SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

June 5, 2018

Chantell Johnson
Tri-State Generation and Transmission Association, Inc.
1100 W 116th Ave.
Westminster, CO 80234

Mr. Thomas Fry
Elk Ridge Mining and Reclamation
27646 W 5th Ave.
Nucla, CO 81424

Dear Ms. Johnson and Mr. Fry:

SeaCrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of Elk Ridge Mining and Reclamation. This testing is in response to a WET result that required an automatic compliance response in Q1 of 2018 suggesting toxicity to the *Ceriodaphnia dubia* test species. This series of manipulations and tests is intended to identify the potential suspected toxicants responsible for the observed toxicity. This report represents Phase II of the TIE protocol. The TIE was performed in accordance with EPA protocols for the conduct of such investigations.

Initial observations from Phase II of the TIE are as follows:

1) Toxicity is removed from the NH Mine effluent when brought to pH 10, filtered, and brought back to pHi. This confirmation was run with a 7 day, daily renewal chronic test, resulting in an IC_{25} of >100% for both lethal and sub-lethal endpoints. The filtrate exhibited conductivity above known toxicity thresholds in this test (average = 3,690 µhmos/cm) which further demonstrates that the toxicant was precipitated out of solution at pH 10 and filtered off.
2) Toxicity was observed in the test that was conducted with the re-dissolved precipitate. The method control for this test exhibited toxicity. It is suspected that the cause of the toxicity in the method blank was from the increase in conductivity, due to the addition of acid and base to re-dissolve the precipitate.
3) The WET testing and analytical data suggest that toxicity was removed when select ions were precipitated and removed from the effluent. Sulfate and some major ion levels in the precipitate were non-detectable or lower than expected.

If you have any questions or concerns, please do not hesitate to contact me at (303) 661-9324.

Best regards,

Kyra Brisson
Laboratory Director
Enclosure(s): Report
Invoice

RESULTS OF PHASE II OF THE CHRONIC TIE (TOXICITY IDENTIFICATION EVALUATION) CONDUCTED FOR ELK RIDGE MINING AND RECLAMATION ON THE NEW HORIZON MINE OUTFALL 013 SITE

Prepared for:

Chantell Johnson
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1100 W 116th Ave.
Westminster, CO 80234

Mr. Thomas Fry
Elk Ridge Mining and Reclamation
P.O. Box 628
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June 5, 2018

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Chronic Toxicity Test Summary

Test:
- 7-day static renewal using *Ceriodaphnia dubia.*
- 7-day static renewal using Fathead minnow *(Pimephales Promelas).*

Client: Elk Ridge Mining and Reclamation

Test Procedure Followed:
- *Ceriodaphnia dubia*: EPA/821/R-02-013. Method 1002.0 (2002)
- Fathead minnow: EPA/821/R-02-013. Method 1000.0 (2002)

Sample Number: 418208.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent 1	0930; 0940; 0950; 0955	03-07-2018	1255	03-08-2018

	Baseline	Filtrate	Re-Diss
Test Initiation Time	1800	1751	1742
Test Initiation Date	04-27-2018	04-27-2018	04-27-2018
Test Completion Time	1813	1700	1725
Test Completion Date	05-04-2018	05-04-2018	05-04-2018

Dilution Water:
- Moderately hard laboratory reconstituted water

Test Organism Source:
- *Ceriodaphnia dubia*

SeaCrest Group

Reference Toxicant:
- Sodium chloride

Abstract of Results

Test Concentrations:	Control (0%), 50%, 60%, 70%, 100%, (Method Control where applicable)
Number of Organisms/Concentration:	10 for *Ceriodaphnia dubia*
Replicates at each Concentration:	10 for *Ceriodaphnia dubia*

	Baseline	**Filtrate**	**Re-Dissolved**
Test vessel size	30ml	30ml	30ml
Exposure volume	15ml	15ml	15ml
Pass/Fail Status	**FAIL**	**PASS**	**INVALID**
Temperature Range (°C)	24.1 – 25.7	24.1 – 25.6	24.1 – 25.4
Dissolved Oxygen Range (mg/L)	6.4 – 7.4	6.2 – 7.4	6.0 – 7.1
pH Range	6.7 – 8.0	6.6 – 8.4	6.6 – 8.7

	CONTROL ***C. dubia***	**100%**
Alkalinity (mg/L as $CaCO_3$)	60	511
Hardness (mg/L as $CaCO_3$)	96	1998
Total residual chlorine (mg/L)	<0.01	<0.01
Total ammonia (mg/L as NH_3)	<0.03	2.29

INTRODUCTION

Toxicity was demonstrated to the *Ceriodaphnia dubia* test species after the Elk Ridge Mining and Reclamation New Horizon Mine 013 effluent failed sub-lethal statistical endpoints for quarterly Whole Effluent Toxicity (WET) test during the first quarter of 2018. In accordance with generally accepted Environmental Protection Agency (EPA) and Colorado Department of Health and Environment (CDPHE) procedures, this triggers the need to initiate a TIE (Toxicity Identification Evaluation) to characterize the possible cause of the observed toxicity. Accordingly, a baseline, and series of TIE Phase II manipulation tests were performed. After each manipulation, chronic toxicity tests are run to determine the effects of the manipulation on the toxicity of the effluent. Analytical data is generated in tandem with the manipulations. Based on the manipulations that reduce or increase toxicity and the accompanying analytical data, inferences about the potential toxicant(s) are made. This report details the results of these investigations

MATERIALS AND METHODS

Sample Collection

A sample of 20 gallons of effluent was collected from the discharge system. The sample was delivered chilled to the SeaCrest lab where it was held at 0-6°C. Chain of custody forms showing sample collection and lab arrival times are included in Appendix 1. It was demonstrated, by comparing baseline data between Tier I and Tier II, that no toxicity has been lost in the effluent due to elongated sample holding time.

Dilution Water

Laboratory reconstituted water was used as both the dilution water source and the control for the tests. Reconstituted water was produced by adding sodium bicarbonate, calcium sulfate, magnesium sulfate, potassium chloride, and sodium selenate to deionized water.

Test Organisms

The biomonitoring tests were conducted with *Ceriodaphnia dubia*. *Ceriodaphnia dubia* is cultured in the SeaCrest laboratory. Stock cultures are maintained in 5-gallon aquaria. Brood females are cultured in individual plastic beakers on brood boards for a period of up to 14-days. Neonates less than 24-hours old released from third or subsequent broods of eight or more within an 8-hour period are removed from the brood chambers and used in tests. Brood and stock organisms are fed daily with a mixture of Yeast, Cereal Leaves and Trout Chow (YCT). This is supplemented with an equal volume of green algae *(Selenastrum capricornutum)*. In-house organisms are tested at least monthly in a reference toxicant test using sodium chloride to monitor overall health and test reproducibility.

Test Procedures

Upon receipt at the lab, samples are analyzed for alkalinity, hardness, conductivity, dissolved oxygen, ammonia, chlorine and pH. Alkalinity and hardness are determined titrimetrically according to methods described in Hach Chemical Company[1]. Ammonia is measured by a Thermo Orion ion-selective electrode according to the procedures in

APHA/AWWA/WEF[2]. Conductivity, dissolved oxygen and pH probes were used to take these measurements.

The baseline and Phase II manipulation tests were started on 04-27-2018. The tests were performed according to the procedures outlined in USEPA[3] and the Colorado Department of Public Health and Environment[4].

The TIE test guidelines (EPA/600/6-91/005F[7]) describe the adjustments that the effluent should undergo and stipulate that a baseline test is run concurrently with other tests to monitor any change in the toxicity of the samples during the testing period.

Individual organisms were placed in 30 ml plastic containers containing approximately 15 ml of exposure medium. Ten replicates at each concentration were used for the baseline and manipulation tests. The animals were fed daily with the YCT mixture and an equal volume of the green algae *(Selenastrum capricornutum)*. Routine measurements were made each day of temperature, dissolved oxygen, conductivity and pH identified in the guidelines.

The test followed the procedures in EPA[3] and CDPHE[4] guidelines. Exposure concentrations included control (0%), 50%, 60%, 70%, 100%, and method blank mixtures, diluted with moderately hard laboratory reconstituted water.

Phase II test

pH 10 Adjustment and Filtration Tests

Since a pH change can cause toxicants to precipitate or cause solubilized toxicants to sorb on particles, filtration at altered pH values can be used as a tool in characterizing the effluent. Therefore, by filtering pH adjusted effluent, compounds that were in solution without a pH adjustment may no longer be in solution or any toxicants associated with particles may be removed by the filtration process.

The effluent was adjusted from pHi to 10 using 1 molar sodium hydroxide. The effluent was then filtered through a 1.5 micron glass fiber filter. The filtrate was adjusted back to pHi using 1 molar hydrochloric acid.

Re-dissolved precipitate

In the TIE Phase I testing, it was observed that a precipitate was formed when the pH of the sample was elevated above 8.5. In the subsequent pH 10 adjustment and filtration testing this precipitate was filtered off. The formation of a cake of precipitate accumulated on the filter. This cake was then washed into the corresponding volume of reconstituted water and brought down to pH 2 using 1 molar Hydrochloric acid with the intention of re-dissolving the precipitate. After re-dissolution, the recon/ precipitate mixture was brought to effluent pHi using 1 molar Sodium hydroxide and used for testing. The method blank was reconstituted water that was treated with an identical process re-dissolving the reconstituted water precipitate, lowering of pH to 2 and returning to reconstituted pHi. Where possible CO_2 was used to lower pH.

Data Analysis

Data from the test(s) were analyzed on a personal computer using the TOXCALC package developed by Tidepool Scientific Software. Statistical tests used in the analyses are shown in Table 1. Test acceptability was determined using control survival and performance criteria, concentration-response relationships and percent minimum significant differences (USEPA [5,6]).

Table 1. Statistics methods used in testing for significant differences in test parameters.

Species	Normality	Homogeneity
Ceriodaphnia dubia	Kolmogorov Test	Bartlett's Test
Statistical Difference		
	Survival	Reproduction	IC_{25}
Baseline	Fisher's Exact Test	Dunnett's Test	ICp
Filtrate	N/A	Steel's Many-One Rank Test	ICp
Re-Dissolved	Fisher's Exact Test	Steel's Many-One Rank Test	ICp

RESULTS

Baseline Test Results

Test results for the *Ceriodaphnia dubia* are summarized in Table 2 and provided on the data sheets located in Appendix 2. Survival was 90% in the 100% effluent concentration and 100% in the remaining effluent concentrations. Control survival was 90%. No statistically significant lethality was measured in any effluent concentration when compared to the control. The No Observable Effect Concentration (NOEC) for lethality was 100%. The IC_{25} for lethality was >100%.

Table 2. Summary of *Ceriodaphnia dubia* test results. Ten animals were exposed at each concentration. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	9	26.2	21	36		
50%	10	30.5	23	37		
60%	10	26.6	21	32		
70%	10	18.6	13	23		*
100%	9	8.7	1	16		*

Average numbers of neonates was 8.7 in the 100% effluent concentration and ranged from 18.6 - 30.5 in the remaining effluent concentrations. Average number of neonates in the control was 26.2 for statistical analyses and 26.6 for test acceptability criteria. A statistically significant difference in the number of neonates was found between the control and the 70% and 100% effluent concentrations. The NOEC for reproduction was 60%. The IC_{25} for reproduction was 66.7%.

Filtrate Test Results

Test results for the *Ceriodaphnia dubia* are summarized in Table 2 and provided on the data sheets located in Appendix 2. Survival was 100% in the 100% effluent concentration and 100% in the remaining effluent concentrations. Control survival was 100%. Survival was 90% in the method blank. No statistically significant lethality was measured in any effluent concentration when compared to the control. The No Observable Effect Concentration (NOEC) for lethality was 100%. The IC_{25} for lethality was >100%.

Table 3. Summary of *Ceriodaphnia dubia* test results. Ten animals were exposed at each concentration. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	10	25.7	21	34		
50%	10	24.9	19	34		
60%	10	23.8	14	36		
70%	10	22.7	19	31		
100%	10	19.6	12	29		
Method Blank	9	21.9	6	32		

Average numbers of neonates was 19.6 in the 100% effluent concentration and ranged from 19.6 - 24.9 in the remaining effluent concentrations. Average number of neonates in the control was 25.7 for statistical analyses and test acceptability criteria. No statistically significant difference in the number of neonates was found between the control and any effluent concentration. The NOEC for reproduction was 100%. The IC_{25} for reproduction was >100%.

Re-Dissolved Precipitate Test Results

Test results for the *Ceriodaphnia dubia* are summarized in Table 2 and provided on the data sheets located in Appendix 2. Survival was 0% in the 100% effluent concentration and ranged from 60% - 100% in the remaining effluent concentrations. Control survival was 100%. Survival was 80% in the method blank. Statistically significant lethality was measured in the 100% and 70% effluent concentrations when compared to the control. The No Observable Effect Concentration (NOEC) for lethality was 60%. The IC_{25} for lethality was 62.5%.

Table 4. Summary of *Ceriodaphnia dubia* test results. Ten animals were exposed at each concentration. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	10	21.7	17	34		
50%	10	19.4	15	29		
60%	8	13.9	0	28		*
70%	6	8.0	0	16	*	*
100%	0	0	0	0	*	*
Method Blank	8	9	1	18		*

Average numbers of neonates was 0 in the 100% effluent concentration and ranged from 8.0 - 19.4 in the remaining effluent concentrations. Average number of neonates in the control was 21.7 for statistical analyses and test acceptability criteria. Average number of neonates in the method blank was 0. Statistically significant difference in the number of neonates was found between the control and the 60%, 70%, and 100% effluent concentrations. The NOEC for reproduction was 50%. The IC_{25} for reproduction was 55.7%.

Test Acceptability

Acceptable control survival was achieved in both tests. Similarly, *Ceriodaphnia dubia* reproduction and Fathead minnow growth in control organisms met required levels. PMSD was within the required limits for an acceptable test (Table 4).

Table 5. PMSD for chronic test parameters.

PMSD (% Minimum significant difference)	Baseline Reproduction	Filtrate Reproduction	Re-Dissolved Reproduction	Result
Lower Bound = 13 Upper bound = 47	17.1	19.4	24.8	Test parameters deemed to be acceptable if numbers fall within limits for the test.

DISCUSSION

SeaCrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of the Elk Ridge Mining and Reclamation. This testing is in response to historical data suggesting toxicity to the *Ceriodaphnia dubia* test species. In Phase II of the TIE protocol manipulations, testing and analytical suites are run with the intention of identifying the potential suspected toxicants responsible for the observed toxicity. The TIE was performed in accordance with EPA protocols for the conduct of such investigations[7].

Based on the removal of toxicity in Phase I Tier ii by raising the pH of the effluent, filtering, and lowering the pH of the filtrate to initial levels, Phase II testing was initiated on April 27, 2018. The purpose of the testing was to 1) confirm the removal of toxicity, 2) re-dissolve the filtered precipitate and evaluate the toxicity of the precipitate when separated from the effluent water and, 3) evaluate the chemical composition of the precipitate by running an analytical suite that include major ions and metals. This series of tests was run with 10 replicates and daily change outs to evaluate the removal of toxicity under chronic testing conditions identical to those mandated by permit number CO-0000213.

Sub-lethal toxicity was observed in the baseline test resulting in an IC_{25} of 66.7%. Toxicity was removed for lethal and sub-lethal toxicity in the pH10 filtrate test resulting in a sub-lethal IC_{25} of >100%. As noted in Phase I of the TIE, the complete removal of toxicity is significant given the elevated conductivity of the filtrate which averaged 3,690 µhmos/cm.

The test run on the re-dissolved precipitate exhibited toxicity resulting in a lethal IC_{25} of 62.5% and a sub-lethal IC_{25} of 55.7%. The method blank for this test was reconstituted water that was treated identically to the re-dissolved precipitate. This entailed washing the filter from filtered pH 10 reconstituted water into reconstituted water, lowering the mixture to pH 2, and lastly raising it to the initial pH.

The average number of neonates in the method control was less than 15 and less than 5 females had 3 or more broods. These two results constitute an invalid method blank. This suggests that the addition of acid and base to reach the desired pH values raised the conductivity to a toxic level. The sub-lethal toxicity in the re-suspended precipitate test may be due in part to the elevated conductivity. However, this elevated conductivity in the method blank did not cause any lethal toxicity. This indicates that the lethal IC_{25} value from the re-dissolved test can still be used to infer that the precipitate causes toxicity when separated from the effluent.

Chemical analysis of the effluent, filtrate and precipitate was used to confirm that calcium, iron, manganese and nickel could be removed from the effluent by the pH manipulation and concentrated in a precipitate. The precipitate, in the form of a filtercake, is pictured in Appendix 7. It was demonstrated that these chemicals need to be removed to remove toxicity of the effluent water. The role of the anions and their concentration towards the toxicity of the effluent is less clear. For example, it would be informative to determine how much of the bicarbonate ended up in the filtrate. Additional work would be required to determine the mass balance of the bicarbonate, alkalinity and carbonate between the effluent and the resulting filtrate and precipitate to better understand the role, if any, of the anions on the toxicity of NHM effluent.

REFERENCES

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4. **CDPHE (Colorado Department of Public Health and Environment).** 1998. *Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests.* Water Quality Control Division.
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9. **USEPA. 1999.** *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*. EPA/833B-99/002
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12. **USEPA. 1993.** *Methods for aquatic toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Sample Exhibiting Acute and Chronic Toxicity.* EPA/600/R-92-080
13. **USEPA. 1993.** *Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity.* EPA/600/R-92-081

Appendix 1 – Chain of Custody Form

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

CHAIN OF CUSTODY

500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
(303) 661.9324 - FAX (303) 661.9325

Client/Project Name: Elk Ridge Mining & Reclamation
P. O./Project Number: New Horizon Mine
Contact: T Fry
Address: 27646 West 5th, Nucla, Co. 81424
Phone # 970 424 3050 E-Mail: tfry@tristategt.org
Fax # 970 864 2168 Sampler: T Fry
Report By: ☐ Mail ☒ PDF ☐ FAX

Analysis (Check all applicable)

Sample Location or ID	Date	Time	Grab/ Comp	Lab ID (LAB Use Only)	WET: Acute (Indicate Below)	WET: Chronic (Indicate Below)	WET: Accelerated (Indicate Below)	WET: PTI/TIE/TRE (Indicate Below)	Metals (List Below)	Solids (TS/TDS/TSS) (Circle)	Anions (List Below)	Chromium III/VI (Circle)	Oil and Grease	Coliform (Total/Fecal/E-Coli) (Circle)	BOD/COD (Circle)	Other Analysis (List Below)				Number of Containers	Total Volume
NPDES 013	3.7.18	0930	G	418208.B												✓				5	G

Turnaround Requirements (Analytical Testing Only)

_____ Standard (10 days) _____ 6-9 Day
_____ 3-5 Day _____ 1-2 Day
Requested Report Date:

Test Species: ☐ Fathead Minnow ☐ Cerio daphnia ☐ Daphnia magna ☐ Daphnia pulex ☐ Other (List Below)

Special Instructions/Comments: T.I.E. ANALYSIS

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	3.7.18 1200	UPS		UPS			030818 1255

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500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
(303) 661.9324 - FAX (303) 661.9325

Client/Project Name: Elk Ridge Mining & Reclamation
P. O./Project Number: New Horizon Mine
Contact: T Fry
Address: 27646 West 5th, Nucla, Co. 81424
Phone # 970 424 3050 | E-Mail: tfry@tristategt.org
Fax # 970 864 2168 | Sampler: TFRY
Report By: ☐ Mail ☒ PDF ☐ FAX

Sample Location or ID	Date	Time	Grab/ Comp	Lab ID (LAB Use Only)	WET: Acute (Indicate Below)	WET: Chronic (Indicate Below)	WET: Accelerated (Indicate Below)	WET: PTI/TIE/TRE (Indicate Below)	Metals (List Below)	Solids (TS/TDS/TSS) (Circle)	Anions (List Below)	Chromium III/VI (Circle)	Oil and Grease	Coliform (Total/Fecal/E-Coli) (Circle)	BOD/COD (Circle)	Other Analysis (List Below)				Number of Containers	Total Volume
NPDES 013	3.7.18	0940	G	418308.B												✓				5	G

Analysis (Check all applicable)

Turnaround Requirements (Analytical Testing Only)

_____ Standard (10 days) _____ 6-9 Day
_____ 3-5 Day _____ 1-2 Day
Requested Report Date:

Test Species: ☐ Fathead Minnow ☐ Cerio daphnia ☐ Daphnia magna ☐ Daphnia pulex ☐ Other (List Below)

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Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	3.7.18 1200	UPS		UPS			030818 1255

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Sample Location or ID	Date	Time	Grab/ Comp	Lab ID (LAB Use Only)	WET: Acute (Indicate Below)	WET: Chronic (Indicate Below)	WET: Accelerated (Indicate Below)	WET: PTI/TIE/TRE (Indicate Below)	Metals (List Below)	Solids (TS/TDS/TSS) (Circle)	Anions (List Below)	Chromium III/VI (Circle)	Oil and Grease	Coliform (Total/Fecal/E-Coli) (Circle)	BOD/COD (Circle)	Other Analysis (List Below)				Number of Containers	Total Volume
NPDES 013	3.7.18	0950	G	418208.B												✓				5	G

Turnaround Requirements (Analytical Testing Only)

_____ Standard (10 days) _____ 6-9 Day
_____ 3-5 Day _____ 1-2 Day
Requested Report Date:

Test Species: ☐ Fathead Minnow ☐ Cerio daphnia ☐ Daphnia magna ☐ Daphnia pulex ☐ Other (List Below)

Special Instructions/Comments: T.I.E. ANALYSIS

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
TFry ✓	3.7.18 1200	UPS		UPS			030818 1255

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Analysis (Check all applicable)

Sample Location or ID	Date	Time	Grab/ Comp	Lab ID (LAB use Only)	WET: Acute (Indicate Below)	WET: Chronic (Indicate Below)	WET: Accelerated (Indicate Below)	WET: PTI/TIE/TRE (Indicate Below)	Metals (List Below)	Solids (TS/TDS/TSS) (Circle)	Anions (List Below)	Chromium III/VI (Circle)	Oil and Grease	Coliform (Total/Fecal/E-Coli) (Circle)	BOD/COD (Circle)	Other Analysis (List Below)				Number of Containers	Total Volume
NPDES 013	3.7.18	0955	G	418208.B												✓				5	G

Turnaround Requirements (Analytical Testing Only)

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Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	3.7.18 1200	UPS		UPS			030818 1255

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 418 208.B
Date: 030818
Sample #:
Initials: ND

Samples Were:
1. (Shipped) Hand Delivered Messengered (circle one)
Notes: UPS

3. Chilled to Ship — Ambient (Chilled) (circle one)
Notes:
Wet Ice (Blue Ice) (circle one)

4. Cooler Received Broken or Leaking — Y (N) NA
Notes:

5. Sample Received Broken or Leaking — Y (N) NA
Notes:

6. Received Within Holding Times — (Y) N
Notes:

7. Aeration necessary — Y (N) NA
Notes:

8. Sample Received at Temperature between 0-6° C . — (Y) N NA
Notes:

9. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
eff: clear, some PM

rec'g initial chemistries taken on several bottles to capture variation

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
208.B	5.8	11.9	101.4	11.7	3010				
208.B	5.4	11.4	101.9	11.6	3030				
208.B	5.7	11.5	99.7	11.6	2910				

Custody Seals:
1. Present on Outer Package — Y (N)
2. Unbroken on Outer Package — Y N (NA)
3. Present on Sample — Y (N)
4. Unbroken on Sample — Y N (NA)

Custody Documentation:
1. Present Upon Receipt of Sample — (Y) N

Appendix 2 – Data Sheets for the Baseline Test

WET TEST REPORT FORM – CHRONIC TIE PHASE II - BASELINE

Permittee: Elk Ridge Mining and Reclamation **Outfall:** 013
Permit No.: CO-0000213

Test Type: Routine ☐ Accelerated ☐ TIE ☒
Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1800	04-27-2018	1813	05-04-2018

Test Results	Lethality	Reproduction
NOEC	100%	60%
	PASS	**FAIL**
IC_{25}	>100%	66.7%
	PASS	**FAIL**

Dilution(s) - % Effluent

Measurements	Control (0%)	50%	60%	70%	100%
% Survival for day 1	100	100	100	100	100
% Survival for day 2	100	100	100	100	100
% Survival for day 3	100	100	100	100	100
% Survival for day 4	100	100	100	100	90
% Survival for day 5	90	100	100	100	90
% Survival for day 6	90	100	100	100	90
% Survival for day 7	90	100	100	100	90
Mean 3 Brood Total	**26.2**	**30.5**	**26.6**	**18.6**	**8.7**

Hardness (mg/L) – Receiving Water: N/A Effluent: 1998 Recon Water: 96
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 511 Recon Water: 60
Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 7.9/8.0 100%: 6.7/7.7
Total Ammonia as NH_3 (mg/L) - Effluent: 2.29

Were all Test Conditions in Conformance with Division Guidelines? YES ☒ NO ☐
If **NO**, list deviations from test specifications:
Laboratory: SeaCrest Group
Comments:
Analyst's Name: Tessa Hunt-Woodland, Madison Reese, and Kyra Brisson

Signature _____ *Date* 06/05/2018

T1

SeaCrest Group
Louisville, CO

BASELINE

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Elk Ridge TIE phase 2 Lab #: 418 208.B Site: NPDES 013
IWC %: 100 Template #: 5 Dilution Water: MHT8.008 Sample Date: 030718
Age & Source: cerio 042718 1108 Test Start: 042718 1800 Test End: 050418 1813
Test Conditions: Test goes 7 days

	0	1	2	3	4	5	6	7	8	Total
(C) 0	0	0	0	0	6	9	10	0		25
	0	0	0	3	7	13	0	—		23
	0	0	0	4	10 +3	0	8	7		25
	0	0	0	2	→ 8	11	12	0		33
	0	0	0	4	7	0	12	14		23
	0	0	0	3	→ 9	9	0	10		31
	0	0	0	3	→ 9	10 +1	0	13	EE	~~23~~ 36
	0	0	0	4	9	9	0	14		22
	0	0	0	4	8	0	9	12		21
	0	0	0	3	12	7 +1	0			23
DO	7.0	6.9 ¦ 6.9	6.7 ¦ 7.0	6.9 ¦ 7.0	6.9 ¦ 7.1	7.0 ¦ 6.9	7.1 ¦ 7.0	6.5		STAT 26.2
Temp	24.3	24.6 ¦ 24.1	25.0 ¦ 24.1	24.4 ¦ 24.2	25.2 ¦ 24.2	25.7 ¦ 24.2	25.6 ¦ 24.1	25.1		
pH	7.9	8.0 ¦ 8.0	7.9 ¦ 8.0	7.8 ¦ 7.8	7.9 ¦ 7.9	7.9 ¦ 7.9	7.8 ¦ 8.0	8.0		ACCP 26.6
Cond	184	309	315	306	308	312	313			
(1) 50	0	0	0	2	→ 7	12	0	16		37
	0	0	0	3	→ 7	0	12	14		36
	0	0	0	3	→ 7	0	10	12		32
	0	0	0	3	→ 8	9	5	7		~~31~~ 27
	0	0	0	5 +1	0	13	12	8		31
	0	0	0	3	→ 8	10	0	12		33
	0	0	0	3	→ 4	11	10	14		28
	0	0	0	3	→ 10	8	9	13		34
	0	0	0	4	6 +3	0	11	12		24
	0	0	0	4	8	0	11	10		23
DO	7.1	7.0 ¦ 7.0	6.7 ¦ 6.9	6.9 ¦ 6.7	6.9 ¦ 6.9	7.0 ¦ 6.9	7.1 ¦ 7.0	6.5		30.5
Temp	24.5	24.6 ¦ 24.4	25.0 ¦ 24.1	24.4 ¦ 24.3	25.2 ¦ 24.2	25.7 ¦ 24.3	25.6 ¦ 24.1	25.1		26.2
pH	6.8	8.0 ¦ 6.9	7.9 ¦ 6.9	7.8 ¦ 6.9	7.9 ¦ 7.2	7.8 ¦ ~~7.5~~ 7.3	7.8 ¦ 7.5	8.0		
Cond	1693	1811	1880	1857	1836	1853	1858			

	0	1	2	3	4	5	6	7	8	Total
(2) 100	0	0	0	2	→ 7	10	0	12		31
	0	0	0	3	→ 7	9	0	13		32
	0	0	0	4	8	0	12	12		24
	0	0	0	0	6	9	9	11		24
	0	0	0	3 +1	0	9	12	13		25
	0	0	0	2	→ 7	6	0	16		31
	0	0	0	1	7 ~~NE~~	0	7	7		22
	0	0	0	3	→ 9	5	0	13		30
	0	0	0	2	→ 7	0	9	8		26
	0	0	0	4	8	0	9	6		21
DO	7.2	7.0 ¦ 7.0	6.7 ¦ 6.8	6.9 ¦ 6.6	6.9 ¦ 6.8	7.1 ¦ 6.8	7.1 ¦ 6.9	6.5		26.6
Temp	24.8	24.6 ¦ 24.6	25.0 ¦ 24.2	24.4 ¦ 24.4	25.2 ¦ 24.3	25.7 ¦ 24.4	25.6 ¦ 24.1	25.1		30.5
pH	6.8	8.0 ¦ 6.9	7.8 ¦ 6.9	7.8 ¦ 6.9	7.8 ¦ 7.2	7.7 ¦ 7.4	7.7 ¦ 7.5	7.9		
Cond	1914	2230	2260	1964	2220	2320	2100			
(3) 70	0	0	0	1	→ ~~6~~ 5	0	7	6		19
	0	0	0	2	0	5	7	4		14
	0	0	0	2	3 +1	0	9	8		15
	0	0	0	4	9	0	10	6		23
	0	0	0	3	0	9	7	8		19
	0	0	0	3	→ ~~6~~ 8	5	0	6		22
	0	0	0	2	→ 6	0	7	3		18
	0	0	0	3	4 +2	0	~~6~~ 0	4		13
	0	0	0	3	→ 4	0	8	7		22
	0	0	0	4	→ 2	0	9	6		21
DO	7.3	7.1 ¦ 7.1	6.8 ¦ 6.7	6.9 ¦ 6.5	6.9 ¦ 6.6	7.1 ¦ 6.7	7.1 ¦ 6.8	6.0		
Temp	25.0	24.6 ¦ 24.9	25.0 ¦ 24.2	24.4 ¦ 24.4	25.2 ¦ 24.3	25.7 ¦ 24.5	25.6 ¦ 24.1	25.1		~~26.6~~
pH	6.7	7.9 ¦ 6.9	7.8 ¦ 6.9	7.7 ¦ 6.9	7.7 ¦ 7.2	7.7 ¦ 7.4	7.6 ¦ 7.5	7.8		
Cond	2100	~~2230~~ 2490	2550	2460	2460	2520	2480			18.6

9/1/12AE

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0	0	3	0	2		5
100	0	0	0	0	0	5	6	0		11
	0	0	0	0	1	0	0	1		2
	0	0	0	0	0	7	0	2		9
	0	0	0	1	0	6	5			12
	0	0	0	2 →	6	5	0	3		16
	0	0	0	0	6	0	4	2		12
	0	0	0	1	0					1
	0	0	0	2	4	0	0	3		9
	0	0	0	3 +2	2	0	5	0		10
DO	7.4	7.1 / 7.2	6.8 / 6.6	6.9 / 6.4	6.9 / 6.5	7.1 / 6.7	7.1 / 6.7	6.6		
Temp	25.4	24.0 / 25.2	25.0 / 24.3	24.4 / 16.9	25.2 / 24.5	25.7 / 24.6	25.6 / 24.1	25.1		~~186~~
pH	10.1	7.9 / 10.8	7.7 / 6.9	7.7 / 6.9	7.6 / 7.0	7.6 / 7.4	7.6 / 7.4	7.1		6.7
Cond	7920	3200	3280	3170	3270	3280	3240		[redacted]	
(5)	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
	0	0	0							
DO										
Temp										8
pH										
Cond									[redacted]	
Algae	AP0I17B	AP0I17B	AB5IAPE	AB5IAPE	AB5IAPE	AB5IAPE	AB5IAPE		[redacted]	
YCT	1802	1802	1802	1802	1802	1802	1802		[redacted]	
H_2O									[redacted]	
Initials	MV	MV	THW	THW	THW	THW	THW	KB	[redacted]	

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	1998						96		
Alkalinity	511						60		
Chlorine	<0.01						<0.01		
Ammonia	2.29						<0.03		

1. Exposure Chamber
   - Total Capacity: 30 ml — Test Solution Volume: 15 ml
   - Test Solution Surface Area: ______ cm² — Water Depth (constant): ______ cm
   - (cyclic): ______ to ______ cm
2. Feeding Schedule
   - Not fed: ______ — Fed Daily: X
   - Fed Irregularly: ______ — Food Used: YCT, algae
3. Aeration
   - #1 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)
   - #2 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)
   - #3 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)
4. Screened Animal Enclosers
   - Not Used: X — Used: ______ cm diameter
5. Condition/appearance of surviving organisms at end of test (i.e., alive but immobile; loss of orientation; erratic movement; etc,): Active and mobile
6. Comments:

x:y:z = board #:row:column

1	2	3	4	5	6	7	8	9	10
B7	B8	B9	B10	C1	C5	C6	C7	C8	C9

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	4/27/2018	Test ID:	418208PIIB	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
ON-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
SN--Control	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
70	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
ON-Control	1.0000	1.1111	0	10	10	10	0.5619	
SN--Control	0.9000	1.0000	1	9	10	10	*	
50	1.0000	1.1111	0	10	10	10	0.5000	0.0500
60	1.0000	1.1111	0	10	10	10	0.5000	0.0500
70	1.0000	1.1111	0	10	10	10	0.5000	0.0500
100	0.9000	1.0000	1	9	10	10	0.7632	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1
Treatments vs SN--Control				

Reviewed by: MB

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	4/27/2018	Test ID:	418208PIIB	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
ON-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
SN--Control	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
70	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
ON-Control	1.0000	1.1111	1.0472	1.0472	1.0472	0.000	10		
SN--Control	0.9000	1.0000	0.9948	0.5236	1.0472	16.644	10	0.9750	1.0000
50	1.0000	1.1111	1.0472	1.0472	1.0472	0.000	10	0.9750	1.0000
60	1.0000	1.1111	1.0472	1.0472	1.0472	0.000	10	0.9750	1.0000
70	1.0000	1.1111	1.0472	1.0472	1.0472	0.000	10	0.9750	1.0000
100	0.9000	1.0000	0.9948	0.5236	1.0472	16.644	10	0.9000	0.9231

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.38358	0.947	-4.3479	19.2691
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 0.33)	1	2.10092		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	89.500			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIB	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
ON-Control	25.000	23.000	25.000	33.000	23.000	31.000	36.000	22.000	21.000	23.000
SN--Control	25.000	25.000	33.000	23.000	31.000	36.000	22.000	21.000	23.000	
50	37.000	36.000	32.000	27.000	31.000	33.000	28.000	34.000	24.000	23.000
60	31.000	32.000	24.000	24.000	25.000	31.000	22.000	30.000	26.000	21.000
70	19.000	14.000	15.000	23.000	19.000	22.000	18.000	13.000	22.000	21.000
100	5.000	11.000	2.000	9.000	12.000	16.000	12.000	1.000	9.000	10.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
ON-Control	26.200	0.9866	26.200	21.000	36.000	19.857	10	*		
SN--Control	26.556	1.0000	26.556	21.000	36.000	20.289	9			
50	30.500	1.1485	30.500	23.000	37.000	15.856	10	-2.130	2.223	4.488
60	26.600	1.0017	26.600	21.000	32.000	15.266	10	-0.198	2.223	4.488
*70	18.600	0.7004	18.600	13.000	23.000	19.168	10	3.765	2.223	4.488
*100	8.700	0.3276	8.700	1.000	16.000	54.198	10	8.669	2.223	4.488

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.96632	0.947	0.09919	-0.8447
Bartlett's Test indicates equal variances (p = 0.83)	1.50716	13.2767		
The control means are not significantly different (p = 0.89)	0.14627	2.10982		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs ON-Control	60	70	64.8074	1.66667	4.48847	0.17132	748.57	20.3778	1.2E-13	4, 45

ToxCalc v5.0.23

Reviewed by: MP

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIB	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
ON-Control	25.000	23.000	25.000	33.000	23.000	31.000	36.000	22.000	21.000	23.000
SN--Control	25.000	25.000	33.000	23.000	31.000	36.000	22.000	21.000	23.000	
50	37.000	36.000	32.000	27.000	31.000	33.000	28.000	34.000	24.000	23.000
60	31.000	32.000	24.000	24.000	25.000	31.000	22.000	30.000	26.000	21.000
70	19.000	14.000	15.000	23.000	19.000	22.000	18.000	13.000	22.000	21.000
100	5.000	11.000	2.000	9.000	12.000	16.000	12.000	1.000	9.000	10.000

			Transform: Untransformed					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
ON-Control	26.200	0.9866	26.200	21.000	36.000	19.857	10	28.350	1.0000
SN--Control	26.556	1.0000	26.556	21.000	36.000	20.289	9		
50	30.500	1.1485	30.500	23.000	37.000	15.856	10	28.350	1.0000
60	26.600	1.0017	26.600	21.000	32.000	15.266	10	26.600	0.9383
70	18.600	0.7004	18.600	13.000	23.000	19.168	10	18.600	0.6561
100	8.700	0.3276	8.700	1.000	16.000	54.198	10	8.700	0.3069

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.96632	0.947	0.09919	-0.8447
Bartlett's Test indicates equal variances (p = 0.83)	1.50716	13.2767		
The control means are not significantly different (p = 0.89)	0.14627	2.10982		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	58.100	3.378	52.961	61.799	-1.9726
IC10	61.356	2.007	55.921	63.621	-1.1884
IC15	63.128	1.601	58.882	65.508	-0.7832
IC20	64.900	1.476	61.886	67.397	-0.3568
IC25	66.672	1.494	64.187	69.496	0.0622
IC40	74.818	3.424	69.139	80.827	0.0228
IC50	83.409	3.451	77.058	90.528	-0.1736

Appendix 3 – Data Sheets for the Filtrate Test

WET TEST REPORT FORM – CHRONIC TIE PHASE II - FILTRATE

Permittee: Elk Ridge Mining and Reclamation **Outfall:** 013
Permit No.: CO-0000213

Test Type: Routine ☒ Accelerated ☐ TIE ☒
Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1751	04-27-2018	1700	05-04-2018

Test Results	Lethality	Reproduction
NOEC	100%	100%
	PASS	**PASS**
IC_{25}	>1000%	>100%
	PASS	**PASS**

Dilution(s) - % Effluent

Measurements	Control (0%)	50%	60%	70%	100%	Method Blank
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	100
% Survival for day 3	100	100	100	100	100	90
% Survival for day 4	100	100	100	100	100	90
% Survival for day 5	100	100	100	100	100	90
% Survival for day 6	100	100	100	100	100	90
% Survival for day 7	100	100	100	100	100	90
Mean 3 Brood Total	**25.7**	**24.9**	**23.8**	**22.7**	**19.6**	**21.9**

Hardness (mg/L) – Recon Water: 96
Alkalinity (mg/L) – Recon Water: 60
pH (initial/final) – Control: 8.0/8.0 100%: 6.7/8.3

Were all Test Conditions in Conformance with Division Guidelines? YES ☒ NO ☐
If **NO**, list deviations from test specifications:
Laboratory: SeaCrest Group
Comments:
Analyst's Name: Tessa Hunt-Woodland, Madison Reese, and Kyra Brisson

Signature *Date* 06/05/2018

T2 Fifth

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Elk Ridge PIEPhase2 Lab #: 418 208B Site: NPDES 013
IWC %: 100 Template #: 5 Dilution Water: MH18-008 Sample Date: 042718
Age & Source: cerio 042718 1008 Test Start: 1751 042718 Test End: 050418 1700
Test Conditions: Test goes 7 days

	0	1	2	3	4	5	6	7	8	Total
(C) 0	0	0	0	5	8	14	0	12		27
	0	0	0	5	9	0	12	12		26
	0	0	0	6	8	0	11	16		25
	0	0	0	5	7 +1	0	14	14		27
	0	0	0	3	8 +1	0	11	15		23
	0	0	0	4	8	0	11	14		23
	0	0	0	3 →	9	7	0	15		34
	0	0	0	3	0	8	10	9		21
	0	0	0	5	7	0	12	11		24
	0	0	0	3 →	7	9	8	6		27
DO	7.0	7.2 7.0	6.9 7.0	6.9 7.0	7.1 7.1	7.1 6.9	7.0 7.0	6.6		STAT
Temp	24.1	25.0 24.3	25.0 24.1	24.7 24.2	25.6 24.1	25.6 24.1	25.5 24.2	24.2		25.7
pH	8.0	8.0 8.0	8.0 8.0	7.8 8.0	7.8 8.1	7.8 8.0	8.0 8.0	8.0		ACCP
Cond	285	321	315	304	308	313	313			—
(1) 50	0	0	0	6	8	7 +1	0	13		22
	0	0	0	6	6	0	11	12		23
	0	0	0	5	8	0	12	14		25
	0	0	0	5 +2	8	0	12	14		19
	0	0	0	3	0	8	9	8		26
	0	0	0	0	0	5	11	12		28
	0	0	0	2 +1	0	9	0	14		26
	0	0	0	4	9	7	12	12		20
	0	0	0	3 →	7	0	10	14		34
	0	0	0	3 →	7	6	0	16		32
DO	10.7	7.2 10.9	6.9 6.8	6.9 6.7	7.1 6.9	7.1 6.8	7.0 6.8	6.6		24.9
Temp	24.4	25.0 24.0	25.0 24.3	24.7 24.3	25.6 24.3	25.6 24.3	25.5 24.3	24.2		
pH	8.1	8.0 7.0	8.1 6.7	8.0 6.9	7.9 6.9	7.9 7.0	8.0 6.8	8.1		
Cond	1902	PTH	2220	1970	1974	1981	1952			
	0	1	2	3	4	5	6	7	8	Total
(2) 100	0	0	0	5	8	9 +2	0	12		24
	0	0	0	5	7	0	10	16		22
	0	0	0	5	6 +1	0	13	16		25
	0	0	0	4	4 +3	8	11	11		22
	0	0	0	3+1	0	9	13	12		26
	0	0	0	3 →	9	0	12	12		36
	0	0	0	2 →	7	5	0	0		14
	0	0	0	3	7 DCE	9	13	8		25
	0	0	0	2	7 +1	0	10	8		20
	0	0	0	0	7	7	10	8		24
DO	10.4	7.3 10.8	6.9 6.6	6.9 6.6	7.1 6.7	7.1 6.7	7.0 6.7	6.7		23.8
Temp	24.6	25.0 24.8	25.0 24.5	24.7 24.3	25.6 24.4	25.6 24.3	25.5 24.3	24.2		
pH	8.1	8.1 8.1	8.2 6.6	8.1 6.8	7.9 6.9	7.9 6.9	8.0 6.7	8.1		
Cond	2270	2480	2580	2490	2550	2530	2510			
(3) 70	0	0	0	3 →	6	9	8	13		31
	0	0	0	4	7	0	13	12		24
	0	0	0	0	0	5	10	9		24
	0	0	0	4	6	0	10	6		20
	0	0	0	2 +2	0	0	9	8		21
	0	0	0	2	4 +2	0	11	12		19
	0	0	0	4	7	0	0	10		21
	0	0	0	5	0	6	9	13		20
	0	0	0	3	7 +1	0	12	11		23
	0	0	0	2 →	5	8	9	0		24
DO	5.9 10.4	7.4 10.7	7.0 6.9	7.0 6.4	7.1 6.5	7.1 6.7	7.1 6.7	6.7		22.7
Temp	24.8	25.0 25.1	25.0 24.6	24.7 24.4	25.6 24.6	25.6 24.5	25.5 24.4	24.2		
pH	8.1	8.2 8.9	8.3 6.6	8.3 6.8	8.0 6.8	7.9 6.9	8.0 6.6	8.2		
Cond	~~4410~~ 1570	2820	2900	2790	2800	2830	2710			

9HNTHi7

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	3 →	7	7	0	12		29
100	0	0	0	80	8	4	10	9		23
	0	0	0	2	0	4	6	6		12
	0	0	0	2	6	egg 0	8	EE x3 ~~12~~ 0		16
	0	0	0	0	4	4	6	8		14
	0	0	0	1	5	0	9	14		29
	0	0	0	0	5	0	4 +3	0		12
	0	0	0	0	0	2	8	6		16
	0	0	0	3	0	8	8	12		19
	0	0	0	2 →	4	8	0	12		26
DO	5.4 / 6.4	7.4 / 6.6	7.0 / 6.1	7.0 / 6.2	7.1 / 6.5	7.1 / 6.7	7.1 / 6.6	6.7		19.6
Temp	25.2	25.0 / 25.5	25.0 / 24.8	24.7 / 24.4	25.6 / 24.8	25.6 / 24.6	25.5 / 24.4	24.2		
pH	6.7	8.3 / 6.8	8.4 / 6.6	8.4 / 6.8	8.1 / 6.7	8.0 / 6.7	8.0 / 6.6	~~6.8~~		
Cond	3350	3190	3840	3700	3750	3820	3650	8.3		
(5)	0	0	0	4	7	12	0	13		23
B	0	0	0	4	7 H	0	11	12		23
	0	0	0	4	8 H	0	10	14		23
	0	0	0	egg ~~7~~ 6	8	0	8	8		22
	0	0	0	2 →	7	0	11	12		32
	0	0	0	5	6	0	12	0		23
	0	0	0	4	7	7	0	14		18
	0	0	0	4	7	0	13	12		24
	0	0	0	6D						6
	0	0	0	8	9	8	8	3		25
DO	6.8	7.3 / 7.3	6.9 / 6.8	6.9 / 6.8	7.2 / 7.3	7.3 / 7.0	7.2 / 7.2	6.6		21.9
Temp	24.3	25.0 / 24.5	25.0 / 24.2	24.7 / 24.2	25.6 / 24.6	25.6 / 24.2	25.5 / 24.2	24.2		
pH	8.1	8.3 / 8.1	8.4 / 8.1	~~8.4~~ / 8.0	8.2 / 8.1	8.2 / 7.9	8.3 / 7.9	8.4		
Cond	440	492	489	475	481	492	489			
Algae	[illegible]	[illegible]	ABS/ABC	ABS/ABC	ABS/ABC	ABS/ABC	ABS/ABC			
YCT	1802	1802	1802	1802	1802	1802	1802			
H_2O										
initials	MK	MK	TMW	TMW	TMW	TMW	TMW	[illegible]		

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness							96		
Alkalinity							60		
Chlorine							<0.01		
Ammonia							<0.03		

1. Exposure Chamber
   - Total Capacity: 30 ml
   - Test Solution Surface Area: ______ cm²
   - Test Solution Volume: 15 ml
   - Water Depth (constant): ______ cm
   - (cyclic): ______ to ______ cm

2. Feeding Schedule
   - Not fed: ______
   - Fed Irregularly: ______
   - Fed Daily: X
   - Food Used: YCT, algae

3. Aeration
   - #1 None: ______ Before Use: ______ (______ minutes @ ~100 bubbles/min)
   - #2 None: ______ Before Use: ______ (______ minutes @ ~100 bubbles/min)
   - #3 None: ______ Before Use: ______ (______ minutes @ ~100 bubbles/min)

4. Screened Animal Enclosers
   - Not Used: X
   - Used: ______ cm diameter

5. Condition/appearance of surviving organisms at end of test (i.e., alive but immobile; loss of orientation; erratic movement; etc,): Healthy and active

6. Comments:

x:y:z = board #:row:column

1	2	3	4	5	6	7	8	9	10
B1	B2	B3	B5	B4	B6	B7	B8	B9	B10

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIF	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	27.000	26.000	25.000	27.000	23.000	23.000	34.000	21.000	24.000	27.000
50	22.000	23.000	25.000	19.000	20.000	28.000	26.000	20.000	34.000	32.000
60	24.000	22.000	25.000	22.000	26.000	36.000	14.000	25.000	20.000	24.000
70	31.000	24.000	24.000	20.000	21.000	19.000	21.000	20.000	23.000	24.000
100	29.000	23.000	12.000	16.000	14.000	29.000	12.000	16.000	19.000	26.000
B	23.000	23.000	23.000	22.000	32.000	23.000	18.000	24.000	6.000	25.000

			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	25.700	1.0000	25.700	21.000	34.000	13.854	10		
50	24.900	0.9689	24.900	19.000	34.000	20.691	10	95.50	76.00
60	23.800	0.9261	23.800	14.000	36.000	23.166	10	88.50	76.00
70	22.700	0.8833	22.700	19.000	31.000	15.267	10	77.50	76.00
100	19.600	0.7626	19.600	12.000	29.000	34.115	10	80.50	76.00
B	21.900	0.8521	21.900	6.000	32.000	30.016	10		

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.94676	0.947	0.61175	0.20895
Bartlett's Test indicates equal variances (p = 0.25)	5.41754	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs D-Control				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIF	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	27.000	26.000	25.000	27.000	23.000	23.000	34.000	21.000	24.000	27.000
50	22.000	23.000	25.000	19.000	20.000	28.000	26.000	20.000	34.000	32.000
60	24.000	22.000	25.000	22.000	26.000	36.000	14.000	25.000	20.000	24.000
70	31.000	24.000	24.000	20.000	21.000	19.000	21.000	20.000	23.000	24.000
100	29.000	23.000	12.000	16.000	14.000	29.000	12.000	16.000	19.000	26.000
B	23.000	23.000	23.000	22.000	32.000	23.000	18.000	24.000	6.000	25.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	25.700	1.0000	25.700	21.000	34.000	13.854	10			
50	24.900	0.9689	24.900	19.000	34.000	20.691	10	0.356	2.223	4.998
60	23.800	0.9261	23.800	14.000	36.000	23.166	10	0.845	2.223	4.998
70	22.700	0.8833	22.700	19.000	31.000	15.267	10	1.334	2.223	4.998
*100	19.600	0.7626	19.600	12.000	29.000	34.115	10	2.713	2.223	4.998
B	21.900	0.8521	21.900	6.000	32.000	30.016	10			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.94676	0.947	0.61175	0.20895
Bartlett's Test indicates equal variances (p = 0.25)	5.41754	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs D-Control	70	100	83.666	1.42857	4.99819	0.19448	56.53	25.2689	0.07995	4, 45

Reviewed by: MK

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIF	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	27.000	26.000	25.000	27.000	23.000	23.000	34.000	21.000	24.000	27.000
50	22.000	23.000	25.000	19.000	20.000	28.000	26.000	20.000	34.000	32.000
60	24.000	22.000	25.000	22.000	26.000	36.000	14.000	25.000	20.000	24.000
70	31.000	24.000	24.000	20.000	21.000	19.000	21.000	20.000	23.000	24.000
100	29.000	23.000	12.000	16.000	14.000	29.000	12.000	16.000	19.000	26.000
B	23.000	23.000	23.000	22.000	32.000	23.000	18.000	24.000	6.000	25.000

			Transform: Untransformed					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	25.700	1.0000	25.700	21.000	34.000	13.854	10	25.700	1.0000
50	24.900	0.9689	24.900	19.000	34.000	20.691	10	24.900	0.9689
60	23.800	0.9261	23.800	14.000	36.000	23.166	10	23.800	0.9261
70	22.700	0.8833	22.700	19.000	31.000	15.267	10	22.700	0.8833
100	19.600	0.7626	19.600	12.000	29.000	34.115	10	19.600	0.7626
B	21.900	0.8521	21.900	6.000	32.000	30.016	10		

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	1.30073	0.895	0.02834	1.16312
Bartlett's Test indicates equal variances (p = 0.25)	6.58482	15.0863		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	54.409			
IC10	66.091			
IC15	78.274			
IC20	90.710			
IC25	>100			
IC40	>100			
IC50	>100			

Appendix 4 – Data Sheets for the Re-Dissolved Filtrate Test

WET TEST REPORT FORM – CHRONIC TIE PHASE II – RE-DISSOLVED

Permittee: Elk Ridge Mining and Reclamation **Outfall:** 013
Permit No.: CO-0000213

Test Type: Routine ☒ Accelerated ☐ TIE ☒
Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1742	04-27-2018	1725	05-04-2018

Test Results	Lethality	Reproduction
NOEC	60%	50%
	FAIL	**FAIL**
IC_{25}	62.5%	55.7%
	FAIL	**FAIL**

Dilution(s) - % Effluent

Measurements	Control (0%)	50%	60%	70%	100%	Method Blank
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	100
% Survival for day 3	100	100	100	80	40	100
% Survival for day 4	100	100	100	70	0	100
% Survival for day 5	100	100	80	60	0	80
% Survival for day 6	100	100	80	60	0	80
% Survival for day 7	100	100	80	60	0	80
Mean 3 Brood Total	**21.7**	**19.4**	**13.9**	**8.0**	**0.0**	**9.0**

Hardness (mg/L) – Recon Water: 96
Alkalinity (mg/L) – Recon Water: 60
pH (initial/final) – Control: 7.8/7.8 100%: 6.6/7.0

Were all Test Conditions in Conformance with Division Guidelines? YES ☒ NO ☐
If **NO**, list deviations from test specifications:
Laboratory: SeaCrest Group
Comments:
Analyst's Name: Tessa Hunt-Woodland, Madison Reese, and Kyra Brisson

Signature [signature] *Date* 06/05/2018

T3 resuspend

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Elk Ridge TIE Phase 2 Lab #: 418 208 B Site: NPDES 013
IWC %: 100 Template #: 5 Dilution Water: MHT 8.008 Sample Date: 030718
Age & Source: cerio 042718 1008 Test Start: 042718 1742 Test End: 050418 1725
Test Conditions: TCH goes 7 days

	0	1	2	3	4	5	6	7	8	Total
(C) 0	0	0	0	3	6 +1	0	8	9		18
	0	0	0	4	0	4	8	13		18
	0	0	0	5	7	0	6	15		18
	0	0	0	5	9	0	7	13		21
	0	0	0	3 →	9	12	8	10		34
	0	0	0	5	8	0	9	16		22
	0	0	0	4	9	9	8	16		17
	0	0	0	4	9	8	0	15		21
	0	0	0	4	5	8 +1	9	12		18
	0	0	0	5	6	8	9	0		20
DO	7.0 7.0	7.0 7.0	6.8 6.9	6.8 7.0	6.8 7.0	6.8 6.9	6.9 7.0	6.4		STAT 21.7
Temp	24.2 24.2	24.1 24.1	24.9 24.2	24.6 24.1	24.1 24.2	25.3 25.0	24.8 24.2	24.3		
pH	7.8 7.9	8.1 8.1	7.8 8.1	7.7 8.0	7.9 8.0	7.9 8.0	7.8 8.1	7.8		ACCP ✓
Cond	287	307	316	305	310	315	313			
(1) 50	0	0	0	2	6 +1	0	7	10		16
	0	0	0	3	6 +1	0	8	9		18
	0	0	0	3	8	8	7	13		18
	0	0	0	3	7	0	6	9		16
	0	0	0	2	6 +1	0	6	12		15
	0	0	0	2	0	9	7	12		15
	0	0	0	3 →	7	6	0	13		29
	0	0	0	2 →	6	8	6	8		22
	0	0	0	3 →	6	0	5	13		27
	0	0	0	3	7	8	5	0		15
DO	6.7 7.0	6.7 6.7	6.7 6.7	6.7 6.7	6.8 6.8	6.8 6.7	7.1 6.8	6.8		19.4
Temp	24.0 24.1	24.4 24.4	24.9 24.2	24.6 24.1	24.7 24.3	25.3 24.2	24.8 24.2	24.3		
pH	6.7 7.1	6.9 7.7	6.9 7.5	7.5 7.1	7.6 7.1	7.6 7.0	7.6 6.9	7.8		
Cond	1951	2210	2310	2240	2200	2300	1859			
	0	1	2	3	4	5	6	7	8	Total
(2) 100	0	0	0	0	7	0	5	8		16
	0	0	0	3 →	5	0	4	8		20
	0	0	0	0	6	D	DEC			0
	0	0	0	2 +1	0	0	4	8		15
	0	0	0	3	5 +1	0	4	10		13
	0	0	0	0	0	5	3	0		8
	0	0	0	2 +2	0	3	0	8		15
	0	0	0	3	6 +1	D				10
	0	0	0	3 →	5	8	7	13		28
	0	0	0	2	0	7	5	7		14
DO	6.5 7.1	6.6 6.8	6.8 6.5	6.6 6.5	6.8 6.7	6.9 6.6	7.1 6.7	6.9		13.9
Temp	24.8 24.9	24.6 24.6	24.9 24.2	24.6 24.1	24.7 24.4	25.3 24.3	24.8 24.3	24.3		
pH	6.8 7.2	6.9 6.9	7.5 6.9	7.4 7.1	7.5 7.1	7.4 6.9	7.5 6.8	7.7		
Cond	2460	2460	2720	2680	2630	2650	2100			
(3) 70	0	0	0	D						0
	0	0	0	0	0	0	3	2		5
	0	0	0	0	3	4	5	0		12
	0	0	0	0	4	0	5	7		16
	0	0	0	4	4D					8
	0	0	0	2	0	D				2
	0	0	0	D						0
	0	0	0	2 →	4	0	3	6		15
	0	0	0	2 →	3	3	7	8		15
	0	0	0	3	0	1	3	2		7
DO	6.8 7.1	7.1 6.5	6.8 6.3	6.5 6.3	6.9 6.5	6.9 6.6	7.2 6.7	7.0		8.0
Temp	25.0 24.9	24.8 24.8	24.9 24.3	24.6 24.2	24.7 24.5	25.3 24.3	24.8 24.3	24.3		
pH	6.8 7.5	6.9 6.9	7.3 6.9	7.2 7.0	7.3 7.0	7.3 6.8	7.4 6.8	7.7		
Cond	3040	3090	3150	3010	2960	3000	2790			

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	D						0
100	0	0	0	D						
	0	0	0	D						
	0	0	0	0	D					
	0	0	0	D						
	0	0	0	8	B					
	0	0	0	8						
	0	0	0	D						
	0	0	0	D						
	0	0	0		D					
DO	5.8 6.4	7.1 6.3	6.8 6.0	6.5 6.2	6.9 6.4	GC				0.0
Temp	25.4	24.9 25.2	24.9 24.3	24.6 24.2	24.7 24.6	~~25.3~~ GC				
pH	6.6	7.3 6.8	7.0 6.8	7.0 6.8	7.0 6.7					
Cond	3160	4010	4170	4030	4030					
(5)	0	0	0	3	0	7	0	0		10
B	0	0	0	2	0	0	9	1		12
	0	0	0	0	0	6 +2	0	3		11
	0	0	0	8	4	8	1	3		8
	0	0	0	0	0	8	1	0		1
	0	0	0	3	0	6D				9
	0	0	0	3	0	D				3
	0	0	0	6	0	0	0	6		12
	0	0	0	4	5	0	1	→ 8		18
	0	0	0	0	0	0	0	6		6
DO	6.6	7.1 6.2	6.9 6.3	6.7 6.7	7.0 6.6	7.0 6.9	7.1 6.9	7.0		9.0
Temp	24.3	24.9 24.4	24.9 24.2	24.6 24.1	24.7 24.4	25.3 24.4	24.8 24.3	24.3		
pH	8.4	8.7 7.6	8.6 8.2	8.5 8.1	8.6 8.1	8.6 8.0	8.5 8.1	8.5		
Cond	1444	1837	2070	2020	1918	2090	2066			
Algae	[illegible]	[illegible]	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO			
YCT	1802	1802	1802	1802	1802	1802	1802			
H_2O										
Initials	MK	MK	TMW	TMW	TMW	TMW	TMW	BB		

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	998						76		
Alkalinity	511						60		
Chlorine	<0.01						<0.01		
Ammonia	2.21						<0.03		

1. Exposure Chamber

Total Capacity: 30 ml — Test Solution Volume: 15 ml

Test Solution Surface Area: ______ cm² — Water Depth (constant): ______ cm

(cyclic): ______ to ______ cm

2. Feeding Schedule

Not fed: ______ — Fed Daily: X

Fed Irregularly: ______ — Food Used: YCT, algae

3. Aeration

#1 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)

#2 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)

#3 None: ______ — Before Use: ______ (______ minutes @ ~100 bubbles/min)

4. Screened Animal Enclosers

Not Used: X — Used: ______ cm diameter

5. Condition/appearance of surviving organisms at end of test (i.e., alive but immobile; loss of orientation; erratic movement; etc,): Healthy and active

6. Comments:

x:y:z = board #:row:column

1	2	3	4	5	6	7	8	9	10
A1	A2	A4	A5	A6	A7	A8	A9	B1	B2

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
70	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500
60	0.8000	0.8000	2	8	10	10	0.2368	0.0500
*70	0.6000	0.6000	4	6	10	10	0.0433	0.0500
*100	0.0000	0.0000	10	0	10	10	0.0000	0.0500
B	0.8000	0.8000	2	8	10	10		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	60	70	64.8074	1.66667
Treatments vs D-Control				

Reviewed by: MK

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
70	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
50	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
60	0.8000	0.8000	0.9425	0.5236	1.0472	23.424	10	0.8000	0.8000
70	0.6000	0.6000	0.8378	0.5236	1.0472	32.275	10	0.6000	0.6000
100	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000
B	0.8000	0.8000	0.9425	0.5236	1.0472	23.424	10		

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.76901	0.947	-1.3206	0.93285
Equality of variance cannot be confirmed				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	52.500	2.907	51.250	61.260	2.2718
IC10	55.000	3.827	52.500	65.000	1.1853
IC15	57.500	4.285	53.750	70.000	0.9967
IC20	60.000	5.123	55.000	71.765	0.6363
IC25	62.500	5.310	56.250	73.529	0.3486
IC40	70.000	5.190	60.000	78.824	-0.2644
IC50	75.000	5.349	64.975	82.353	-0.4426

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
70	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
50	1.0000	1.0000	0	10	10	10		
60	0.8000	0.8000	2	8	10	10		
70	0.6000	0.6000	4	6	10	10		
100	0.0000	0.0000	10	0	10	10		
B	0.8000	0.8000	2	8	10	10	0.2368	0.0500

Hypothesis Test (1-tail, 0.05)

Fisher's Exact Test indicates no significant differences

Treatments vs D-Control

Reviewed by: MR

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	18.000	28.000	18.000	21.000	34.000	22.000	17.000	21.000	18.000	20.000
50	16.000	18.000	18.000	16.000	15.000	18.000	29.000	22.000	27.000	15.000
60	16.000	20.000	0.000	15.000	13.000	8.000	15.000	10.000	28.000	14.000
70	0.000	5.000	12.000	16.000	8.000	2.000	0.000	15.000	15.000	7.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B	10.000	12.000	11.000	8.000	1.000	9.000	3.000	12.000	18.000	6.000

			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	21.700	1.0000	21.700	17.000	34.000	24.678	10		
50	19.400	0.8940	19.400	15.000	29.000	25.739	10	87.00	76.00
*60	13.900	0.6406	13.900	0.000	28.000	52.916	10	68.00	76.00
*70	8.000	0.3687	8.000	0.000	16.000	78.174	10	55.00	76.00
*100	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	76.00
B	9.000	0.4147	9.000	1.000	18.000	54.181	10		

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.94635	0.947	0.45825	1.14824
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	60	54.7723	2
Treatments vs D-Control				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	18.000	28.000	18.000	21.000	34.000	22.000	17.000	21.000	18.000	20.000
50	16.000	18.000	18.000	16.000	15.000	18.000	29.000	22.000	27.000	15.000
60	16.000	20.000	0.000	15.000	13.000	8.000	15.000	10.000	28.000	14.000
70	0.000	5.000	12.000	16.000	8.000	2.000	0.000	15.000	15.000	7.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B	10.000	12.000	11.000	8.000	1.000	9.000	3.000	12.000	18.000	6.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	21.700	1.0000	21.700	17.000	34.000	24.678	10			
50	19.400	0.8940	19.400	15.000	29.000	25.739	10	0.949	2.223	5.388
*60	13.900	0.6406	13.900	0.000	28.000	52.916	10	3.219	2.223	5.388
*70	8.000	0.3687	8.000	0.000	16.000	78.174	10	5.653	2.223	5.388
*100	0.000	0.0000	0.000	0.000	0.000	0.000	10	8.954	2.223	5.388
B	9.000	0.4147	9.000	1.000	18.000	54.181	10			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.94635	0.947	0.45825	1.14824
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	60	54.7723	2	5.38804	0.2483	776.65	29.3644	2.6E-11	4, 45
Treatments vs D-Control										

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	18.000	28.000	18.000	21.000	34.000	22.000	17.000	21.000	18.000	20.000
50	16.000	18.000	18.000	16.000	15.000	18.000	29.000	22.000	27.000	15.000
60	16.000	20.000	0.000	15.000	13.000	8.000	15.000	10.000	28.000	14.000
70	0.000	5.000	12.000	16.000	8.000	2.000	0.000	15.000	15.000	7.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B	10.000	12.000	11.000	8.000	1.000	9.000	3.000	12.000	18.000	6.000

			Transform: Untransformed					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	21.700	1.0000	21.700	17.000	34.000	24.678	10	21.700	1.0000
50	19.400	0.8940	19.400	15.000	29.000	25.739	10	19.400	0.8940
60	13.900	0.6406	13.900	0.000	28.000	52.916	10	13.900	0.6406
70	8.000	0.3687	8.000	0.000	16.000	78.174	10	8.000	0.3687
100	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000
B	9.000	0.4147	9.000	1.000	18.000	54.181	10		

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.97417	0.947	0.37023	0.30943
Equality of variance cannot be confirmed				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	23.587	16.003	9.058	52.387	0.4784
IC10*	47.174	12.568	18.116	55.035	-0.3877
IC15	51.736	8.627	27.174	59.876	-1.1100
IC20	53.709	5.556	36.232	60.920	-1.3471
IC25	55.682	3.878	45.290	62.268	-0.4505
IC40	61.492	3.302	55.881	68.266	0.4169
IC50	65.169	3.703	58.356	73.186	0.3599

* indicates IC estimate less than the lowest concentration

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/27/2018	Test ID:	418208PIIR	Sample ID:	EFFFIN-Effluent Final
End Date:	5/4/2018	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	18.000	28.000	18.000	21.000	34.000	22.000	17.000	21.000	18.000	20.000
50	16.000	18.000	18.000	16.000	15.000	18.000	29.000	22.000	27.000	15.000
60	16.000	20.000	0.000	15.000	13.000	8.000	15.000	10.000	28.000	14.000
70	0.000	5.000	12.000	16.000	8.000	2.000	0.000	15.000	15.000	7.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B	10.000	12.000	11.000	8.000	1.000	9.000	3.000	12.000	18.000	6.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	21.700	1.0000	21.700	17.000	34.000	24.678	10			
50	19.400	0.8940	19.400	15.000	29.000	25.739	10			
60	13.900	0.6406	13.900	0.000	28.000	52.916	10			
70	8.000	0.3687	8.000	0.000	16.000	78.174	10			
100	0.000	0.0000	0.000	0.000	0.000	0.000	10			
*B	9.000	0.4147	9.000	1.000	18.000	54.181	10	5.545	1.734	3.972

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.94524	0.905	0.89027	0.8763
F-Test indicates equal variances (p = 0.78)	1.20607	6.54109		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs D-Control	3.97156	0.18302	806.45	26.2278	2.9E-05	1, 18

Reviewed by: MR

Appendix 5 – QA/QC and Reference Toxicant Test Chart

Quality Assurance Check List – Chronic Whole Effluent Toxicity Test

Client: Elk Ridge Mining and Reclamation **SeaCrest Sample No.:** 418208.B

Species Tested: *Ceriodaphnia dubia*

Sample received in lab properly preserved (0-6°C)?	**Y**
Sample delivered on ice or equivalent?	**Y**
Test protocol conforms to CDPHE guidelines?	**Y**
Average test temp. ±1°C ?	**Y**
DO level ≥4.0mg/L; no super-saturation?	**Y**
Survival in control ≥90%, ≥80% for chronic?	**Y**
Ceriodaphnia dubia neonates <24-hours old?	**Y**
Appropriate reference toxicity test conducted?	**Y**
Lab. Ref. Tox. test results within the confidence limits for the lab?	**Y**

Signature _____ *Date* 06/05/2018
Position: Laboratory Director

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

METHOD QC

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	5/3/2018	100.80%	99.34%	0.00%	± 5.00%
2320 B	Alkalinity - Total	5/10/2018	100.80%	101.57%	1.74%	± 5.00%
2320 B	Alkalinity - Total	5/14/2018	100.80%	95.38%	-1.83%	± 5.00%
2320 B	Alkalinity - Total	5/21/2018	103.20%	97.69%	3.85%	± 5.00%
4500 NH_3 D	Ammonia	5/2/2018	98.32%	103.69%	0.65%	± 10.00%
4500 NH_3 D	Ammonia	5/8/2018	98.32%	103.97%	0.00%	± 10.00%
4500 NH_3 D	Ammonia	5/14/2018	103.14%	94.24%	4.29%	± 10.00%
4500 NH_3 D	Ammonia	5/21/2018	103.14%	95.51%	-1.98%	± 10.00%
4500 Cl D	Chlorine	5/27/2018	96.97%	96.97%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	5/5/2018	105.26%	95.18%	3.39%	± 5.00%
2340 B	Hardness - Total	5/10/2018	105.26%	97.41%	2.17%	± 5.00%
2340 B	Hardness - Total	5/17/2018	98.25%	95.86%	4.26%	± 5.00%
2340 B	Hardness - Total	5/24/2018	96.49%	98.52%	3.77%	± 5.00%

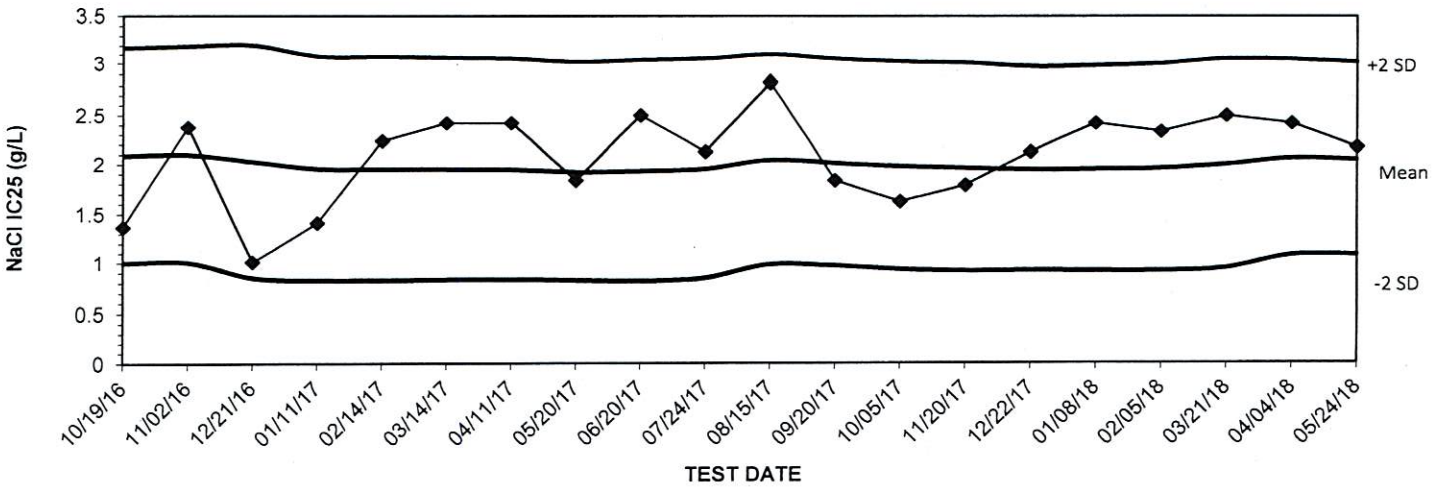
		Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	5/3/2018	N/A	98.59%	100.00%	± 5.00%
4500 O	DO - Winkler	5/11/2018	N/A	98.55%	101.49%	± 5.00%
4500 O	DO - Winkler	5/18/2018	N/A	98.57%	100.00%	± 5.00%
4500 O	DO - Winkler	5/26/2018	N/A	98.55%	100.00%	± 5.00%
4500 O	DO - Winkler	5/31/2018	N/A	98.53%	101.52%	± 5.00%

		Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	5/11/2018	99.9996%	-3.27%	105.80%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	5/11/2018	99.99997%	0.00%	89.40%	±20%, ± 15%

Signature: _____ ***Signature:*** _____

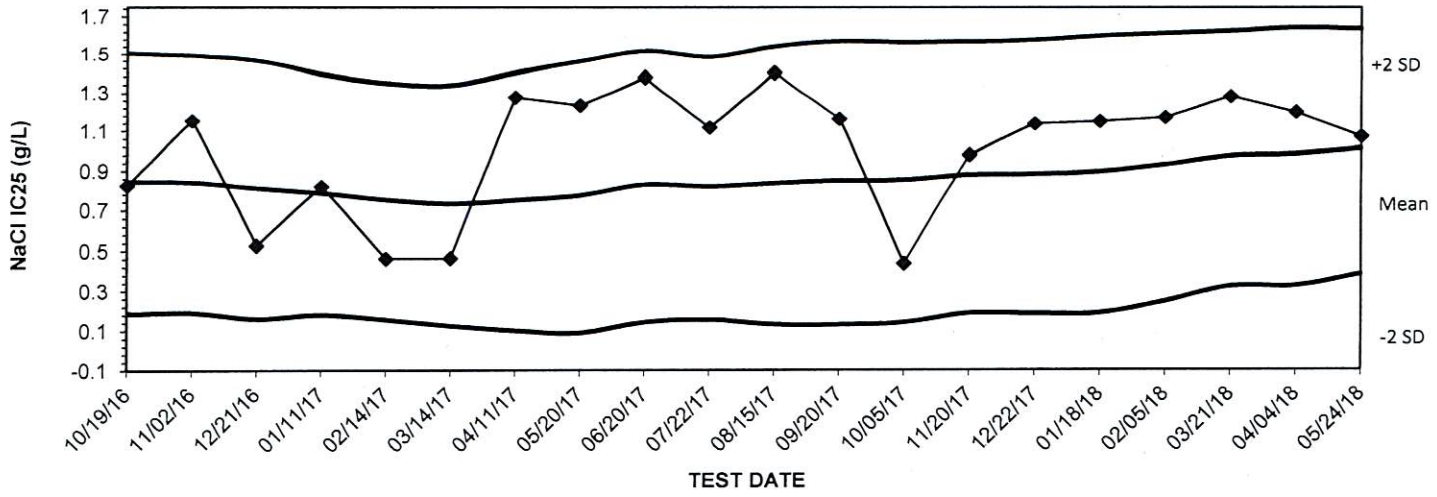
Date: 06/01/18 ***Date:*** 6/1/18

CERIODAPHNIA SURVIVAL IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
10/19/16	1.3674	2.0869	0.9991	3.1748
11/02/16	2.3750	2.0989	1.0038	3.1939
12/21/16	1.0083	2.0278	0.8515	3.2041
01/11/17	1.4100	1.9548	0.8280	3.0815
02/14/17	2.2353	1.9524	0.8284	3.0763
03/14/17	2.4211	1.9486	0.8318	3.0654
04/11/17	2.4211	1.9448	0.8353	3.0543
05/20/17	1.8333	1.9210	0.8252	3.0169
06/20/17	2.5000	1.9290	0.8182	3.0397
07/24/17	2.1250	1.9528	0.8480	3.0576
08/15/17	2.8284	2.0438	0.9834	3.1042
09/20/17	1.8333	2.0121	0.9693	3.0548
10/05/17	1.6250	1.9783	0.9334	3.0233
11/20/17	1.7857	1.9622	0.9162	3.0081
12/22/17	2.1250	1.9462	0.9223	2.9700
01/08/18	2.4211	1.9503	0.9191	2.9815
02/05/18	2.3333	1.9609	0.9183	3.0035
03/21/18	2.5000	2.0023	0.9459	3.0587
04/04/18	2.4211	2.0652	1.0795	3.0510
05/24/18	2.1719	2.0499	1.0827	3.0171

CERIODAPHNIA REPRODUCTION IC25 NaCl
REFTOX



Date	IC25	Mean	-2 SD	+2 SD
10/19/16	0.8250	0.8454	0.1867	1.5041
11/02/16	1.1541	0.8415	0.1916	1.4915
12/21/16	0.5270	0.8117	0.1615	1.4619
01/11/17	0.8196	0.7868	0.1816	1.3920
02/14/17	0.4621	0.7522	0.1564	1.3480
03/14/17	0.4637	0.7320	0.1254	1.3387
04/11/17	1.2762	0.7495	0.1006	1.3985
05/20/17	1.2328	0.7742	0.0902	1.4581
06/20/17	1.3758	0.8305	0.1432	1.5178
07/22/17	1.1166	0.8209	0.1569	1.4848
08/15/17	1.3990	0.8376	0.1322	1.5430
09/20/17	1.1638	0.8516	0.1313	1.5718
10/05/17	0.4375	0.8546	0.1423	1.5669
11/20/17	0.9798	0.8800	0.1893	1.5707
12/22/17	1.1379	0.8836	0.1881	1.5791
01/18/18	1.1509	0.8962	0.1904	1.6019
02/05/18	1.1717	0.9318	0.2475	1.6161
03/21/18	1.2810	0.9761	0.3242	1.6281
04/04/18	1.1996	0.9861	0.3266	1.6456
05/24/18	1.0705	1.0122	0.3852	1.6393

Appendix 6 – Analytical Data

Client: Elk Ridge NHM
Analyte: Chloride

Prep Date:	05/02/2018
Analysis Date:	05/02/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	SM 4500-Cl--1997
Analytical Method ID:	SM 4500-Cl--1997
Instrument:	Titrimetric
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	100 mL
Analyst:	SE

Location ID	SmpDate	SCG #	Results	Flags	RL	Units
NPDES 013	03/07/18	418208.BT1	11		2	mg/L
Filtrate	03/07/18	418208.BT2	9		2	mg/L
Re-Suspended Precipitate	03/07/18	418208.BT2	2		2	mg/L

Client: Elk Ridge NHM
Analyte: Bicarbonate (As HCO_3)

Prep Date:	05/02/2018
Analysis Date:	05/02/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	Std. Methods 2320 B.
Analytical Method ID:	Std. Methods 2320 B.
Instrument:	Titrimetric
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	100 mL
Analyst:	TA

Location ID	SmpDate	SCG #	Results	Flags	RL	Units
NPDES 013	03/07/18	418208.BT1	464		10	mg/L
Filtrate	03/07/18	418208.BT2	44		10	mg/L
Re-Suspended Precipitate	03/07/18	418208.BT2	8	J	10	mg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: Elk Ridge NHM
Analyte: Carbonate Alkalinity

Prep Date:	05/02/2018
Analysis Date:	05/02/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	Std. Methods 2320 B.
Analytical Method ID:	Std. Methods 2320 B.
Instrument:	Titrimetric
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	100 mL
Analyst:	TA

Location ID	SmpDate	SCG #	Results	Flags	RL	Units
NPDES 013	03/07/18	418208.BT1	U		10	mg/L
Filtrate	03/07/18	418208.BT2	44		10	mg/L
Re-Suspended Precipitate	03/07/18	418208.BT2	24		10	mg/L

Client: Elk Ridge NHM
Analyte: Alkalinity

Prep Date:	05/02/2018
Analysis Date:	05/02/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	Std. Methods 2320 B.
Analytical Method ID:	Std. Methods 2320 B.
Instrument:	Titrimetric
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	100 mL
Analyst:	TA

Location ID	SmpDate	SCG #	Results	Flags	RL	Units
NPDES 013	03/07/18	418208.BT1	463		10	mg/L
Filtrate	03/07/18	418208.BT2	88		10	mg/L
Re-Suspended Precipitate	03/07/18	418208.BT2	32		10	mg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: **Elk Ridge NHM**
Analyte: **Sulfate, SO_4^{2-}**

Prep Date: 05/02/2018
Analysis Date: 05/02/2018
Approved Method Source: 40 CFR 136.3
Prep ID: ASTM D516-07
Analytical Method ID: ASTM D516-07
Instrument: Evo 160, UV/VIS

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 100 mL Dilution Factor: 100
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	1,951		12	59	mg/L
Filtrate	03/07/18	418208.B T2	1,937		12	59	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		12	59	mg/L

Client: **Elk Ridge NHM**
Analyte: **Calcium, Ca – Total**

Prep Date: 05/01/2018
Analysis Date: 05/01/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: Std. Methods 3111 B.
Instrument: iCE 3500, FLAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 200, 100, 200
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	470		1.7	10.0	mg/L
Filtrate	03/07/18	418208.B T2	97.5		0.85	5.0	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	330		1.7	10.0	mg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: Elk Ridge NHM
Analyte: Magnesium, Mg – Total

Prep Date: 05/01/2018
Analysis Date: 05/02/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: Std. Methods 3111 B.
Instrument: iCE 3500, FLAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 200, 200, 100
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	197		0.12	0.62	mg/L
Filtrate	03/07/18	418208.B T2	181		0.12	0.62	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	10.4		0.06	0.31	mg/L

Client: Elk Ridge NHM
Analyte: Potassium, K – Total

Prep Date: 05/01/2018
Analysis Date: 05/02/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: Std. Methods 3111 B.
Instrument: iCE 3500, FLAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 20, 10, 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	24.0		0.20	1.2	mg/L
Filtrate	03/07/18	418208.B T2	17.3		0.10	0.6	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	6.4		0.01	0.06	mg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: **Elk Ridge NHM**
Analyte: **Sodium, Na – Total**

Prep Date: 05/01/2018
Analysis Date: 05/02/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: Std. Methods 3111 B.
Instrument: iCE 3500, FLAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 100, 400, 2
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	120		0.25	1.25	mg/L
Filtrate	03/07/18	418208.B T2	402		1.0	5.0	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	19.9		0.005	0.025	mg/L

Client: **Elk Ridge NHM**
Analyte: **Residue – filterable (TDS)**

Prep Date: 04/30/2018
Analysis Date: 05/01/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 2540 C
Analytical Method ID: Std. Methods 2540 C
Instrument: AE-240 Dual Range Analytical Balance

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 100 mL
Analyst: KB

Location ID	Smp Date	SCG #	Results	Flags	RL	Units	
NPDES 013	03/07/18	418208.B T1	3,215		0.25	1.25	mg/L
Filtrate	03/07/18	418208.B T2	368		0.25	1.25	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	2,538		0.25	1.25	mg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: Elk Ridge NHM

Analyte: Aluminum, Al - Total

Prep Date: 05/02/2018
Analysis Date: 05/25/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.7 Rev 4.4
Instrument: ICP

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: TA

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		1.9	5.0	µg/L
Filtrate	03/07/18	418208.B T2	U		1.9	5.0	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		1.9	5.0	µg/L

Client: Elk Ridge NHM
Analyte: Cadmium, Cd - Total

Prep Date: 05/01/2018
Analysis Date: 05/07/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		0.05	0.1	µg/L
Filtrate	03/07/18	418208.B T2	U		0.05	0.1	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		0.05	0.1	µg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: Elk Ridge NHM
Analyte: Chromium, Cr - Total

Prep Date: 05/01/2018
Analysis Date: 05/03/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		1.6	6.4	µg/L
Filtrate	03/07/18	418208.B T2	U		1.6	6.4	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		1.6	6.4	µg/L

Client: Elk Ridge NHM
Analyte: Copper, Cu - Total

Prep Date: 05/01/2018
Analysis Date: 05/02/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags		MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		0.21	1.07	µg/L	
Filtrate	03/07/18	418208.B T2	U			0.21	1.07	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U			0.21	1.07	µg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: Elk Ridge NHM
Analyte: Iron, Fe - Total

Prep Date:	05/01/2018
Analysis Date:	05/01/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	Std. Methods 3030 E.
Analytical Method ID:	Std. Methods 3111 B.
Instrument:	iCE 3500, FLAA
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	50 mL Dilution Factor: 1
Analyst:	SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	1.24		0.04	0.1	mg/L
Filtrate	03/07/18	418208.B T2	U		0.04	0.1	mg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	1.11		0.04	0.1	mg/L

Client: Elk Ridge NHM
Analyte: Manganese, Mn - Total

Prep Date:	05/01/2018
Analysis Date:	05/07/2018
Approved Method Source:	40 CFR 136.3
Prep ID:	Std. Methods 3030 E.
Analytical Method ID:	Std. Methods 200.9
Instrument:	iCE 3500, GFAA
Matrix:	Aqueous (water, wastewater, groundwater)
Sample volume used:	50 mL Dilution Factor: 1
Analyst:	SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	57.7		0.07	0.33	µg/L
Filtrate	03/07/18	418208.B T2	4.3		0.07	0.33	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	52.7		0.07	0.33	µg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: **Elk Ridge NHM**
Analyte: **Nickel, Ni – Total**

Prep Date: 05/012018
Analysis Date: 05/03/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	7.11		0.39	2.0	µg/L
Filtrate	03/07/18	418208.B T2	2.29		0.39	2.0	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	5.08		0.39	2.0	µg/L

Client: **Elk Ridge NHM**
Analyte: **Lead, Pb - Total**

Prep Date: 05/01/2018
Analysis Date: 05/08/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		0.04	0.18	µg/L
Filtrate	03/07/18	418208.B T2	U		0.04	0.18	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		0.04	0.18	µg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

Client: **Elk Ridge NHM**
Analyte: **Silver, Ag - Total**

Prep Date: 05/01/2018
Analysis Date: 05/05/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: USEPA 200.9
Instrument: iCE 3500, STPGFAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		0.036	0.18	µg/L
Filtrate	03/07/18	418208.B T2	U		0.036	0.18	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		0.036	0.18	µg/L

Client: **Elk Ridge NHM**
Analyte: **Zinc, Zn - Total**

Prep Date: 05/01/2018
Analysis Date: 05/08/2018
Approved Method Source: 40 CFR 136.3
Prep ID: Std. Methods 3030 E.
Analytical Method ID: Std. Methods 3111 B.
Instrument: iCE 3500, FLAA

Matrix: Aqueous (water, wastewater, groundwater)
Sample volume used: 50 mL Dilution Factor: 1
Analyst: SE

Location ID	Smp Date	SCG #	Results	Flags	MDL	RL	Units
NPDES 013	03/07/18	418208.B T1	U		1.6	8.08	µg/L
Filtrate	03/07/18	418208.B T2	U		1.6	8.08	µg/L
Re-Suspended Precipitate	03/07/18	418208.B T3	U		1.6	8.08	µg/L

Qualifiers:
E – Extrapolated value. Value exceeds calibration range
H – Analysis exceeded holding time
J – Estimated value detected below the RL/MRL
S – Spike recovery outside acceptance limits
U – Analyte not detected
X – See case narrative

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

CHAIN OF CUSTODY

500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
(303) 661.9324 - FAX (303) 661.9325

Client/Project Name: ELK RIDGE MINING & REC.
P. O./Project Number: NEW HORIZON MINE
Contact: T FRY
Address: 27696 W 5TH NUCLA CO 81424
Phone # 970 864 1073 E-Mail: TFRY@TRISTATEGT.ORG
Fax # Sampler: T FRY
Report By: ☐ Mail ☐ PDF ☐ FAX

Analysis (Check all applicable)

Sample Location or ID	Date	Time	Grab/ Comp	Lab ID (LAB Use Only)	WET: Acute (Indicate Below)	WET: Chronic (Indicate Below)	WET: Accelerated (Indicate Below)	WET: PTI/TIE/TRE (Indicate Below)		Metals (List Below)	Solids (TS/TDS/TSS) (Circle)	Anions (List Below)	Chromium III/VI (Circle)	Oil and Grease	Coliform (Total/Fecal/E-Coli) (Circle)	BOD/COD (Circle)	Other Analysis (List Below)				Number of Containers	Total Volume
NPDES 013	3.7.18	1005	G	418208.A													✓				1	250mL
NPDES 013	3.7.18	1005	G	418208.A													✓				1	QT

Turnaround Requirements (Analytical Testing Only)

_____ Standard (10 days) _____ 6-9 Day
_____ 3-5 Day _____ 1-2 Day
Requested Report Date:

Test Species: ☐ Fathead Minnow ☐ Cerio daphnia ☐ Daphnia magna ☐ Daphnia pulex ☐ Other (List Below)

Special Instructions/Comments: ELK RIDGE_022718

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	3.07.18 1200	UPS		UPS			030818 1342

SeaCrest Group
Louisville, Co

Analytical Receipt Form

Form#: 42c
Effective: Dec 2011

Project # 418 408.A
Date: 03081 8
Sample #:
Initials: MR

Samples Were:
1. Shipped Hand Delivered Messengered (circle one)
Notes:

3. Chilled to Ship
Notes:
Ambient Chilled (circle one)

Wet Ice Blue Ice (circle one)

4. Cooler Received Broken or Leaking Y N NA
Notes:

5. Sample Received Broken or Leaking Y N NA
Notes:

6. Received Within Holding Times Y N
Notes:

8. Sample Received at Temperature between 0-4° C . Y N NA
Notes:

9. Description of Sample (Color, and/or Presence of Particulate Matter):
Sample:

Samp. #	Preservative	Temp	pH	Cond
208.A	none	3.1		
	HNO3	4.0	1.9	

Custody Seals:
1. Present on Outer Package Y N
2. Broken on Outer Package Y N NA
3. Present on Sample Y N
4. Broken on Sample Y N NA

Custody Documentation:
1. Present Upon Receipt of Sample Y N

Notes:

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-295.A		
Analysis Date:	5/2/2018	**Analyst:**	S. Eubanks
Instrument:	EVO 160	**Analyte:**	SO_4^{2-}
QC Method:	ASTM D516-90 (SO4)		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\VISION_DATA		

		QC Limits
Calibration Line Fit:	0.9970	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	101.39%	90 - 110%
	102.20%	90 - 110%

	% Difference	QC Limits
Laboratory Control Duplicates:	0.99%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: ≤0-4°C

Client Contact: None

Comments: None

amPell JR

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208T1-T3.A		
Analysis Date:	5/1/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 FLAA	**Analyte:**	Ca
QC Method:	Std Methods 3111 B		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	1.0000	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	99.14%	90 - 110%
	99.93%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	99.60%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	-1.59%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A		
Analysis Date:	5/2/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 FLAA	**Analyte:**	Mg
QC Method:	Std Methods 3111 B		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9993	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	100.01%	90 - 110%
	97.45%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	104.67%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	-0.62%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A		
Analysis Date:	5/2/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 FLAA	**Analyte:**	K
QC Method:	Std Methods 3111 B		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9994	≥ 0.995
	% Recovery	**QC Limits**
Quality Control Sample:	101.93%	90 - 110%
	101.05%	90 - 110%
	% Recovery	**QC Limits**
Laboratory Fortified Blank:	100.58%	85 - 115%
	% Difference	**QC Limits**
Laboratory Control Duplicates:	0.47%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

All Data contained within this report is summarized. Actual batch QC data is maintained by the Quality Assurance Department at SeaCrest Group and is available upon request.

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A		
Analysis Date:	5/2/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 FLAA	**Analyte:**	Na
QC Method:	Std Methods 3111 B		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9982	≥ 0.995

	% Recovery	**QC Limits**
Quality Control Sample:	97.92%	90 - 110%
	97.78%	90 - 110%

	% Recovery	**QC Limits**
Laboratory Fortified Blank:	95.49%	85 - 115%

	% Difference	**QC Limits**
Laboratory Control Duplicates:	-0.06%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

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Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-324.A		
Analysis Date:	5/7/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Cd
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9986	≥ 0.995
	% Recovery	**QC Limits**
Quality Control Sample:	102.20%	90 - 110%
	106.07%	90 - 110%
	% Recovery	**QC Limits**
Laboratory Fortified Blank:	100.10%	85 - 115%
	% Difference	**QC Limits**
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

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Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A T1-T3		
Analysis Date:	5/3/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Cr
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9990	≥ 0.995
	% Recovery	**QC Limits**
Quality Control Sample:	101.14%	90 - 110%
	105.18%	90 - 110%
	% Recovery	**QC Limits**
Laboratory Fortified Blank:	94.81%	85 - 115%
		QC Limits
Laboratory Control Duplicates:	5.82%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A		
Analysis Date:	5/2/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Cu
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9995	≥ 0.995
	% Recovery	**QC Limits**
Quality Control Sample:	98.42%	90 - 110%
	100.64%	90 - 110%
	% Recovery	**QC Limits**
Laboratory Fortified Blank:	108.84%	85 - 115%
	% Difference	**QC Limits**
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

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Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A		
Analysis Date:	5/1/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Fe
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9969	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	104.73%	90 - 110%
	105.61%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	104.76%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

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Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-324.A		
Analysis Date:	5/7/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Mn
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9962	≥ 0.995
	% Recovery	**QC Limits**
Quality Control Sample:	106.12%	90 - 110%
	91.60%	90 - 110%
	% Recovery	**QC Limits**
Laboratory Fortified Blank:	102.80%	85 - 115%
	% Difference	**QC Limits**
Laboratory Control Duplicates:	4.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208.A T1-T3		
Analysis Date:	5/3/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Ni
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9989	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	103.91%	90 - 110%
	103.44%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	102.77%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	-6.69%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-324.A		
Analysis Date:	5/8/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Pb
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9967	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	102.96%	90 - 110%
	101.50%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	91.34%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-328.A		
Analysis Date:	5/5/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 GFAA	**Analyte:**	Ag
QC Method:	USEPA 200.9		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9950	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	95.72%	90 - 110%
	99.60%	90 - 110%
	101.35%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	103.91%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

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Validated

Analytical Quality Assurance Report

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

Batch Number(s):	418208-322.A		
Analysis Date:	5/8/2018	**Analyst:**	S. Eubanks
Instrument:	iCE 3500 FLAA	**Analyte:**	Zn
QC Method:	Std Methods 3111 B		
Results File Location:	\\SEACRESTSERV\Operations\Analytical\SOLAAR_DATA\Results		

		QC Limits
Calibration Line Fit:	0.9986	≥ 0.995

	% Recovery	QC Limits
Quality Control Sample:	103.45%	90 - 110%
	102.73%	90 - 110%

	% Recovery	QC Limits
Laboratory Fortified Blank:	102.03%	85 - 115%

	% Difference	QC Limits
Laboratory Control Duplicates:	0.00%	-15 - 15%

Analysis Anomalies: None

Method Required Preservation: HNO3/ ≤0-4°C

Client Contact: None

Comments: None

AMReese

Validated

Appendix 7 – Photography of Precipitate Filtered Cake