:

	Sample ID		
mg/L SO_4 BTC	survival	Proportion normal	
EC25 ~~% (v/v) (95% CL)~~	626 (272-N/A)	646 (238-N/A)	
EC50 ~~% (v/v) (95% CL)~~	>1428	>1428	
mg/L SO_4 BTC			

Reviewed by: JGL Date reviewed: Apr. 10/15

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @1500
Stop Date & Time: February 20, 2015 @1130
Test Species: O. mykiss

(% v/v) Concentration Control	Days														
	0	1		2		3		4		5		6		7	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	
Temperature (°C)	14.0	14.0	14.5	14.0	14.0	14.0	14.0	14.5	14.0	14.5	14.5	14.5	14.5	15.0	
DO (mg/L)	10.1	10.0	10.0	9.9	9.9	9.9	9.9	9.8	10.0	9.9	9.9	10.0	9.9	9.8	
pH	6.9	6.8	7.0	6.8	7.0	6.9	7.0	6.7	6.9	6.7	6.8	6.7	6.9	6.8	
Cond. (µS/cm)	27	28		28		28		29		28		28		29	
Initials	YML	YML		A		A		YML		SSD		YML		YML	

Concentration 100 - Site water	Days														
	0	1		2		3		4		5		6		7	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	
Temperature (°C)	14.0	14.0	14.5	14.0	14.0	14.0	14.0	14.5	14.0	14.5	14.5	14.0	14.5	14.5	
DO (mg/L)	9.6	9.4	9.9	9.9	9.9	9.9	9.9	9.8	10.0	10.0	9.9	9.8	9.8	9.7	
pH	7.8	7.7	8.0	7.9	7.9	7.9	8.1	7.8	7.9	7.9	8.1	7.8	8.1	7.8	
Cond. (µS/cm)	759	760		755		758		766		761		764		760	
Initials	YML	YML		A		A		YML		SSD		YML		YML	

Concentration 20 - spiked	Days														
	0	1		2		3		4		5		6		7	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	
Temperature (°C)	14.0	14.0	14.5	14.0	14.0	14.0	14.0	14.5	14.0	14.5	14.5	14.0	14.5	14.5	
DO (mg/L)	9.8	9.9	10.0	9.9	9.8	9.9	9.9	9.8	9.9	10.0	10.0	9.9	9.8	9.8	
pH	7.9	7.8	8.1	7.9	8.0	7.9	8.1	7.9	8.0	7.9	8.1	7.8	8.0	8.0	
Cond. (µS/cm)	1201	1214		1215		1217		1210		1235		1208		1212	
Initials	YML	YML		A		A		YML		SSD		YML		YML	

Concentration 50 - spiked	Days														
	0	1		2		3		4		5		6		7	
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new	
Temperature (°C)	14.0	14.0	14.5	14.0	14.0	14.0	14.0	14.5	14.0	14.5	14.5	14.0	14.5	14.5	
DO (mg/L)	9.8	10.0	9.9	9.9	9.8	9.8	9.9	10.0	10.0	10.0	10.1	9.9	9.8	9.9	
pH	8.0	7.9	8.1	7.9	8.1	7.9	8.1	8.0	8.0	8.0	8.2	7.9	8.0	8.1	
Cond. (µS/cm)	1751	1763		1772		1770		1774		1789		1786		1780	
Initials	YML	YML		A		A		YML		SSD		YML		YML	

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	Control (Jacko)	site water	site control
Hardness*	312		
Alkalinity*	267		

* mg/L as CaCO3

Analysts: AWD, SSD, YML
Reviewed by: JGK
Date reviewed: Apr. 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date & Time: February 20, 2015 @ 1130
Test Species: O. mykiss

(% v/v) Concentration	Days													
	0	1		2		3		4		5		6		7
100 - spiked	init.	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.0	14.0	14.5	14.0	14.0	14.0	14.0	14.5	14.0	14.0	14.5	14.0	14.5	14.5
DO (mg/L)	9.8	10.0	9.9	9.9	9.8	9.5	9.9	10.0	9.9	10.0	10.0	10.1	9.8	9.9
pH	8.2	8.1	8.1	8.0	8.1	8.2	8.2	8.2	8.1	8.0	8.1	8.0	8.0	8.1
Cond. (µS/cm)	2700	2720		2690		2690		2700		2700		2710		2690
Initials	MML	MML		[illegible]		[illegible]		MML		SSD		MML		MML

Concentration	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, SSD, MML

Reviewed by: JOL
Date reviewed: Apr. 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @1500
Stop Date & Time: February 29, 2015 @1130
Test Species: O. mykiss

(% v/v) Concentration Control	Days 7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.0	14.5	14.0	14.5	15.0	14.5	15.0	15.0	15.0	14.5	15.0
DO (mg/L)	10.0	10.2	9.7	9.8	9.9	9.9	10.0	10.0	9.9	9.8	10.0	10.0	10.1	10.0
pH	6.9	6.7	6.9	7.0	6.9	7.0	7.1	6.9	6.9	6.9	6.9	6.8	7.0	6.8
Cond. (µS/cm)	—	27		28		28		27		27		27		27
Initials	YML	YML		AD		AD		YML		KLP		YML		YML

Concentration 100-site	Days 7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.0	14.5	14.0	14.5	14.5	14.5	14.5	15.0	14.5	14.5	15.0
DO (mg/L)	10.0	9.6	9.8	9.8	9.8	9.9	9.9	9.8	9.9	9.8	10.0	9.9	10.1	9.7
pH	7.8	7.7	8.1	7.8	7.9	7.8	8.1	7.8	8.2	7.8	8.3	7.9	8.1	7.7
Cond. (µS/cm)	—	763		739		740		748		745		743		736
Initials	YML	YML		AD		AD		YML		KLP		YML		YML

Concentration 20-spiked	Days 7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.0	14.5	14.0	14.5	14.5	14.5	14.5	15.0	14.5	14.5	15.0
DO (mg/L)	9.9	9.8	9.8	9.8	9.8	9.9	9.8	9.9	10.0	9.9	10.0	9.9	10.1	9.9
pH	7.9	7.8	8.2	7.9	AD	AD	8.2	8.0	8.2	7.8	8.3	7.9	8.2	7.8
Cond. (µS/cm)	—	1219		1220		1222		1209		1212		1207		1202
Initials	YML	YML		AD		AD		YML		KLP		YML		YML

Concentration 50-spiked	Days 7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.0	14.5	14.0	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	9.8	9.7	9.8	9.8	9.8	9.9	9.9	9.9	9.9	9.9	10.0	9.9	10.0	9.9
pH	8.1	8.0	8.2	8.1	8.2	8.1	8.2	8.1	8.3	8.1	8.3	8.0	8.3	8.0
Cond. (µS/cm)	—	1777		1745		1755		1763		1810		1764		1761
Initials	YML	YML		AD		AD		YML		KLP		YML		YML

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	Control (Jacko) site			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, KLP, YML
Reviewed by: JOL
Date reviewed: Mar. 10/15

Sample Description: clear, yellow colour, some particulate

Comments:

Chronic Embryo-Alevin Freshwater Toxicity Test Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @1500
Stop Date & Time: February 20, 2015 @1130
Test Species: O. mykiss

Concentration (% v/v)	Days													
	7	8		9		10		11		12		13		14
100-spiked	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.0	14.5	14.0	14.5	14.5	14.5	14.5	15.0	14.5	14.5	14.5
DO (mg/L)	9.9	9.9	9.8	9.8	9.8	9.8	9.9	10.0	9.8	9.9	10.0	9.9	10.1	10.0
pH	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.2	8.2	8.2
Cond. (µS/cm)	—	2690		2700		2705		2710		2720		2720		2710
Initials	AWD	YYL		A		A		YYL		KLP		YYL		YYL

Concentration	Days													
	7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	7	8		9		10		11		12		13		14
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

DO meter: 3 pH meter: 3 Conductivity meter: 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, KLP, YYL
Reviewed by: JTK
Date reviewed: Apr. 10/15

Sample Description: clear, yellow, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date & Time: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

(% v/v) Concentration Control	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	15.0	14.0	15.0	14.0	15.0	14.0	14.5	14.5	14.5	14.5	15.0	14.5	15.0
DO (mg/L)	9.9	10.1	10.1	9.9	9.8	9.8	9.6	9.9	10.0	9.9	9.8	10.0	9.8	9.9
pH	7.0	7.0	7.0	6.9	7.0	6.9	7.0	6.8	7.0	6.8	6.9	6.8	7.0	6.7
Cond. (µS/cm)	—	28		27		28		27		27		27		28
Initials	YWL	YWL		A		A		YWL		SSD		YWL		YWL

100-site Concentration ~~20-sp~~	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.0	15.0	14.0	15.0	14.0	14.5	14.5	14.5	14.5	15.0	14.5	14.5
DO (mg/L)	9.8	9.8	10.0	9.9	9.9	9.9	9.8	9.7	10.0	9.6	9.8	9.5	9.9	9.7
pH	8.1	7.8	8.2	8.0	8.1	7.9	8.1	7.9	8.1	7.9	8.1	7.8	8.2	7.8
Cond. (µS/cm)	—	743		745		740		733		744		741		742
Initials	YWL	YWL		A		A		YWL		SSD		YWL		YWL

Concentration 20-spiked	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.0	15.0	14.0	15.0	14.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	9.8	10.0	10.0	9.9	9.9	9.9	9.6	9.8	9.9	9.8	9.9	9.8	9.9	9.7
pH	8.3	7.9	8.3	8.2	8.3	8.2	8.2	8.1	8.2	8.2	8.3	8.0	8.2	7.8
Cond. (µS/cm)	—	1213		1210		1215		1202		1198		1204		1217
Initials	YWL	YWL		A		A		YWL		SSD		YWL		YWL

Concentration 50 spiked	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.0	15.0	14.0	15.0	14.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	9.8	10.0	9.9	9.9	9.9	9.9	9.7	9.7	9.9	9.8	9.9	9.7	9.8	9.6
pH	8.2	8.1	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.0	8.2	8.0
Cond. (µS/cm)	—	1768		1790		1759		1769		1792		1785		1760
Initials	YWL	YWL		A		A		YWL		SSD		YWL		YWL

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, SSD, YWL
Reviewed by: Joe
Date reviewed: Apr. 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date & Time: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Concentration	Days													
	14	15		16		17		18		19		20		21
100-spiked	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.0	15.0	14.0	15.0	14.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	9.9	10.0	10.1	9.9	9.8	9.9	9.6	9.9	9.8	10.0	9.9	9.9	9.8	9.8
pH	8.2	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.2	8.3	8.2	8.2	8.2	8.1
Cond. (µS/cm)	—	2720		2610		2615		2690		2720		2730		2730
Initials	YML	YML		A		A		YML		SSD		YML		YML

Concentration	Days													
	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	14	15		16		17		18		19		20		21
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

DO meter: 3 pH meter: 3 Conductivity meter: 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as $CaCO_3$

Analysts: AWD, SSD, YML
Reviewed by: JGH
Date reviewed: April 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841
Start Date & Time: January 22, 2015 @1500
Stop Date & Time: February 20, 2015 @1130
Test Species: *Oncorhynchus mykiss*

(% v/v) Concentration Control	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
DO (mg/L)	9.7	9.9	10.0	9.9	9.8	9.9	9.9	9.8	9.9	9.9	9.8	9.9	9.8	9.9
pH	8.0	6.7	6.9	6.9	7.0	6.9	7.0	6.8	6.9	6.7	6.8	6.7	7.0	6.7
Cond. (µS/cm)	–	23		23		23		23		23		24		23
Initials	YME	YME		M		M		YME		SSD		YME		YME

Concentration 100 - Site	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.0	14.5	14.5	14.5	13.5	14.5	14.5
DO (mg/L)	9.6	9.6	10.0	9.9	9.8	9.7	9.7	9.7	9.8	9.8	9.7	9.6	9.8	9.6
pH	8.1	7.7	7.9	7.9	8.0	7.9	8.1	7.7	8.2	7.7	8.0	7.7	8.1	7.7
Cond. (µS/cm)	–	740		743		742		720		705		736		728
Initials	YME	YME		M		M		YME		SSD		YME		YME

Concentration spiked 20 - spiked	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.0	14.5	14.5	14.5	14.0	14.5	14.5
DO (mg/L)	9.7	9.9	10.1	9.8	9.9	9.9	9.8	9.8	9.9	9.7	9.7	9.7	9.9	9.7
pH	8.1	7.8	8.1	8.0	8.1	8.0	8.2	8.0	8.2	7.9	8.1	7.9	8.1	7.8
Cond. (µS/cm)	–	1206		1179		1185		1151		1187		1192		1197
Initials	YME	YME		M		M		YME		SSD		YME		YME

Concentration 50 - spiked	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.0	14.5	14.5	14.5	14.0	14.5	14.5
DO (mg/L)	9.8	9.9	10.1	9.9	9.8	9.9	9.9	9.8	9.9	9.8	9.8	9.8	9.8	9.9
pH	8.1	8.0	8.3	8.1	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.0	8.1	8.0
Cond. (µS/cm)	–	1785		1770		1768		1765		1798		1753		1765
Initials	YME	YME		M		M		YME		SSD		YME		YME

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	Control (Jacko site)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, SSD, YME

Reviewed by: JOU

Date reviewed: Apr. 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date & Time: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Concentration	Days													
	21	22		23		24		25		26		27		28
100-spiked	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5	14.3	14.5	14.5	14.5	14.5	14.5	14.0	14.5	14.5	14.5	14.0	14.5	14.5
DO (mg/L)	9.8	10.0	9.9	9.9	9.8	9.8	9.7	10.0	10.1	9.9	9.4	9.8	9.9	10.0
pH	8.1	8.2	8.2	8.2	8.3	8.2	8.3	8.2	8.1	8.2	8.1	8.2	8.1	8.2
Cond. (µS/cm)	–	2700		2690		2700		2730		2720		2720		2730
Initials	YYC	YYC		[illegible]		[illegible]		YYC		SSD		YYC		YYC

Concentration	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days													
	21	22		23		24		25		26		27		28
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: AWD, SSD, YYC
Reviewed by: JGh
Date reviewed: Apr. 10/15

Sample Description: clear, yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date & Time: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

(%v/v) Concentration Control	Days													
	28	29 & final		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5		14.5											
DO (mg/L)	10.0		10.1											
pH	6.9		6.8											
Cond. (µS/cm)	–		29											
Initials	YML		YML											

100-site Concentration	Days													
	28	29 & final		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5		14.5											
DO (mg/L)	10.0		10.1											
pH	8.0		8.0											
Cond. (µS/cm)	–		725											
Initials	YML		YML											

20-spiked Concentration	Days													
	28	29 & final		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5		14.5											
DO (mg/L)	10.0		10.0											
pH	8.0		8.0											
Cond. (µS/cm)	–		1194											
Initials	YML		YML											

30-spiked Concentration	Days													
	28	29 & final		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5		14.5											
DO (mg/L)	10.0		10.1											
pH	8.1		8.1											
Cond. (µS/cm)	–		1767											
Initials	YML		YML											

DO meter: 3 site
pH meter: 3
Conductivity meter: –3

	Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: YML
Reviewed by: JCL
Date reviewed: Apr. 10/15

Sample Description: clear, light yellow colour, some particulates

Comments:

Embryo-Alevin Freshwater Toxicity Test
Water Quality Measurements

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500h
Stop Date & Time: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Concentration	Days 28	29 final		30		31		32		33		34		35
100-Spiked	old	new	~~old~~	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)	14.5		14.5											
DO (mg/L)	9.9		10.1											
pH	8.2		8.1											
Cond. (µS/cm)	–	2730												
Initials	YML	YML												

Concentration	Days 28	29		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days 28	29		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

Concentration	Days 28	29		30		31		32		33		34		35
	old	new	old	new	old	new	old	new	old	new	old	new	old	new
Temperature (°C)														
DO (mg/L)														
pH														
Cond. (µS/cm)														
Initials														

DO meter: 3 **pH meter:** 3 **Conductivity meter:** 3

	site Control (Jacko)			
Hardness*	312			
Alkalinity*	267			

* mg/L as CaCO3

Analysts: YML
Reviewed by: [illegible]
Date reviewed: Apr. 10/15

Sample Description: clear, light yellow colour, some particulates.

Comments:

Chronic Toxicity Test
Daily Mortality

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @1500
Stop Date: February 20, 2015 @1130
Test Species: *Oncorhynchus mykiss*

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities 1	2	3	4	5	6	7	Total Dead Eggs/ Embryos Alevins	Total Undeveloped/ Unhatched Embryos	Total No. Alevins	Total Exposed
Control	1	0	0	0	0	0	0	0	0			
	2							0	0			
	3							1	1			
	4							0	0			
100-site	1							0	0			
	2							0	0			
	3							1	1			
	4							0	0			
20-spiked	1								0			
	2								0			
	3								0			
	4								0			
50-spiked	1								0			
	2							1	1			
	3							0	0			
	4								0			
100-spiked	1								0			
	2								0			
	3								0			
	4								0			
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials		WML	B	n	FMM	SSD	WML	WML	WML			

Comments:

Reviewed by: JOle

Date reviewed: April 10/15

Embryo-Alevin ~~Chronic~~ Toxicity Test
Daily Mortality

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @1500
Stop Date: February 20, 2015 @1130
Test Species: *Oncorhynchus mykiss*

Concentration (%v/v)	Rep	Day of Test - No. of Mortalities							Total Dead Eggs/ Embryos Alevins	Total Undeveloped/ Unhatched Embryos	Total No. Alevins	Total Exposed
		8	9	10	11	12	13	14				
Control	1	0	0	0	0	0	0	0	0			
	2	0				0	0		~~0~~ 1			
	3				0	0	0		~~0~~ 1			
	4	0				0	0		0			
100-	1	0				0		0	1			
site	2	0				0	0		1			
	3	0				0		0	0			
	4		2	2		1			6			
20-	1	0	0	0		2			2			
spiked	2				~~1~~ 2	0			2			
	3				0	0			0			
	4				0	2			3			
50-	1				3	0	2		6			
spiked	2					0		0	2			
	3				0	0	0	0	0			
	4				0	0		~~1~~ 2	3			
100-	1				3	0	2	0	5			
spiked	2					0	0	0	1			
	3				2	0	0	0	0			
	4				3	0		0	4			
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials												

Comments: _____

Reviewed by: JBe **Date reviewed:** Apr. 10/15

Embryo-Alevin Freshwater Toxicity Test
Daily Mortality

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Treatments (% v/v)	Rep	Day of Test - No. of Mortalities 15	16	17	18	19	20	21	Total Dead Eggs/ Embryos Alevins	Total Undeveloped/ Unhatched Embryos	Total No. Alevins	Total Exposed
Control	1	0	0	0	0	0	0	1	1			
	2	↓	0	↓	↓	↓	↓	0	0			
	3		0					0	0			
	4		0		↓	↓	↓	0	0			
100-Site	1		0		1		8	0	9			
	2		0		0		0	1	1			
	3		3①		0		1	0	3			
	4		0		0	↓	3	0	3			
20-Spiked	1	↓	1		2	1	1	0	5			
	2	1	0		0	0	3	0	4			
	3	0	0	↓	0	1	3	1	5			
	4	0	2①		0	0	2	0	4			
50-Spiked	1	4	0	1	2	1	3	1	12			
	2	0	0	0	0	1	5	2	8			
	3	↓	①2	3①	4①	4①	3①	1	17			
	4		①1	①2	1①	0	1	1	6			
100-Spiked	1		0	1①	1	0	6①	1	9			
	2		0	0	0	1	3	1	5			
	3		0	0	1	0	5	1	7			
	4	↓	1①	0	1	0	0	1①	2			
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials		MM	A	M	MM	SSD	MC	MM	MM			

Comments: ① fungal growth present, removed

Reviewed by: JCL **Date reviewed:** Apr. 10/15

Embryo-Alevin Freshwater Toxicity Test
Daily Mortality

Client: AJAX
Sample ID: Jacko
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Concentration (%v/v)	Rep	Day of Test - No. of Mortalities 22 ①	23 ②	24 ②	25	26	27	28	Total Dead Eggs/ Embryos Alevins	Total Undeveloped/ Unhatched Embryos	Total No. Alevins	Total Exposed
Control	1	0	0	0	0	0	0	0	0			
	2	1		0	0	0	1		2			
	3	0		1	0	0	1		2			
	4	0		1	1	0	1		~~2~~ 3			
100-Site	1	0		1	1		1		3			
	2	3		5	3		0		11			
	3	0	1	0	1				2			
	4	0	0	1	0				1			
20-spiked	1	2	2	0	0				4			
	2	0	0	0	1				1			
	3	1	1	6	3	1			12			
	4	0	0	0	0	0			0			
50-spiked	1	1	0	2	0	0		~~1~~ 0	3			
	2	0	0	2	0	0			2			
	3	1	1	0	1	0			3			
	4	0	1	0	1	1			3			
100-spiked	1	2	0	0	1	0		1	4			
	2	~~0~~ 1	3	2	3	0	1	0	10			
	3	5 ②	~~3~~ 4	4	1	0	0	0	14			
	4	2	1	2	1	1	0	0	7			
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials		[illegible]	[illegible]	[illegible]	[illegible]	SSD	[illegible]	[illegible]	[illegible]			

Comments: ① >50% controls at alevin stage
② fungal growth present, removed

Reviewed by: [illegible signature]
Date reviewed: Apr. 10/15

Nautilus Environmental

Embryo-Alevin Freshwater Toxicity Test
Daily Mortality

Client: AJAX
Sample ID: Jacks
Work Order #: 14841

Start Date & Time: January 22, 2015 @ 1500
Stop Date: February 20, 2015 @ 1130
Test Species: *Oncorhynchus mykiss*

Concentration (%v/v)	Rep	Day of Test - No. of Mortalities 29	30	31	32	33	34	35	Total Dead Eggs/Alevins	Total Abnormal Alevins	Total Normal Alevins	Total Exposed
control	1	0							0	10	28	30
	2	0							0	0	27	30
	3	0							0	10	25	30
	4	0							0	0	27	30
100-site	1	0							0	0	16	29
	2	0							0	20	15	30
	3	0							0	0	24	30
	4	1							1	0	19	30
20-spiked	1	0							0	0	18	29
	2	0							0	0	23	30
	3	0							0	0	13	30
	4	0							0	13	22	30
50-spiked	1	0							0	0	9	30
	2	0							0	0	17	30
	3	0							0	0	10	30
	4	0							0	0	18	30
100-spiked	1	0							0	0	13	31
	2	0							0	14	13	30
	3	0							0	15	7	29
	4	0							0	12	17	31
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
	1											
	2											
	3											
	4											
Tech Initials		MME							MME	MME	MME	MME

Comments: ① Scoliosis ② scoliosis - coiled body ③ swimming slowly, sideways.
④ 2-headed sharing yolk sac, joined at tail.
⑤ head slightly bent to side

Reviewed by: JOH **Date reviewed:** Apr. 10/15

Rainbow Trout Embryo-Alevin Toxicity Test

Client: AJAX

WO#: 14841

Sample ID: Jacko

Test Initiation Date: January 22, 2015

Test Termination Date: February 20, 2015

Test Conc.		Weekly Mortality Counts					Total	Abnormal	Normal			Survival			Normal Alevins		
(% v/v)	Rep	1	2	3	4	5	Dead	Alevins	Alevins	Total No. Alevins	Total No. Exposed						
Control	1	0	0	1	0	0	1	1	28	29	30	96.7			93.3		
	2	0	1	0	2	0	3	0	27	27	30	90.0			90.0		
	3	1	1	0	2	0	4	1	25	26	30	86.7	**Mean**	**SD**	83.3	**Mean**	**SD**
	4	0	0	0	3	0	3	0	27	27	30	90.0	90.8	4.2	90.0	89.2	4.2
100 - site		0	1	9	3	0	13	0	16	16	29	55.2			55.2		
	2	0	1	1	11	0	13	2	15	17	30	56.7			50.0		
	3	1	0	3	2	0	6	0	24	24	30	80.0	**Mean**	**SD**	80.0	**Mean**	**SD**
	4	0	6	3	1	1	11	0	19	19	30	63.3	63.8	11.4	63.3	62.1	13.1
20 - spiked	1	0	2	5	4	0	11	0	18	18	29	62.1			62.1		
	2	0	2	4	1	0	7	0	23	23	30	76.7			76.7		
	3	0	0	5	12	0	17	0	13	13	30	43.3	**Mean**	**SD**	43.3	**Mean**	**SD**
	4	0	3	4	0	0	7	1	22	23	30	76.7	64.7	15.8	73.3	63.9	15.0
50 - spiked	1	0	6	12	3	0	21	0	9	9	30	30.0			30.0		
	2	1	2	8	2	0	13	0	17	17	30	56.7			56.7		
	3	0	0	17	3	0	20	0	10	10	30	33.3	**Mean**	**SD**	33.3	**Mean**	**SD**
	4	0	3	6	3	0	12	0	18	18	30	60.0	45.0	15.5	60.0	45.0	15.5
100 - spiked	1	0	5	9	4	0	18	0	13	13	31	41.9			41.9		
	2	0	1	5	10	0	16	1	13	14	30	46.7			43.3		
	3	0	0	7	14	0	21	1	7	8	29	27.6	**Mean**	**SD**	24.1	**Mean**	**SD**
	4	0	4	2	7	0	13	1	17	18	31	58.1	43.6	12.6	54.8	41.1	12.7

JGe
Apr. 10/15

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	15-8042-7949	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Mar-15 16:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~ Jacko site water BTC
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~ Trout lodge BTC	**Age:**	
Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ Sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	~~63h~~ BTC	**Station:**	Jacko		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1133617	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL
EC5	368.7	N/A	488.4
EC10	420.8	N/A	907.9
EC15	480.3	57.12	1034
EC20	548.2	201.6	N/A
EC25	625.6	271.9	N/A
EC40	>1428	N/A	N/A
EC50	>1428	N/A	N/A

Survival Rate Summary — Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
52	Negative Control	4	0.6379	0.5517	0.8	0.05686	0.1137	17.83%	0.0%	76	119
323		4	0.6468	0.4333	0.7667	0.07905	0.1581	24.44%	-1.4%	77	119
714		4	0.45	0.3	0.6	0.07758	0.1552	34.48%	29.46%	54	120
1428		4	0.4356	0.2759	0.5806	0.0631	0.1262	28.97%	31.71%	53	121

Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	0.5517	0.5667	0.8	0.6333
323		0.6207	0.7667	0.4333	0.7667
714		0.3	0.5667	0.3333	0.6
1428		0.4194	0.4667	0.2759	0.5806

Survival Rate Binomials

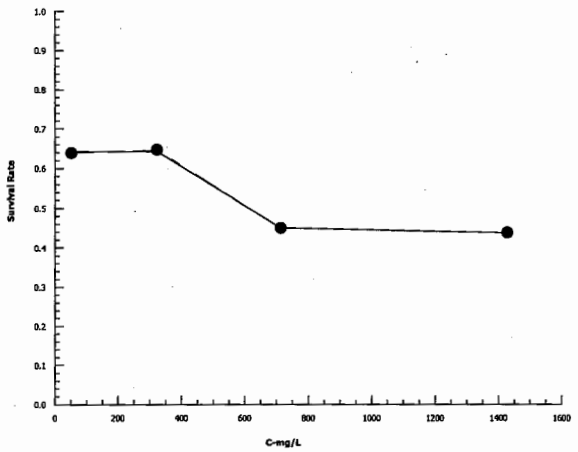
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52 ✓	Negative Control	16/29	15/30	24/30	19/30
323 ✓		18/29	23/30	13/30	22/30
714 ✓		9/30	17/30	10/30	18/30
1428 ✓		13/31	13/30	7/29	17/31

* negative control = Jacko site water (unamended)

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	15-8042-7949	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Mar-15 16:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	01-1716-1924	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Apr-15 18:05	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~ Jacko site water BTC
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~ Trout lodge BTC	**Age:**	
Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	63h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	323	714	480.2	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
52		323	1	1.0000	Exact	Non-Significant Effect
52		714	0.002516	0.0050	Exact	Significant Effect
52		1428	0.001367	0.0041	Exact	Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
52	Negative Contr	76	43	119	0.6387	0.3613	0.0%
323		77	42	119	0.6471	0.3529	-1.32%
714		54	66	120	0.45	0.55	29.54%
1428		53	68	121	0.438	0.562	31.42%

Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	0.5517	0.5667	0.8	0.6333
323		0.6207	0.7667	0.4333	0.7667
714		0.3	0.5667	0.3333	0.6
1428		0.4194	0.4667	0.2759	0.5806

Survival Rate Binomials

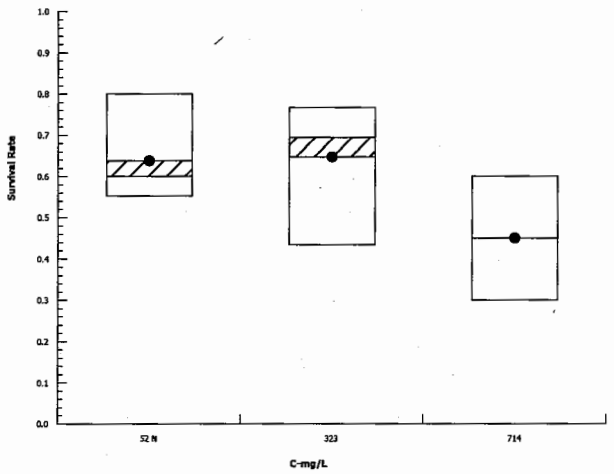
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	16/29	17/30	24/30	19/30
323		18/29	23/30	13/30	23/30
714		9/30	17/30	10/30	18/30
1428		13/31	14/30	8/29	18/31

* negative control = Jacko site water (unamended)

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	01-1716-1924	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Apr-15 18:05	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Graphics



Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	16-1574-1480	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Mar-15 16:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~ Jacko site water BTC
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~ Trout Lodge BTC	**Age:**	
Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	~~83h~~ BTC	**Station:**	Jacko		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	716008	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL
EC5	371.1	N/A	729.3
EC10	426.3	N/A	999.6
EC15	489.7	13.34	1182
EC20	562.6	135.9	1744
EC25	646.2	237.9	N/A
EC40	>1428	N/A	N/A
EC50	>1428	N/A	N/A

Proportion Normal Summary

			Calculated Variate(A/B)								
C-mg/L	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**	**A**	**B**
52	Negative Control	4	0.6213	0.5	0.8	0.0656	0.1312	21.12%	0.0%	74	119
323		4	0.6385	0.4333	0.7667	0.07518	0.1504	23.55%	-2.78%	76	119
714		4	0.45	0.3	0.6	0.07758	0.1552	34.48%	27.57%	54	120
1428		4	0.4106	0.2414	0.5484	0.06339	0.1268	30.87%	33.91%	50	121

Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	0.5517	0.5	0.8	0.6333
323		0.6207	0.7667	0.4333	0.7333
714		0.3	0.5667	0.3333	0.6
1428		0.4194	0.4333	0.2414	0.5484

Proportion Normal Binomials

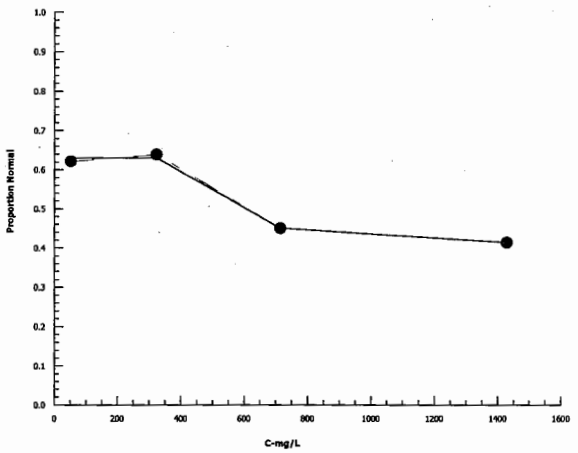
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	16/29	15/30	24/30	19/30
323		18/29	23/30	13/30	22/30
714		9/30	17/30	10/30	18/30
1428		13/31	13/30	7/29	17/31

* negative control = Jacko site water (unamended)

Salmonid Embryo-Alevin Survival and Development Test **Nautilus Environmental**

Analysis ID:	16-1574-1480	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Mar-15 16:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



CETIS Analytical Report

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	19-3373-4299	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Apr-15 18:05	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss	**Brine:**	Jacko site water BTC
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~ trout lodge BTC	**Age:**	
Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	63h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	323	714	480.2	

Fisher Exact/Bonferroni-Holm Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
52		323	1	1.0000	Exact	Non-Significant Effect
52		714	0.005563	0.0111	Exact	Significant Effect
52		1428	0.000923	0.0028	Exact	Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
52	Negative Contr	74	45	119	0.6218	0.3782	0.0%
323		76	43	119	0.6387	0.3613	-2.7%
714		54	66	120	0.45	0.55	27.64%
1428		50	71	121	0.4132	0.5868	33.55%

Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	0.5517	0.5	0.8	0.6333
323		0.6207	0.7667	0.4333	0.7333
714		0.3	0.5667	0.3333	0.6
1428		0.4194	0.4333	0.2414	0.5484

Proportion Normal Binomials

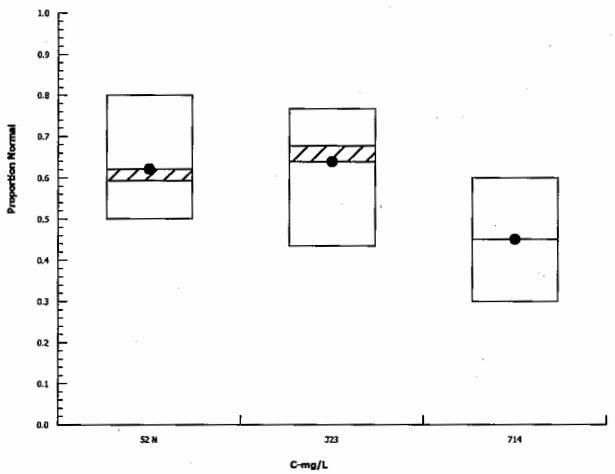
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
52	Negative Control	16/29	15/30	24/30	19/30
323		18/29	23/30	13/30	22/30
714		9/30	17/30	10/30	18/30
1428		13/31	13/30	7/29	17/31

* negative control = Jacko site water (unamended)

Salmonid Embryo-Alevin Survival and Development Test | **Nautilus Environmental**

Analysis ID:	19-3373-4299	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.8.7
Analyzed:	09 Apr-15 18:05	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Graphics



CETIS Analytical Report

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	07-4907-3079	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	10 Apr-15 9:18	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~ Jacko site water BTC
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss Trout lodge BTC	**Brine:**	
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~	**Age:**	
Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	63h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Fails survival rate

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
1		52	3.84E-07	<0.0001	Exact	Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
1	Lab Water	109	11	120	0.908	0.0917	0.0%
52	Negative Contr	76	43	119	0.639	0.361	29.7%

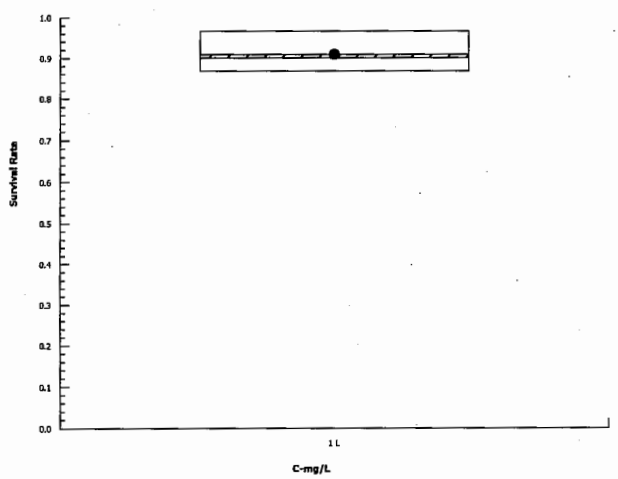
Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
1	Lab Water	0.9667	0.9	0.8667	0.9
52	Negative Control	0.5517	0.5667	0.8	0.6333

Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
1	Lab Water	29/30	27/30	26/30	27/30
52	Negative Control	16/29	17/30	24/30	19/30

Graphics



* Lab water = dechlorinated tap water
negative control = Jacko site water (unamended)

CETIS Analytical Report

Salmonid Embryo-Alevin Survival and Development Test — **Nautilus Environmental**

Analysis ID:	20-5614-6195	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.8.7
Analyzed:	10 Apr-15 9:18	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes
Batch ID:	12-9392-5771	**Test Type:**	Survival-Development	**Analyst:**	Brett Lucas
Start Date:	22 Jan-15 15:00	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	~~Dechlorinated Tap Water~~ Jacko site water BTC
Ending Date:	20 Feb-15 11:30	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	28d 20h	**Source:**	~~Vancouver Island Trout Hatchery~~ Trout lodge RTC	**Age:**	

Sample ID:	04-6307-7987	**Code:**	1B9A0263	**Client:**	AJAX
Sample Date:	20 Jan-15	**Material:**	~~Total Dissolved Solids~~ sulphate BTC	**Project:**	Ajax sulphate testing
Receive Date:	21 Jan-15	**Source:**	AJAX sulphate testing		
Sample Age:	63h	**Station:**	Jacko		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Fails proportion normal

Fisher Exact Test

Sample	vs	Sample	Test Stat	P-Value	P-Type	Decision(α:5%)
1		52	7.67E-07	<0.0001	Exact	Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
1	Lab Water	107	13	120	0.892	0.108	0.0%
52	Negative Contr	74	45	119	0.622	0.378	30.3%

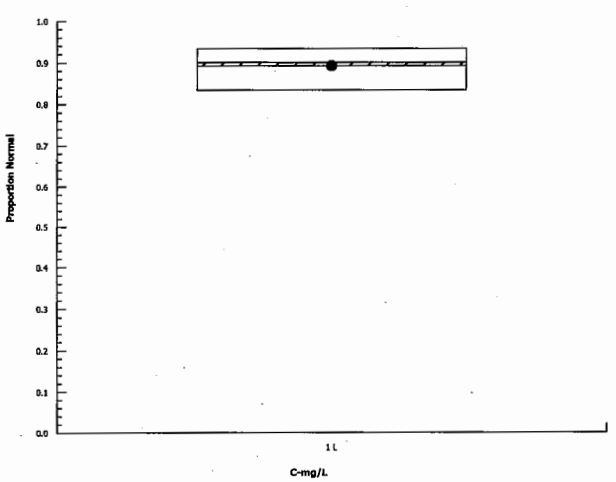
Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
1	Lab Water	0.9333	0.9	0.8333	0.9
52	Negative Control	0.5517	0.5	0.8	0.6333

Proportion Normal Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
1	Lab Water	28/30	27/30	25/30	27/30
52	Negative Control	16/29	15/30	24/30	19/30

Graphics



* Lab water = dechlorinated tap water
negative control = Jacko site water (unamended)

APPENDIX B – Analytical chemistry results

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 06-NOV-14
Report Date: 14-NOV-14 17:56 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1544091

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1544091-1	L1544091-2			
	Description	Water	Water			
	Sampled Date	06-NOV-14	06-NOV-14			
	Sampled Time	11:00	11:00			
	Client ID	AJAX SPIKED	AJAX SITE			
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Bromide (Br) (mg/L)	<1.0 DLM	<0.050			
	Chloride (Cl) (mg/L)	60	55.2			
	Fluoride (F) (mg/L)	<0.40 DLM	0.220			
	Nitrate (as N) (mg/L)	<0.10 DLM	0.0276			
	Nitrite (as N) (mg/L)	<0.020 DLM	0.0033			
	Sulfate (SO4) (mg/L)	1500	48.9			
Total Metals	Aluminum (Al)-Total (mg/L)	0.23	<0.20			
	Antimony (Sb)-Total (mg/L)	<0.20	<0.20			
	Arsenic (As)-Total (mg/L)	<0.20	<0.20			
	Barium (Ba)-Total (mg/L)	0.063	0.063			
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.010	<0.010			
	Calcium (Ca)-Total (mg/L)	239	55.6			
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010			
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010			
	Copper (Cu)-Total (mg/L)	<0.010	<0.010			
	Iron (Fe)-Total (mg/L)	<0.030	<0.030			
	Lead (Pb)-Total (mg/L)	<0.050	<0.050			
	Lithium (Li)-Total (mg/L)	<0.010	<0.010			
	Magnesium (Mg)-Total (mg/L)	256	37.5			
	Manganese (Mn)-Total (mg/L)	<0.0050	<0.0050			
	Molybdenum (Mo)-Total (mg/L)	<0.030	<0.030			
	Nickel (Ni)-Total (mg/L)	<0.050	<0.050			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	14.5	11.0			
	Selenium (Se)-Total (mg/L)	<0.20	<0.20			
	Silicon (Si)-Total (mg/L)	5.97	6.00			
	Silver (Ag)-Total (mg/L)	<0.010	<0.010			
	Sodium (Na)-Total (mg/L)	70.6	38.1			
	Strontium (Sr)-Total (mg/L)	0.466	0.387			
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20			
	Tin (Sn)-Total (mg/L)	<0.030	<0.030			
	Titanium (Ti)-Total (mg/L)	0.023	<0.010			
	Vanadium (V)-Total (mg/L)	<0.030	<0.030			
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Bromide (Br)	DLM	L1544091-1, -2
Duplicate	Chloride (Cl)	DLM	L1544091-1, -2
Duplicate	Nitrite (as N)	DLM	L1544091-1, -2
Duplicate	Nitrate (as N)	DLM	L1544091-1, -2
Duplicate	Fluoride (F)	DLM	L1544091-1, -2
Duplicate	Nitrite (as N)	DLM	L1544091-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1544091-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑PDF ☑EXCEL ☐EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐Criteria on Report - provide details below if box checked	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax brett@nautilusenvironmental.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	anions	cations (ICP-OES)												Number of Containers
						P												
	AJAX spiked	06/11/2014	11:00	water	R	R												2
	AJAX site	06/11/2014	11:00	water	R	R												2

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	One bottle for each sample has been preserved with HNO3 and should be used for metals analysis only. The other bottle has not been preserved and should be used for anions only. Bottles are labelled with the analysis they are meant for and bottles that have been preserved have the preserved box ticked. Thanks.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)			
Frozen ☐	SIF Observations Yes ☐ No ☐		
Ice packs Yes ☐ No ☐	Custody seal intact Yes ☐ No ☐		
Cooling Initiated ☐			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: Shayan	Date: Nov 6	Time: 20:00 18°C

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0328e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: BRETT LUCAS
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 14-NOV-14
Report Date: 20-NOV-14 16:40 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1547104

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1205
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1547104-1	L1547104-2	L1547104-3	L1547104-4	L1547104-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	06-NOV-14	06-NOV-14	06-NOV-14	06-NOV-14	06-NOV-14
	Sampled Time					
	Client ID	LAB CONTROL	SITE CONTROL	13%	20%	30%
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	8.16	50.6	242	336	475
Total Metals	Calcium (Ca)-Total (mg/L)	35.7	47.9	70.0	80.2	93.9
	Magnesium (Mg)-Total (mg/L)	0.91	33.1	58.6	71.2	88.9

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1547104-6	L1547104-7	L1547104-8		
	Description	WATER	WATER	WATER		
	Sampled Date	06-NOV-14	06-NOV-14	06-NOV-14		
	Sampled Time					
	Client ID	44%	67%	100%		
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	684	1000	1470		
Total Metals	Calcium (Ca)-Total (mg/L)	114	147	200		
	Magnesium (Mg)-Total (mg/L)	113	154	217		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1205

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Nautilus Environmental

(1) BRITISH COLUMBIA
8664 Commerce Court
Burnaby British Columbia Ca
Phone 604.420.8773
Fax 604.357.1361

L1547104-COFC

Chain of Custody

1205

Date NOV 6/14 Page 1 of 1

Sample Collection by: _____

Report to:
Company Nautilus Environmental
Address (1) _____
City _____ Prov. _____ PC _____
Contact Brett@nautilusenvironmental.com
Phone No. _____

Invoice to:
Company same as report to
Address _____
City _____ Prov. _____ PC _____
Contact Brett@nautilusenvironmental.com
Phone No. use as nautilusenvironmental.com

SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS	ANALYSIS REQUIRED: sulphate (SO_4)	ANALYSIS REQUIRED: calcium (Ca^{2+}) and magnesium (Mg^{2+})	RECEIPT TEMPERATURE (°C)
lab control	NOV6/14	—	water	125mL plastic	1	AJAX - initiation	X	X	
site control		—					X	X	
13%		—					X	X	
20%		—					X	X	
30%		—					X	X	
44%		—					X	X	
67%		—					X	X	
100%		—					X	X	

PROJECT INFORMATION	SAMPLE RECEIPT	RELINQUISHED BY (CLIENT)	RELINQUISHED BY (COURIER)
CLIENT	TOTAL NO. OF CONTAINERS	(Signature) (Time)	(Signature) (Time)
P.O. NO.	REC'D GOOD CONDITION	(Printed Name) (Date)	(Printed Name) (Date)
SHIPPED VIA:		(Company) Nautilus Environmental	(Company)

SPECIAL INSTRUCTIONS/COMMENTS:

Short Holding Time

Rush Processing

RECEIVED BY (COURIER)	RECEIVED BY (LABORATORY)
(Signature) (Time)	(Signature) PAUL NOV 14 @ 21:00 (Time)
(Printed Name) (Date)	(Printed Name) 11.2°C (Date)
(Company)	

Additional costs may be required for ... Net 30 unless otherwise contracted.

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

P. subcapitata chemistry

concentration	sulphate	calcium	magnesium	hardness
site	50.6	47.9	33.1	255.7029
13%	242	70	58.6	415.7621
20%	336	80.2	71.2	493.0536
30%	475	93.9	88.9	600.0615
44%	684	114	113	749.3702
67%	1000	147	154	1000.399
100%	1470	200	217	1391.847

NAUTILUS ENVIRONMENTAL
ATTN: BRETT LUCAS
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 14-NOV-14
Report Date: 20-NOV-14 16:38 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1547101

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1212
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1547101-1	L1547101-2	L1547101-3	L1547101-4	L1547101-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	12-NOV-14	12-NOV-14	12-NOV-14	12-NOV-14	12-NOV-14
	Sampled Time					
	Client ID	SITE CONTROL	13%	20%	30%	44%
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	50.1	240	338	473	673
Total Metals	Calcium (Ca)-Total (mg/L)	47.1	68.3	76.4	96.2	120
	Magnesium (Mg)-Total (mg/L)	32.2	57.4	68.1	89.9	117

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1547101-6	L1547101-7			
	Description	WATER	WATER			
	Sampled Date	12-NOV-14	12-NOV-14			
	Sampled Time					
	Client ID	67%	100%			
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1030	1450			
Total Metals	Calcium (Ca)-Total (mg/L)	164	195			
	Magnesium (Mg)-Total (mg/L)	172	213			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1212

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Nautilus Environmental

(1) BRITISH COLUMBIA
8664 Commerce Court
Burnaby British Columbia Canada V5A 4
Phone 604.420.8773
Fax 604.357.1361

L1547101-COFC

Chain of Custody

1212

Date NOV 12/14 Page 1 of 1

Sample Collection by: _____

Report to:
Company Nautilus Environmental
Address (1)
City _____ Prov. _____ PC _____
Contact Brett@nautilusenvironmental
Phone No. _____

Invoice to:
Company _____
Address _____
City _____ Prov. _____ PC _____
Contact Brett@nautilusenvironmental
Phone No. lisa@nautilusenvironmental

SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS	ANALYSIS REQUIRED: Sulphate (SO_4^{2-})	ANALYSIS REQUIRED: Calcium (Ca^{2+}) + Magnesium (Mg^{2+})	RECEIPT TEMPERATURE (°C)
site control	NOV 12/14	—	water	Plastic 125mL	1	termination - AJAX proj.	X	X	
13%		—					X	X	
20%		—					X	X	
30%		—					X	X	
44%		—					X	X	
67%		—					X	X	
100%		—					X	X	

PROJECT INFORMATION	SAMPLE RECEIPT
CLIENT	TOTAL NO. OF CONTAINERS
P.O. NO.	REC'D GOOD CONDITION
SHIPPED VIA:	

SPECIAL INSTRUCTIONS/COMMENTS:

Short Holding Time

Rush Processing

RELINQUISHED BY (CLIENT)	RELINQUISHED BY (COURIER)
(Signature) Brett Lucas (Time)	(Signature) (Time)
(Printed Name) Nautilus Environmental (Date)	(Printed Name) (Date)
(Company)	(Company)
RECEIVED BY (COURIER)	**RECEIVED BY (LABORATORY)** PAUL
(Signature) (Time)	(Signature) NOV 14 @ 21:00 (Time)
(Printed Name) (Date)	(Printed Name) 9.9°C (Date)
(Company)	

...by be required for sample disposal or storage. Net 30 unless otherwise contracted.

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

	C. dubia initiation				C. dubia termination				C. dubia avg			
concentration	sulphate	calcium	magnesium	hardness	sulphate	calcium	magnesium	hardness	sulphate	calcium	magnesium	hardness
lab	8.16	35.7	0.91	92.82039					8.16	35.7	0.91	92.82039
site	50.6	47.9	33.1	255.7029	50.1	47.1	32.2	250.0039	50.35	47.5	32.65	252.8534
13%	242	70	58.6	415.7621	240	68.3	57.4	406.5831	241	69.15	58	411.1726
20%	336	80.2	71.2	493.0536	338	76.4	68.1	470.8175	337	78.3	69.65	481.9356
30%	475	93.9	88.9	600.0615	473	96.2	89.9	609.9147	474	95.05	89.4	604.9881
44%	684	114	113	749.3702	673	120	117	780.7986	678.5	117	115	765.0844
67%	1000	147	154	1000.399	1030	164	172	1116.875	1015	155.5	163	1058.637
100%	1470	200	217	1391.847	1450	195	213	1362.914	1460	197.5	215	1377.381

NAUTILUS ENVIRONMENTAL
ATTN: BRETT LUCAS
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 24-JAN-15
Report Date: 30-JAN-15 11:26 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1570667

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1570667-1	L1570667-2			
	Description	Water	Water			
	Sampled Date	22-JAN-15	22-JAN-15			
	Sampled Time	16:00	16:00			
	Client ID	AJAX SPIKED	AJAX SITE			
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	267	266			
	Bromide (Br) (mg/L)	<1.0 DLM	<0.10 DLM			
	Chloride (Cl) (mg/L)	76	60.8			
	Fluoride (F) (mg/L)	<0.40 DLM	0.208			
	Nitrate (as N) (mg/L)	0.12	0.078			
	Nitrite (as N) (mg/L)	<0.020 DLM	0.0113			
	Sulfate (SO4) (mg/L)	1500	53.6			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	15.4	15.7			
Total Metals	Aluminum (Al)-Total (mg/L)	0.30	<0.20			
	Antimony (Sb)-Total (mg/L)	<0.20	<0.20			
	Arsenic (As)-Total (mg/L)	<0.20	<0.20			
	Barium (Ba)-Total (mg/L)	0.069	0.069			
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.010	<0.010			
	Calcium (Ca)-Total (mg/L)	252	58.0			
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010			
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010			
	Copper (Cu)-Total (mg/L)	<0.010	<0.010			
	Iron (Fe)-Total (mg/L)	0.041	<0.030			
	Lead (Pb)-Total (mg/L)	<0.050	<0.050			
	Lithium (Li)-Total (mg/L)	<0.010	<0.010			
	Magnesium (Mg)-Total (mg/L)	247	40.4			
	Manganese (Mn)-Total (mg/L)	0.0143	0.0132			
	Molybdenum (Mo)-Total (mg/L)	<0.030	<0.030			
	Nickel (Ni)-Total (mg/L)	<0.050	<0.050			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	14.5	11.5			
	Selenium (Se)-Total (mg/L)	<0.20	<0.20			
	Silicon (Si)-Total (mg/L)	6.32	6.36			
	Silver (Ag)-Total (mg/L)	<0.010	<0.010			
	Sodium (Na)-Total (mg/L)	69.1	38.7			
	Strontium (Sr)-Total (mg/L)	0.484	0.405			
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20			
	Tin (Sn)-Total (mg/L)	<0.030	<0.030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1570667-1	L1570667-2			
	Description	Water	Water			
	Sampled Date	22-JAN-15	22-JAN-15			
	Sampled Time	16:00	16:00			
	Client ID	AJAX SPIKED	AJAX SITE			
Grouping	**Analyte**					
WATER						
Total Metals	Titanium (Ti)-Total (mg/L)	0.021	<0.010			
	Vanadium (V)-Total (mg/L)	<0.030	<0.030			
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1570667-1	AJAX SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1570667-2	AJAX SITE	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1570667-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax	brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2		

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	brett@nautilusenvironmental.com
Company:		Email 2	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	anions	cations (ICP-OES)	alkalinity	DOC BTC								Number of Containers
	AJAX spiked	22/01/2014	16:00	water	R	R	R	P								1
	AJAX site	22/01/2014	16:00	water	R	R	R	P								1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	One bottle for each sample has been preserved with HNO3 and should be used for metals analysis only. The other bottle has not been preserved and should be used for anions only. Bottles are labelled with the analysis they are meant for and bottles that have been preserved have the preserved box ticked. Thanks.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated	☐			

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
				6.5°C	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: Eli	Date: Jan 23	Time: 17:25

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v69 Front04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 04-FEB-15
Report Date: 12-FEB-15 13:02 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1574833

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1574833-1	L1574833-2			
	Description	water	water			
	Sampled Date	30-JAN-15	30-JAN-15			
	Sampled Time	10:00	10:00			
	Client ID	AJAX SPIKED	AJAX SITE			
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	267	270			
	Bromide (Br) (mg/L)	<1.0 DLM	<0.050			
	Chloride (Cl) (mg/L)	61	57.8			
	Fluoride (F) (mg/L)	0.40	0.221			
	Nitrate (as N) (mg/L)	0.27	0.0857			
	Nitrite (as N) (mg/L)	0.022	0.0145			
	Sulfate (SO4) (mg/L)	1520	51.7			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.20	<0.20			
	Antimony (Sb)-Total (mg/L)	<0.20	<0.20			
	Arsenic (As)-Total (mg/L)	<0.20	<0.20			
	Barium (Ba)-Total (mg/L)	0.069	0.072			
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.010	<0.010			
	Calcium (Ca)-Total (mg/L)	260	60.1			
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010			
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010			
	Copper (Cu)-Total (mg/L)	<0.010	<0.010			
	Iron (Fe)-Total (mg/L)	<0.030	<0.030			
	Lead (Pb)-Total (mg/L)	<0.050	<0.050			
	Lithium (Li)-Total (mg/L)	0.020	<0.010			
	Magnesium (Mg)-Total (mg/L)	254	41.1			
	Manganese (Mn)-Total (mg/L)	0.0132	0.0126			
	Molybdenum (Mo)-Total (mg/L)	<0.030	<0.030			
	Nickel (Ni)-Total (mg/L)	<0.050	<0.050			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	15.6	12.4			
	Selenium (Se)-Total (mg/L)	<0.20	<0.20			
	Silicon (Si)-Total (mg/L)	6.29	6.46			
	Silver (Ag)-Total (mg/L)	<0.010	<0.010			
	Sodium (Na)-Total (mg/L)	69.8	40.1			
	Strontium (Sr)-Total (mg/L)	0.543	0.416			
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20			
	Tin (Sn)-Total (mg/L)	<0.030	<0.030			
	Titanium (Ti)-Total (mg/L)	0.013	<0.010			
	Vanadium (V)-Total (mg/L)	<0.030	<0.030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1574833-1	L1574833-2			
	Description	water	water			
	Sampled Date	30-JAN-15	30-JAN-15			
	Sampled Time	10:00	10:00			
	Client ID	AJAX SPIKED	AJAX SITE			
Grouping	**Analyte**					
WATER						
Total Metals	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1574833-1	AJAX SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1574833-2	AJAX SITE	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L1574833-1, -2
Matrix Spike	Silicon (Si)-Total	MS-B	L1574833-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1574833-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / L	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑PDF ☑EXCEL ☐EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐Criteria on Report - provide details below if box checked	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax brett@nautilusenvironmental.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	anions	cations (ICP-OES)	alkalinity	Number of Containers
	AJAX spiked	30/01/2014	10:00	water	R	R	R	1
	AJAX site	30/01/2014	10:00	water	R	R	R	1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	One bottle for each sample has been preserved with HNO3 and should be used for metals analysis only. The other bottle has not been preserved and should be used for anions only. Bottles are labelled with the analysis they are meant for and bottles that have been preserved have the preserved box ticked. Thanks.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			17		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: DT	Date: Feb 04/	Time: 16:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

1/15

NAUTILUS ENVIRONMENTAL
ATTN: BRETT LUCAS
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 06-FEB-15
Report Date: 16-FEB-15 15:41 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1575608

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1575608-1	L1575608-2			
	Description	WATER	WATER			
	Sampled Date	06-FEB-15	06-FEB-15			
	Sampled Time	10:00	10:00			
	Client ID	JACKO SPIKED 100%	JACKO SITE WATER			
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	260	264			
	Bromide (Br) (mg/L)	<1.0 DLM	<0.10 DLM			
	Chloride (Cl) (mg/L)	60	59.5			
	Fluoride (F) (mg/L)	<0.40 DLM	0.216			
	Nitrate (as N) (mg/L)	0.16	0.114			
	Nitrite (as N) (mg/L)	<0.020 DLM	0.0110			
	Sulfate (SO4) (mg/L)	1510	53.3			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.20	<0.20			
	Antimony (Sb)-Total (mg/L)	<0.20	<0.20			
	Arsenic (As)-Total (mg/L)	<0.20	<0.20			
	Barium (Ba)-Total (mg/L)	0.069	0.069			
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.010	<0.010			
	Calcium (Ca)-Total (mg/L)	255	58.4			
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010			
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010			
	Copper (Cu)-Total (mg/L)	<0.010	<0.010			
	Iron (Fe)-Total (mg/L)	0.041	0.037			
	Lead (Pb)-Total (mg/L)	<0.050	<0.050			
	Lithium (Li)-Total (mg/L)	0.018	<0.010			
	Magnesium (Mg)-Total (mg/L)	248	38.9			
	Manganese (Mn)-Total (mg/L)	0.0179	0.0172			
	Molybdenum (Mo)-Total (mg/L)	<0.030	<0.030			
	Nickel (Ni)-Total (mg/L)	<0.050	<0.050			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	14.9	11.5			
	Selenium (Se)-Total (mg/L)	<0.20	<0.20			
	Silicon (Si)-Total (mg/L)	6.45	6.44			
	Silver (Ag)-Total (mg/L)	<0.010	<0.010			
	Sodium (Na)-Total (mg/L)	72.8	40.7			
	Strontium (Sr)-Total (mg/L)	0.572	0.419			
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20			
	Tin (Sn)-Total (mg/L)	<0.030	<0.030			
	Titanium (Ti)-Total (mg/L)	0.017	<0.010			
	Vanadium (V)-Total (mg/L)	<0.030	<0.030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1575608-1	L1575608-2			
	Description	WATER	WATER			
	Sampled Date	06-FEB-15	06-FEB-15			
	Sampled Time	10:00	10:00			
	Client ID	JACKO SPIKED 100%	JACKO SITE WATER			
Grouping	**Analyte**					
WATER						
Total Metals	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1575608-1	JACKO SPIKED 100%	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1575608-2	JACKO SITE WATER	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L1575608-1, -2
Matrix Spike	Silicon (Si)-Total	MS-B	L1575608-1, -2
Matrix Spike	Sodium (Na)-Total	MS-B	L1575608-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1575608-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2, E or P:
		Email 2	

Invoice To		Invoice Distribution
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax brett@nautilusenvironmental.com
Company:		Email 2
Contact:		

Project Information	Oil and Gas Required Fields (client use)	
ALS Qu	Approver ID:	Cost Center:
Job #:	GL Account:	Routing Code:
PO / AF	Activity Code:	
LSD:	Location:	
ALS	ALS Contact:	Sampler:

L1575608-COFC

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	anions	cations (ICP-OES)	alkalinity	Number of Containers
	Jacko spiked 100%	06/02/2015	10:00	water	R	R	R	1
	Jacko site water	06/02/2015	10:00	water	R	R	R	1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
16°C					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date: Feb 6	Time: 1700	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 24-JAN-15
Report Date: 02-FEB-15 14:28 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1570665

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1570665-1 Water 22-JAN-15 16:00 AJ-100 SPIKED	L1570665-2 Water 22-JAN-15 16:00 AJ-50 SPIKED	L1570665-3 Water 22-JAN-15 16:00 AJ-20 SPIKED	L1570665-4 Water 22-JAN-15 16:00 AJ-SITE CONTROL	L1570665-5 Water 22-JAN-15 16:00 AJ-CONTROL
Sample ID		L1570665-1	L1570665-2	L1570665-3	L1570665-4	L1570665-5
Description		Water	Water	Water	Water	Water
Sampled Date		22-JAN-15	22-JAN-15	22-JAN-15	22-JAN-15	22-JAN-15
Sampled Time		16:00	16:00	16:00	16:00	16:00
Client ID		AJ-100 SPIKED	AJ-50 SPIKED	AJ-20 SPIKED	AJ-SITE CONTROL	AJ-CONTROL
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1500	734	339	54.0	1.34
Total Metals	Calcium (Ca)-Total (mg/L)	262	157	99.2	57.6	3.58
	Magnesium (Mg)-Total (mg/L)	261	142	84.1	39.9	0.23

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1570665-1	AJ-100 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1570665-2	AJ-50 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1570665-3	AJ-20 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1570665-4	AJ-SITE CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1570665-5	AJ-CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1570665-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To		Invoice Distribution
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	
Company:		Email 1 or Fax brett@nautilusenvironmental.com
Contact:		Email 2

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4-) concentration	Ca2+ and Mg2+ concentrations	Number of Containers
	AJ-100 spiked	22/01/2015	16:00	water	R	R	1
	AJ-50 spiked	22/01/2015	16:00	water	R	R	1
	AJ-20 spiked	22/01/2015	16:00	water	R	R	1
	AJ-site control	22/01/2015	16:00	water	R	R	1
	AJ-control	22/01/2015	16:00	water	R	R	1
		BTC					

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
					6.5°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
							Jan 23	17:25

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0026e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 28-JAN-15
Report Date: 04-FEB-15 11:33 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1572470

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1572470-1	L1572470-2	L1572470-3	L1572470-4	L1572470-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	28-JAN-15	28-JAN-15	28-JAN-15	28-JAN-15	28-JAN-15
	Sampled Time	11:00	11:00	11:00	11:00	11:00
	Client ID	AJ-100	AJ-50	AJ-20	AJ-SITE	AJ-CONTROL
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1460	634	308	54.9	1.24
Total Metals	Calcium (Ca)-Total (mg/L)	257	158	100	57.8	3.34
	Magnesium (Mg)-Total (mg/L)	249	141	80.9	39.3	0.18

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1572470-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-TUR-VA	Water	Sulfate(SO4) by Turbidity	APHA 4500-SO4 E. SULFATE

This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulfate". Sulfate is determined using the turbidimetric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1572470-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Turnaround Time (TAT) (Rush TAT is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax	brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2		

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:		Email 1 or Fax	brett@nautilusenvironmental.com
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4^{-}) concentration	Ca^{2+} and Mg^{2+} concentrations	Number of Containers
	AJ-100	28/01/2015	11:00	water	R	R	1
	AJ-50	28/01/2015	11:00	water	R	R	1
	AJ-20	28/01/2015	11:00	water	R	R	1
	AJ-site	28/01/2015	11:00	water	R	R	1
	AJ-control	28/01/2015	11:00	water	R	R	1

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Shawn	Date: Jan.28	Time: 16:55	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 04-FEB-15
Report Date: 12-FEB-15 15:58 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1574844

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1574844-1	L1574844-2	L1574844-3	L1574844-4	L1574844-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-FEB-15	04-FEB-15	04-FEB-15	04-FEB-15	04-FEB-15
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	AJ-100 SPIKED	AJ-50 SPIKED	AJ-20 SPIKED	AJ-SITE CONTROL	AJ-LAB-CONTROL
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1330	685	319	50.1	1.29
Total Metals	Calcium (Ca)-Total (mg/L)	278	164	95.9	59.4	3.57
	Magnesium (Mg)-Total (mg/L)	258	143	80.4	39.1	0.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1574844-1	AJ-100 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1574844-2	AJ-50 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1574844-3	AJ-20 SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1574844-4	AJ-SITE CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1574844-5	AJ-LAB-CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1574844-1, -2, -3, -4, -5
Matrix Spike	Sulfate (SO4)	MS-B	L1574844-1, -2, -3, -4, -5
Matrix Spike	Sulfate (SO4)	MS-B	L1574844-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L1574844-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-TUR-VA	Water	Sulfate(SO4) by Turbidity	APHA 4500-SO4 E. SULFATE

This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulfate". Sulfate is determined using the turbidimetric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1574844-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Di...	(Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑PDF ☑EXCEL ☐EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐Criteria on Report - provide details below if box checked	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax brett@nautilusenvironmental.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4) concentration	Ca^{2+} and Mg^{2+} concentrations	Number of Containers
	AJ-100 spiked	04/02/2014	12:00	water	R	R	1
	AJ-50 spiked	04/02/2014	12:00	water	R	R	1
	AJ-20 spiked	04/02/2014	12:00	water	R	R	1
	AJ-site control	04/02/2014	12:00	water	R	R	1
	AJ- lab control	04/02/2014	12:00	water	R	R	1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			17		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: DJ	Date: 7-APR-14	Time: 16:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0106-WS Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 11-FEB-15
Report Date: 18-FEB-15 16:25 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1576995

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1576995-1	L1576995-2	L1576995-3	L1576995-4	L1576995-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	11-FEB-15	11-FEB-15	11-FEB-15	11-FEB-15	11-FEB-15
	Sampled Time	14:00	14:00	14:00	14:00	14:00
	Client ID	AJ-100% SPIKED	AJ-50% SPIKED	AJ-20% SPIKED	AJ-SITE CONTROL	AJ- LAB CONTROL
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1300	724	300	55.4	1.14
Total Metals	Calcium (Ca)-Total (mg/L)	260	158	94.7	59.2	3.59
	Magnesium (Mg)-Total (mg/L)	255	144	78.0	40.4	0.19

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1576995-1	AJ-100% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1576995-2	AJ-50% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1576995-3	AJ-20% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1576995-4	AJ-SITE CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1576995-5	AJ- LAB CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1576995-1, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-TUR-VA	Water	Sulfate(SO4) by Turbidity	APHA 4500-SO4 E. SULFATE

This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulfate". Sulfate is determined using the turbidimetric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1576995-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑PDF ☑EXCEL ☐EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐Criteria on Report - provide details below if box checked	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	604-420-8773	Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX
Company:		Email 1 or Fax brett@nautilusenvironmental.com
Contact:		Email 2

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4-) concentration	Ca^{2+} and Mg^{2+} concentrations	Number of Containers
	AJ-100% spiked	11/02/2014	14:00:00 PM	water	R	R	1
	AJ-50% spiked	11/02/2014	14:00:00 PM	water	R	R	1
	AJ-20% spiked	11/02/2014	14:00:00 PM	water	R	R	1
	AJ-site control	11/02/2014	14:00:00 PM	water	R	R	1
	AJ- lab control	11/02/2014	14:00:00 PM	water	R	R	1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
19					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Shayan	Date: Feb.11	Time: 17:10	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0325a v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 18-FEB-15
Report Date: 24-FEB-15 13:52 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1579293

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1579293-1	L1579293-2	L1579293-3	L1579293-4	L1579293-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-FEB-15	18-FEB-15	18-FEB-15	18-FEB-15	18-FEB-15
	Sampled Time	14:00	14:00	14:00	14:00	14:00
	Client ID	AJ-100% SPIKED	AJ-50% SPIKED	AJ-20% SPIKED	AJ-SITE CONTROL	AJ-LAB CONTROL
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Sulfate (SO4) (mg/L)	1470	748	333	48.8	0.81
Total Metals	Calcium (Ca)-Total (mg/L)	261	160	96.9	55.1	2.76
	Magnesium (Mg)-Total (mg/L)	251	143	80.9	37.2	0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1579293-1	AJ-100% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1579293-2	AJ-50% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1579293-3	AJ-20% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1579293-4	AJ-SITE CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1579293-5	AJ-LAB CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L1579293-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1579293-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2,E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax brett@nautilusenvironmental.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4-) concentration	Ca2+ and Mg2+ concentrations	Number of Containers
	AJ-100% spiked	18/02/2015	14:00:00 PM	water	R	R	1
	AJ-50% spiked	18/02/2015	14:00:00 PM	water	R	R	1
	AJ-20% spiked	18/02/2015	14:00:00 PM	water	R	R	1
	AJ-site control	18/02/2015	14:00:00 PM	water	R	R	1
	AJ- lab control	18/02/2015	14:00:00 PM	water	R	R	1

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
19					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Shayan	Date: Feb 18	Time: 16:50	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-R4-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

NAUTILUS ENVIRONMENTAL
ATTN: Brett Lucas
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 20-FEB-15
Report Date: 02-MAR-15 12:52 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1580104

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1580104-1	L1580104-2	L1580104-3	L1580104-4	L1580104-5
Description	Water	Water	Water	Water	Water
Sampled Date	20-FEB-15	20-FEB-15	20-FEB-15	20-FEB-15	20-FEB-15
Sampled Time	15:00	15:00	15:00	15:00	15:00
Client ID	AJ-100% SPIKED	AJ-50% SPIKED	AJ-20% SPIKED	AJ-SITE CONTROL	AJ-LAB CONTROL
Grouping / **Analyte**					
WATER					
Physical Tests Hardness (as CaCO3) (mg/L)	1600	950	560	292	8.00
Anions and Nutrients Sulfate (SO4) (mg/L)	1510	758	341	49.4	1.41
Total Metals Calcium (Ca)-Total (mg/L)	252	154	95.7	55.6	2.79
Magnesium (Mg)-Total (mg/L)	236	137	77.9	37.2	0.25

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1580104-1	AJ-100% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1580104-2	AJ-50% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1580104-3	AJ-20% SPIKED	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1580104-4	AJ-SITE CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.
L1580104-5	AJ-LAB CONTROL	LPMB	Lab-Preserved for Metals. Sample received with pH > 2 and preserved at the lab. Metals results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L1580104-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L1580104-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Nautilus Environmental Company Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Brett Lucas	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	8664 Commerce Court, Burnaby, BC, Canada, V5A 4N7	☐ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	604-420-8773	Email 1 or Fax brett@nautilusenvironmental.com	Specify Date Required for E2, E or P:
		Email 2	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax brett@nautilusenvironmental.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)	L1580104	ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	sulphate (SO_4-) concentration	Ca2+ and Mg2+ concentrations	Number of Containers
	AJ-100% spiked	20/02/2015	15:00:00 PM	water	R	R	1
	AJ-50% spiked	20/02/2015	15:00:00 PM	water	R	R	1
	AJ-20% spiked	20/02/2015	15:00:00 PM	water	R	R	1
	AJ-site control	20/02/2015	15:00:00 PM	water	R	R	1
	AJ- lab control	20/02/2015	15:00:00 PM	water	R	R	1

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	No.preservation.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)			
Frozen ☐		SIF Observations Yes ☐ No ☐	
Ice packs Yes ☐ No ☐		Custody seal intact Yes ☐ No ☐	
Cooling Initiated ☐			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	
18			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Shayan	Date: Feb-20	Time: 18:50	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS-FM-0325a v09 Front04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

embryo day	sulphate control	site control	20%	50%	100%	embryo day
0	1.34	54	339	734	1500	0
7	1.24	54.9	308	634	1460	7
14	1.29	50.1	319	685	1330	14
21	1.14	55.4	300	724	1300	21
28	0.81	48.8	333	748	1470	28
30	1.41	49.4	341	758	1510	30
average	1.205	52.1	323.3333	713.8333	1428.333	average

calcium control	site control	20%	50%	100%	embryo day	magnesium control
3.58	57.6	99.2	157	262	0	0.23
3.34	57.8	100	158	257	7	0.18
3.57	59.4	95.9	164	278	14	0.21
3.59	59.2	94.7	158	260	21	0.19
2.76	55.1	96.9	160	261	28	0.15
2.79	55.6	95.7	154	252	30	0.25
3.271666667	57.45	97.06667	158.5	261.6667	average	0.20166667

site control	20%	50%	100%
39.9	84.1	142	261
39.3	80.9	141	249
39.1	80.4	143	258
40.4	78	144	255
37.2	80.9	143	251
37.2	77.9	137	236
38.85	80.36667	141.6667	251.6667

embryo day	hardness control	site contro	20%
0	9.878889	307.8835	593.5367
7	9.074338	305.9139	582.3668
14	9.77165	309.0832	570.0795
21	9.739265	313.9329	557.2109
28	7.503728	290.5368	574.6319
30	7.99002	291.7844	559.2946
average	8.992982	303.1891	572.8534

50%	100%
975.978	1727.578
974.3588	1665.73
997.5584	1755.157
986.7019	1697.902
987.5778	1683.939
947.9207	1599.768
978.3493	1688.346

APPENDIX C – Chain of custody form

Nautilus Environmental

BRITISH COLUMBIA
8664 Commerce Court
Burnaby British Columbia Canada V5A 4N7
Phone 604.420.8773
Fax 604.357.1361

wo#14891 wo#14892

Chain of Custody
1204

Date _____ Page _____ of _____

Sample Collection by: _____

Report to:
Company AJAX
Address _____
City _____ Prov. _____ PC _____
Contact _____
Phone No. _____

Invoice to:
Company _____
Address _____
City _____ Prov. _____ PC _____
Contact _____
Phone No. _____

SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS	ANALYSIS REQUIRED: EA Test wo#14891	ceriodaphnia dubia 7-d	Selenastrum P. subcapitata 72-h								RECEIPT TEMPERATURE (°C)
JACKO	Oct.30/14			20L	17		X	X	X								12.9

PROJECT INFORMATION	SAMPLE RECEIPT	
CLIENT	TOTAL NO. OF CONTAINERS	17
P.O. NO.	REC'D GOOD CONDITION	Y
SHIPPED VIA:		

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY (CLIENT)	RELINQUISHED BY (COURIER)
(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)
RECEIVED BY (COURIER)	**RECEIVED BY (LABORATORY)**
(Signature) (Time)	(Signature) 0900 (Time)
(Printed Name) (Date)	(Printed Name) Yvonne Lan Oct31/14 (Date)
(Company)	

Additional costs may be required for sample disposal or storage. Net 30 unless otherwise contracted.

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

Nautilus Environmental

BRITISH COLUMBIA
8664 Commerce Court
Burnaby British Columbia Canada V5A 4N7
Phone 604.420.8773
Fax 604.357.1361

Chain of Custody
1271

Date ______ Page ______ of ______

Sample Collection by: ______

Report to:
Company AJAX
Address
City ______ Prov. ______ PC ______
Contact
Phone No.

Invoice to:
Company
Address
City ______ Prov. ______ PC ______
Contact
Phone No.

ANALYSIS REQUIRED: WO# 15-0I 1-841 EA Test

SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS	EA Test											RECEIPT TEMPERATURE (°C)
Jacko	Jan. 20 2015			20L	10		X											9

PROJECT INFORMATION	SAMPLE RECEIPT	
CLIENT	TOTAL NO. OF CONTAINERS	10
P.O. NO.	REC'D GOOD CONDITION	Y
SHIPPED VIA:		

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY (CLIENT)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) Nautilus.
(Signature) [signature] (Time) 0850
(Printed Name) Emma Marus (Date) Jan-21/15

Additional costs may be required for sample disposal or storage. Net 30 unless otherwise contracted.

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

Nautilus Environmental

TESTING LOCATION (Please Circle)

British Columbia
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N3
Phone 604.420.8773
Fax 604.357.1361

Chain of Custody

Date_____Page___of__

Sample Collection By:

Report to:		Invoice To:	
Company	AJAX	Company	Same as Report to
Address		Address	
City/State/Zip		City/State/Zip	
Contact		Contact	
Phone		Phone	
Email		Email	

	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	ANALYSES REQUIRED: EA Test WO# 14841	Receipt Temperature (°C)
1	Jacko	Jan 28/15			20L	10		X	7
2									
3									
4									
5									
6									
7									
8									
9									
10									

PROJECT INFORMATION		SAMPLE RECEIPT	
Client:		Total No. of Containers	10
PO No.:		Received Good Condition?	Y
Shipped Via:		Matches Test Schedule?	Y

SPECIAL INSTRUCTIONS/COMMENTS:

refresh samples

RELINQUISHED BY (CLIENT)	RELINQUISHED BY (COURIER)
(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)
NO. OF CONTAINERS	(Company)

RECEIVED BY (COURIER)	RECEIVED BY (LABORATORY)
(Signature) (Time)	(Signature) NY (Time) 0845
(Printed Name) (Date)	(Printed Name) Nair Yamamoto (Date) Jan. 29/15
(Company)	(Company) Nautilus

*Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Nautilus Environmental

TESTING LOCATION (Please Circle)

British Columbia
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N3
Phone 604.420.8773
Fax 604.357.1361

Chain of Custody

Date_____Page___of__

Sample Collection By:

Report to:		Invoice To:	
Company	AJAX	Company	Same as Report to
Address		Address	
City/State/Zip		City/State/Zip	
Contact		Contact	
Phone		Phone	
Email		Email	

	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	ANALYSES REQUIRED: EA Test mth/484	Receipt Temperature (°C)
1	Jacko	Feb4/15			20L	10		X	9.2
2									
3									
4									
5									
6									
7									
8									
9									
10									

PROJECT INFORMATION		SAMPLE RECEIPT	
Client:		Total No. of Containers	10
PO No.:		Received Good Condition?	Y
Shipped Via:		Matches Test Schedule?	Y

SPECIAL INSTRUCTIONS/COMMENTS:

Refresh samples

RELINQUISHED BY (CLIENT)	RELINQUISHED BY (COURIER)
(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)
NO. OF CONTAINERS	(Company)

RECEIVED BY (COURIER)	RECEIVED BY (LABORATORY)
(Signature) (Time)	(Signature) (Time) 0845
(Printed Name) (Date)	(Printed Name) Emma Mews (Date) Feb 5/15
(Company)	(Company) Nautilus

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.