STATE OF COLORADO

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
Water Quality Control Division

AUTHORIZATION TO DISCHARGE UNDER THE
COLORADO DISCHARGE PERMIT SYSTEM
PERMIT NUMBER CO0045161

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended), for both discharges to surface and ground waters, and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), for discharges to surface waters only, the

Colowyo Coal Company L.P.

is authorized to discharge from the Colowyo Coal Mine located at **5731 State Highway 13 in Meeker, Colorado at 40.265648°latitude North and 107.808334°longitude West**

to **Wilson Creek, Taylor Creek, Good Spring Creek, and Collom Gulch**

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

The applicant may demand an adjudicatory hearing within thirty (30) calendar days of the date of issuance of the final permit determination, per the Colorado Discharge Permit System Regulations, 61.7(1). Should the applicant choose to contest any of the effluent limitations, monitoring requirements or other conditions contained herein, the applicant must comply with Section 24-4-104 CRS and the Colorado Discharge Permit System Regulations. Failure to contest any such effluent limitation, monitoring requirement, or other condition, constitutes consent to the condition by the Applicant.

This permit and the authorization to discharge shall expire at midnight, September 30, 2023.

Issued and Signed this 29th day of May, 2020.

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Meg Parish

Meg Parish, Permits Section Manager
Water Quality Control Division

Permit History
Modification 2 – Minor Amendment: Issued 5/29/2020, Effective 7/1/2020 (Parts. I.C.1, Part I.E.2)
Modification 1 – Minor Amendment: Issued 7/31/2019, Effective 9/1/2019 (Parts I.B., I.C., I.D., APPENDIX B)
Originally Issued August 31, 2018; Effective October 1, 2018.

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PART I

A. PERMITTED FEATURES

Beginning no later than the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from, and self monitoring samples taken in accordance with the monitoring requirements shall be obtained from permitted feature(s):

001- Stormwater runoff from reclamation areas, shallow springs (not associated with current or former mining areas), and groundwater (natural springs) from toe drain
002- Stormwater runoff from reclamation areas
003- Stormwater runoff from coal storage area, coal crushing facility, and crushing facility wash water
004- Stormwater runoff from reclamation areas
005- Stormwater runoff from reclamation areas
006- Stormwater runoff from coal storage area, railroad tunnel wash water, and runoff from pond outslope of Gossard Pond 003A
007- Stormwater runoff from reclamation areas
008- Stormwater runoff from reclamation areas and groundwater from toe drain (contains spoil springs)
009- Stormwater runoff from reclamation areas
010- Stormwater runoff from reclamation areas and natural springs (not associated with current or former mining areas)
011- Stormwater runoff from reclamation areas, three natural springs (not associated with current or former mining areas) and groundwater (natural springs) from toe drain (no spoil springs)
012- Stormwater runoff from reclamation areas, natural springs (not associated with current or former mining areas)
013- Stormwater runoff from overburden storage area and facilities area and natural springs managed through the underdrain system
014- Stormwater runoff from overburden storage area
015- Streeter pond outslope runoff (sheet flow)
016- Stoker siding pond outslope runoff (sheet flow)
017- Prospect pond outslope runoff (sheet flow)
018- West Taylor pond outslope runoff (sheet flow)
019- Stormwater runoff from topsoil stock piles
020- Stormwater runoff from S-Curve topsoil stockpile
021- Stormwater discharge from haul road (between coal preparation facilities) Sump 1
022- Stormwater discharge from haul road (between coal preparation facilities) Sump 2
023- Stormwater discharge from haul road (between coal preparation facilities) Sump 3
024- Stormwater discharge from haul road (between coal preparation facilities) Sump 4
025- Stormwater discharge from haul road (between coal preparation facilities) Sump 5
026- Stormwater runoff from Haul Road topsoil stockpile

Outfall	Latitude, Longitude	Receiving Water
001A	40.261111°N, 107.788611°W	Good Spring Creek
002A	40.268889°N, 107.821944°W	Taylor Creek
003A	40.308333°N, 107.806111°W	Wilson Creek
004A	40.253333°N, 107.788333°W	Good Spring Creek
005A	40.311944°N, 107.802778°W	Wilson Creek
006A	40.308333°N, 107.806389°W	Wilson Creek
007A	40.233056°N, 107.795556°W	Good Spring Creek
008A	40.269444°N, 107.828889°W	Taylor Creek
009A	40.221667°N, 107.825556°W	Good Spring Creek
010A	40.261111°N, 107.83389°W	Taylor Creek
011A	40.236944°N, 107.849167°W	Taylor Creek
012A	40.205833°N, 107.838056°W	Good Spring Creek
013A	40.288452°N, 107.889254° W	Little Collom Gulch
014A	40.286903°N, 107.904508° W	Collom Gulch
015A	40.261246°N, 107.788364° W	Good Spring Creek
016A	40.311846°N, 107.802578°W	Wilson Creek
017A	40.232876°N, 107.795576° W	Good Spring Creek

Outfall	Latitude, Longitude	Receiving Water
018A	40.237098°N, 107.848571° W	Taylor Creek
019A	40.241262°N, 107.793634° W	Good Spring Creek
020A	40.276482°N, 107.814472°W	Taylor Creek
021A	40.297476°N, 107.809681°W	Taylor Creek
022A	40.288033°N, 107.815753°W	Taylor Creek
023A	40.287368°N, 107.816071°W	Taylor Creek
024A	40.283029°N, 107.818751°W	Taylor Creek
025A	40.281440°N, 107.820013°W	Taylor Creek
026A	40.270948°N, 107.817353° W	Taylor Creek

The location(s) provided above will serve as the point(s) of compliance for this permit and are appropriate as they are located after all treatment and prior to discharge to the receiving water. Any discharge to the waters of the State from a point source other than specifically authorized by this permit is prohibited.

B. PERMIT COMPLIANCE

In accordance with the Water Quality Control Commission Regulations for Effluent Limitations (Section 62.4), the Colorado Discharge Permit System Regulations, Section 61.8(2), 5 C.C.R. 1002-61, and the federal Effluent Limitation Guideline for the Coal Mining Point Source (40 CFR 434), the permitted discharge shall not contain effluent parameter concentrations which exceed the limitations specified below or exceed the specified flow limitation. All discharges authorized under this permit shall comply with all the terms and conditions required by this permit. Violation of the terms and conditions specified in this permit may be subject to civil and criminal liability pursuant to sections 25-8-601 through 612, C.R.S.. Failure to take any required corrective actions, as detailed in the CORRECTIVE ACTIONS section, constitutes an independent, additional violation of this permit and may be subject to civil and criminal liability.

1. Facilities Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective performance, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when installed by the permittee only when necessary to achieve compliance with the conditions of the permit.

Any sludge produced at the wastewater treatment facility shall be disposed of in accordance with State and Federal guidelines and regulations. The permittee shall take all reasonable steps to minimize or prevent any discharge of sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. As necessary, accelerated or additional monitoring to determine the nature and impact of the noncomplying discharge is required.

2. Discharge(s) from Outfalls 003 and 006

This permit does not authorize any discharges from outfalls 003 and 006 that are not solely caused by precipitation events, where the discharge starts and stops shortly after the precipitation event starts/stops.

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Numeric Effluent Limitations and Site-specific Monitoring (Outfalls 003, 006, 010, 013, 014, 021-025)

In order to obtain an indication of the probable compliance or noncompliance with the effluent limitations specified in this Part, the permittee shall monitor all effluent parameters at the frequencies and sample types specified below. Such monitoring will begin immediately and last for the life of the permit unless otherwise noted. The results of such monitoring shall be reported on the Discharge Monitoring Report form (see REPORTING AND RECORDKEEPING section).

Self-monitoring sampling by the permittee for compliance with the effluent monitoring requirements specified in this permit, shall be performed at the location(s) noted in the PERMITTED FEATURES section above.

a. Oil and Grease Monitoring: For every permitted feature with oil and grease monitoring, in the event an oil sheen or floating oil is observed, a grab sample shall be collected, analyzed, and reported on the appropriate DMR. In addition, the permittee shall take immediate action to mitigate the discharge of oil and grease. A description of the action(s) taken must be included with the DMR.

b. Alternate Limitation Burden of Proof Requirements: In conformance with 40 CFR 434.63, the permittee has the burden of proof when requesting relief from total suspended solids (TSS), total iron and/or settleable solids limitations, as appropriate. The alternate limitations apply to outfalls 003, 006, 010, 013, 014, 021, 022, 023, 024, and 025.

   For rainfall, to waive TSS and total iron limitations, the permittee must prove that the discharge occurred during the precipitation event, or within 48 hours after measurable precipitation has stopped. In addition, to waive settleable solids limitations, the permittee must prove that the discharge occurred during the precipitation event, or within 48 hours after precipitation greater than the 10-year, 24-hour event has stopped.

   For snowmelt, to waive TSS and total iron limitations, the permittee must prove that the discharge occurred during pond inflow from the snow melt event, or within 48 hours after pond inflow has stopped. In addition, to waive settleable solids limitations, the permittee must prove that the discharge occurred during pond inflow from the snow melt event, or within 48 hours after pond inflow volume greater than the 10-year, 24-hour event has stopped.

   The permittee must submit documentation that the treatment facilities were properly operated and maintained prior to and during the storm event with any request for relief from primary limitations. The division shall determine the adequacy of proof. All manual pond dewatering must meet TSS and total iron limitations.

   All data/documentation required by the permit which cannot be reported on applicable discharge monitoring report forms (DMRs) shall be reported in a letter as an attachment to the DMR. Submittal of documentation of containment, maintenance and precipitation records above does not exempt the permittee from the notification requirements of this permit (see NOTIFICATION REQUIREMENTS).

c. Salinity Parameters: In order to obtain an indication of the quantity of Salinity, measured as total dissolved solids (TDS), being discharged from the site the permittee shall monitor the wastewater effluent. Self-monitoring samples taken in compliance with the monitoring requirements specified above shall be taken at those locations listed in Part I.A.

The following Limitations, Monitoring Frequencies and Sample Types apply to the outfalls identified in this Part:

Outfall 003

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.82	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	Monthly	Grab
00530	TSS, effluent (mg/l)	35	70	Monthly	Grab
84066	Oil and Grease (visual)		Report	Monthly	Visual
03582	Oil and Grease (mg/l)		10	Contingent	Grab
70295	TDS (mg/l)	Report		Quarterly	Grab
00978	As, TR (µg/l)	Report		2 Days/Month	Grab
01313	Cd, PD (µg/l)	Report	Report	2 Days/Month	Grab
04262	Cr+3, TR (µg/l)	Report	Report	2 Days/Month	Grab
01314	Cr+3, PD (µg/l)	Report		2 Days/Month	Grab
01306	Cu, PD (µg/l)	Report	Report	2 Days/Month	Grab
00980	Fe, TR (µg/l)	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	2 Days/Month	Grab
50286	Hg, Tot (µg/l)	Report		2 Days/Month	Grab
01323	Se, PD (µg/l)	Report	Report	2 Days/Month	Grab
01304	Ag, PD (µg/l)	Report	Report	2 Days/Month	Grab
01303	Zn, PD (µg/l)	Report	Report	2 Days/Month	Grab
81020	Sulfate (mg/l)	Report		Quarterly	Grab
00918	Calcium (mg/l)	Report	Report	2 Days/Month	Grab
00921	Magnesium (mg/l)	Report	Report	2 Days/Month	Grab
00923	Sodium (mg/l)	Report	Report	2 Days/Month	Grab
00440	Bicarbonate as HCO_3 (mg/l)	Report	Report	2 Days/Month	Grab
00931	SAR calculated limit[1]	Report	Report	2 Days/Month	Calculated
00931	Adjusted SAR effluent[2]	Report	Report	2 Days/Month	Calculated
00094	EC (dS/m)	Report		2 Days/Month	Grab
	WET, acute until June 30, 2020				
TAN6C	LC50 Statere 96 Hr Acute* *Pimephales promelas*		LC50 ≥ Report (daily min)	Quarterly	Grab
TAM3B	LC50 Statere 48 Hr Acute* *Ceriodaphnia dubia*		LC50 ≥ Report (daily min)	Quarterly	Grab
	WET, acute beginning July 1, 2020				
TAN6C	LC50 Statere 96 Hr Acute* *Pimephales promelas*		LC50 ≥ 100% (daily min)	Quarterly	Grab
TAM3B	LC50 Statere 48 Hr Acute* *Ceriodaphnia dubia*		LC50 ≥ 100% (daily min)	Quarterly	Grab

84165	Discharge event observation [Visual Monitoring] (Discharge due to rain/snow melt)	# of Occurrences (Discharges per Month)	Pass/Fail**	Monthly	Calculated

***ACUTE WET BASED ON INTERMITTENT DISCHARGE. SEE DEFINITIONS**
Rainfall: a discharge that occurred during the precipitation event, or within 48 hours after measurable precipitation has stopped is indicated as a 'pass**'. Snowmelt: a discharge that occurred during pond inflow from the snow melt event, or within 48 hours after pond inflow has stopped is indicated as a '**pass**'. Discharges due to other conditions is indicated as a '**fail**'.

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 003 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 003 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab

Outfall 006

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.32	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	Monthly	Grab
00530	TSS, effluent (mg/l)	35	70	Monthly	Grab
84066	Oil and Grease (visual)		Report	Monthly	Visual
03582	Oil and Grease (mg/l)		10	Contingent	Grab
70295	TDS (mg/l)	Report		Quarterly	Grab
00978	As, TR (µg/l)	Report		2 Days/Month	Grab
01313	Cd, PD (µg/l)	Report	Report	2 Days/Month	Grab
04262	Cr+3, TR (µg/l)	Report	Report	2 Days/Month	Grab
01314	Cr+3, PD (µg/l)	Report		2 Days/Month	Grab
01306	Cu, PD (µg/l)	Report	Report	2 Days/Month	Grab
00980	Fe, TR (µg/l)	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	2 Days/Month	Grab
50286	Hg, Tot (µg/l)	Report		2 Days/Month	Grab
01323	Se, PD (µg/l)	Report	Report	2 Days/Month	Grab
01304	Ag, PD (µg/l)	Report	Report	2 Days/Month	Grab
01303	Zn, PD (µg/l)	Report	Report	2 Days/Month	Grab
81020	Sulfate (mg/l)	Report		Quarterly	Grab
00918	Calcium (mg/l)	Report	Report	2 Days/Month	Grab
00921	Magnesium (mg/l)	Report	Report	2 Days/Month	Grab
00923	Sodium (mg/l)	Report	Report	2 Days/Month	Grab
00440	Bicarbonate as HCO_3 (mg/l)	Report	Report	2 Days/Month	Grab
00931	SAR calculated limit[1]	Report	Report	2 Days/Month	Calculated
00931	Adjusted SAR effluent[2]	Report	Report	2 Days/Month	Calculated
00094	EC (dS/m)	Report		2 Days/Month	Grab
	WET, acute until June 30, 2021				
TAN6C	LC50 Statere 96 Hr Acute* *Pimephales promelas*		LC50 ≥ Report (daily min)	Quarterly	Grab
TAM3B	LC50 Statere 48 Hr Acute* *Ceriodaphnia dubia*		LC50 ≥ Report (daily min)	Quarterly	Grab
	WET, acute beginning July 1, 2021				
TAN6C	LC50 Statere 96 Hr Acute* *Pimephales promelas*		LC50 ≥ 100% (daily min)	Quarterly	Grab
TAM3B	LC50 Statere 48 Hr Acute* *Ceriodaphnia dubia*		LC50 ≥ 100% (daily min)	Quarterly	Grab

84165	Discharge event observation [Visual Monitoring] (Discharge due to rain/snow melt)	# of Occurrences (Discharges per Month)	Pass/Fail**	Monthly	Calculated

***ACUTE WET BASED ON INTERMITTENT DISCHARGE. SEE DEFINITIONS**
Rainfall: a discharge that occurred during the precipitation event, or within 48 hours after measurable precipitation has stopped is indicated as a 'pass**'. Snowmelt: a discharge that occurred during pond inflow from the snow melt event, or within 48 hours after pond inflow has stopped is indicated as a '**pass**'. Discharges due to other conditions is indicated as a '**fail**'.

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 006 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 006 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Outfall 010

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	1.5	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	Monthly	Grab
00530	TSS, effluent (mg/l)	35	70	Monthly	Grab
84066	Oil and Grease (visual)		Report	Monthly	Visual
03582	Oil and Grease (mg/l)		10	Contingent	Grab
70295	TDS (mg/l)	Report		Quarterly	Grab
00978	As, TR (µg/l)	Report		2 Days/Month	Grab
01313	Cd, PD (µg/l)	Report	Report	2 Days/Month	Grab
04262	Cr+3, TR (µg/l)	Report	Report	2 Days/Month	Grab
01314	Cr+3, PD (µg/l)	Report		2 Days/Month	Grab
01306	Cu, PD (µg/l)	Report	Report	2 Days/Month	Grab
00980	Fe, TR (µg/l)	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	2 Days/Month	Grab
50286	Hg, Tot (µg/l)	Report		2 Days/Month	Grab
01323	Se, PD (µg/l)	Report	Report	2 Days/Month	Grab
01304	Ag, PD (µg/l)	Report	Report	2 Days/Month	Grab
01303	Zn, PD (µg/l)	Report	Report	2 Days/Month	Grab
00918	Calcium (mg/l)	Report	Report	2 Days/Month	Grab
00921	Magnesium (mg/l)	Report	Report	2 Days/Month	Grab
00923	Sodium (mg/l)	Report	Report	2 Days/Month	Grab
00440	Bicarbonate as HCO_3 (mg/l)	Report	Report	2 Days/Month	Grab
00931	SAR calculated limit[1]	Report	Report	2 Days/Month	Calculated
00931	Adjusted SAR effluent[2]	Report	Report	2 Days/Month	Calculated
00094	EC (dS/m)	Report		2 Days/Month	Grab
	WET, chronic until September 30, 2023				
TKP6C	Static Renewal 7 Day Chronic *Pimephales promelas*		NOEC or IC25 ≥ Report	Quarterly	3 Grabs/ Test
TKP3B	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*		NOEC or IC25 ≥ Report	Quarterly	3 Grabs/ Test
	WET, chronic beginning October 1, 2023				
TKP6C	Static Renewal 7 Day Chronic *Pimephales promelas*		NOEC or IC25 ≥ IWC	Quarterly	3 Grabs/ Test

TKP3B	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*		NOEC or IC25 ≥ IWC	Quarterly	3 Grabs/ Test

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 010 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 010 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Footnotes to effluent tables for Outfalls 003, 006, 010

[1] This SAR limit is to be calculated using the actual measured EC value (30-day average) of the effluent and substituting this value in to the following equation to solve for SAR. The equation for determining the SAR limit is: SAR = (7.1 * EC) – 2.48.

[2] The SAR value of the effluent is to be reported as the adjusted SAR. See the definitions section in Part I.C.17 for information on calculating the adjusted SAR value.

Outfall 013

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.61	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01113	Cd, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
01118	Cr, TR (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01119	Cu, TR (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l)	1000	6000	2 Days/Month	Grab
11123	Mn, TR (µg/l)	Report		Quarterly	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01074	Ni, TR (µg/l)	Report		Quarterly	Grab
01322	Ni, PD (µg/l)	Report	Report	Quarterly	Grab
00981	Se, TR (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01094	Zn, TR (µg/l)	Report		Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 013 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 013 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab

Outfall 014

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.43	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01113	Cd, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
01118	Cr, TR (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01119	Cu, TR (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l)	1000	6000	2 Days/Month	Grab
11123	Mn, TR (µg/l)	Report		Quarterly	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
00981	Se, TR (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01094	Zn, TR (µg/l)	Report		Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 014 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 014 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l)	1000		Report	Monthly	Grab

Outfall 021

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	1.3	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l), until 7/31/22	3000	6000	2 Days/Month	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 021 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 021 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Outfall 022

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.63	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l), until 7/31/22	3000	6000	2 Days/Month	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 022 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 022 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Outfall 023

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	1.14	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l), until 7/31/22	3000	6000	2 Days/Month	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 023 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 023 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Outfall 024

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.12	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l), until 7/31/22	3000	6000	2 Days/Month	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 024 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab

00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 024 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

Outfall 025

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations		Monitoring Requirements	
		30-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	2.16	Report	Monthly	Instantaneous
00400	pH (su)		6.5-9.0	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	35	70	2 Days/Month	Grab
00978	As, TR (µg/l)	Report		Quarterly	Grab
01313	Cd, PD (µg/l)	Report	Report	Quarterly	Grab
04262	Cr+3, TR (µg/l)	Report	Report	Quarterly	Grab
01314	Cr+3, PD (µg/l)	Report		Quarterly	Grab
01306	Cu, PD (µg/l)	Report	Report	Quarterly	Grab
00980	Fe, TR (µg/l), until 7/31/21	3000	6000	2 Days/Month	Grab
00980	Fe, TR (µg/l), beginning 8/1/21	1000	6000	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report	Report	Quarterly	Grab
50286	Hg, Tot (µg/l)	Report		Quarterly	Grab
01323	Se, PD (µg/l)	Report	Report	Quarterly	Grab
01303	Zn, PD (µg/l)	Report	Report	Quarterly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in the volume of a discharge is caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limits for Fe(TR) and Settleable Solids may be substituted for the Fe(TR) and TSS limitations contained in the previous table. All other parameters remain unchanged.

Alternate Limits Outfall 025 (less than or equal to the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab
00545	Settleable Solids (ml/l)	Report		0.5	Monthly	Grab

ALTERNATE LIMITATIONS

Any discharge or increase in volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour event (or series of storms or snowmelt of equivalent volume) may comply with alternate limitations subject to burden of proof requirements as described in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section.

The following limit for Fe(TR) may be substituted for that contained in the previous table. TSS and Settleable Solids monitoring/ effluent limitations are not required. All other parameters remain unchanged.

Alternate Limits Outfall 025 (greater than the 10-year, 24-hour precipitation event)

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
00980	Fe, TR (µg/l), until 7/31/22	Report		Report	Monthly	Grab
00980	Fe, TR (µg/l), beginning 8/1/22	1000		Report	Monthly	Grab

2. **Narrative Water Quality Based Effluent Limitation (Outfalls 001, 002, 004, 005, 007, 008, 009, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026)**

Discharges authorized under this permit must be controlled as necessary to meet applicable water quality standards.

The division expects that compliance with the other terms and conditions in this permit will control discharges as necessary to meet applicable water quality standards. If at any time the permittee becomes aware, or the division determines, that the authorized discharge causes or contributes to an exceedance of applicable water quality standards, the permittee must take corrective action as required, document the corrective actions as required, and report the corrective actions to the Division as required (see CORRECTIVE ACTIONS).

If the division becomes aware of information indicating that compliance with the other terms and conditions of this permit will not control the discharge as necessary to meet applicable water quality standards, the division may include additional site-specific water quality-based effluent limitation(s) to the discharge.

3. **Federal Effluent Limitation Guideline - Sediment Control Plan (Outfalls 001, 002, 004, 005, 007, 008, 009, 011, 012, 015, 016, 017, 018, 019, 020, 026)**

ICIS Code	Description	Due date	Frequency
00308	The permittee shall submit proof to the division that the Sediment Control Plan (SCP) required under Subpart H (40 CFR Part 434.82) has been approved by the Colorado Division of Reclamation, Mining, and Safety, and is implemented at the facility.	December 1, 2018	Annual

4. **Practice-based Effluent Limitations (Outfalls 001, 002, 004, 005, 007, 008, 009, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026)**

Practice-based limitations required by this permit include the following:

a. Minimize Exposure
The permittee must minimize (as defined in Appendix B) the exposure of pollutant sources associated with manufacturing, processing, and material storage areas (including loading and unloading, storage, disposal, cleaning, maintenance, and fueling operations) to rain, snow, snowmelt, and runoff. Minimizing exposure may include locating these industrial materials and activities inside or protecting them with storm resistant coverings.

b. Good Housekeeping
The permittee must keep clean all areas exposed to stormwater runoff, as necessary to minimize potential sources of pollutants, using such measures as sweeping at regular intervals, keeping materials orderly and labeled, and storing materials in appropriate containers.

c. Maintenance of Control Measures
The permittee must maintain all control measures (structural and non-structural) used to achieve the effluent limits required by this permit in effective operating condition. The permittee must conduct maintenance of control measures in accordance with this permit (see CONTROL MEASURES).

d. Spill Prevention and Response Procedures

The permittee must minimize the potential for leaks, spills and other releases that may be exposed to stormwater and develop plans for effective response to such potential spills. The permittee must at minimum implement:

i. Procedures for regularly inspecting, testing, maintaining, and repairing all industrial equipment and systems to avoid situations that may result in leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters.
ii. Procedures for plainly labeling containers that could be susceptible to spillage or leakage to encourage proper handling and facilitate rapid response if spills or leaks occur;
iii. Preventative measures such as barriers between material storage and traffic areas, secondary containment provisions, or procedures for material storage and handling;
iv. Procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other releases. Employees who may cause, detect, or respond to a spill or leak must be trained in these procedures and have necessary spill response equipment available; and
v. Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies. Contact information must be in locations that are readily accessible and available.

e. Erosion and Sediment Controls
The permittee must stabilize exposed areas and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants. Among other actions taken to meet this effluent limit, flow velocity dissipation devices must be placed at discharge locations and within outfall channels where necessary to minimize erosion and/or settle out pollutants.

f. Management of Runoff

The permittee must divert, infiltrate, reuse, contain, or treat stormwater runoff, in a manner that minimizes pollutants in stormwater discharges from the site.

g. Salt Storage Piles or Piles Containing Salt
The permittee must enclose or cover storage piles of salt, or piles containing salt, used for deicing or other commercial or industrial purposes, including maintenance of paved surfaces, and implement appropriate measures to minimize exposure resulting from adding to or removing materials from the pile.

h. Employee Training
The permittee must develop and implement a training program for employees. Training must be conducted at least **annually**, and must address the following, as applicable to the trainee's activities: the site-specific control measures used to achieve the permit effluent limits, components and goals of the SWMP, monitoring and inspection procedures, and other applicable requirements of the permit. At a minimum, the following individuals must be trained:

i. Employee(s) overseeing implementation of, revising, and amending the SWMP.
ii. Employee(s) performing installation, inspection, maintenance, and repair of control measures.
iii. Employee(s) who work in areas of industrial activity subject to this permit.
iv. Employee(s) who conduct stormwater discharge monitoring required by this permit.

i. Waste, Garbage and Floatable Debris
The permittee must minimize the discharge of waste, garbage, and floatable debris from the site by keeping exposed areas free of such materials or by intercepting them before they are discharged.

j. Dust Generation and Vehicle Tracking of Industrial Materials.
The permittee must minimize generation of dust and off-site tracking of raw, final, or waste materials.

D. SPECIFIC MONITORING REQUIREMENTS

1. Acute WET Testing (Outfalls 003, 006)

a. General Acute WET Testing and Reporting Requirements

The permittee shall conduct an acute 48-hour WET test using *Ceriodaphnia dubia*, and an acute 96-hour WET test using *Pimephales promelas*. Acute tests shall be conducted as a static replacement test using a single effluent grab sample. The permittee shall conduct each acute WET test in accordance with the 40 CFR Part 136 methods described in Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, Fifth Edition, October 2002 (EPA-821-R-02-012) or its most current edition.

The following minimum dilution series should be used: 0% effluent (control), 20%, 40%, 60%, 80%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing as was used in the failed test.

Tests shall be done at the frequency listed in Part I.C. Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting period when the sample was taken. (i.e., WET testing results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, etc.) The permittee shall submit all laboratory statistical summary sheets, summaries of the determination of a valid, invalid or inconclusive test, and copies of the chain of custody forms, along with the DMR for the reporting period.

If a test is considered invalid, the permittee is required to perform additional testing during the monitoring period to obtain a valid test result. Failure to obtain a valid test result during the monitoring period shall result in a violation of the permit for failure to monitor.

b. Violations of the Permit Limit and Division Notification

An acute WET test is failed whenever the LC50, which represents an estimate of the effluent concentration which is lethal to 50% of the test organisms in the time period prescribed by the test, is found to be less than or equal to 100% effluent. The permittee must provide written notification of the failure of a WET test to the Division, along with a statement as to whether accelerated testing or a Toxicity Identification Evaluation (TIE)

is being performed, unless otherwise exempted, in writing, by the Division. **Notification must be received by the Division within 14 calendar days of the permittee receiving notice of the WET testing results.**

c. Automatic Compliance Response

The permittee is responsible for implementing the automatic compliance response provisions of this permit when one of the following occurs:

- there is a violation of the permit limit (the LC50 endpoint is less than the applicable IWC)
- during a report-only period, when the LC50 endpoint is less than the applicable IWC
- the permittee is otherwise informed by the Division that a compliance response is necessary.

When one of the above listed events occurs, the following automatic compliance response shall apply. The permittee shall either:

- conduct accelerated testing using the single species found to be more sensitive
- conduct a Toxicity Identification Evaluation / Toxicity Reduction Evaluation (TIE/TRE) investigation as described below.

i. Accelerated Testing

If accelerated testing is being performed, testing will be at least once every two weeks for up to five tests, at the appropriate IWC, but only one test should be run at a time. Accelerated testing shall continue until; 1) two consecutive tests fail or three of five tests fail, in which case a pattern of toxicity has been demonstrated or 2) two consecutive tests pass or three of five tests pass, in which case no pattern of toxicity has been found. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a TIE/TRE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some other modified approach. The permittee shall provide written notification of the results within 14 calendar days of completion of the Pattern of Toxicity/No Toxicity demonstration.

ii. Toxicity Identification Evaluation / Toxicity Reduction Evaluation (TIE/TRE)

If a TIE/TRE is being performed, the results of the investigation are to be received by the Division within 180 calendar days of the demonstration of acute WET in the routine test, as defined above, or if accelerated testing was performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 60 and 120 calendar day points of the TIE/TRE investigation. The Division may extend the time frame for investigation where reasonable justification exists. A request for an extension must be made in writing and received prior to the 180 calendar day deadline. Such request must include a justification and supporting data for such an extension.

Under a TIE, the permittee may use the time for investigation to conduct a preliminary TIE (PTIE) or move directly into the TIE. A PTIE consists of a brief search for possible sources of WET, where a specific parameter(s) is reasonably suspected to have caused such toxicity, and could be identified more simply and cost effectively than a formal TIE. If the PTIE allows resolution of the WET incident, the TIE need not necessarily be conducted in its entirety. If, however, WET is not identified or resolved during the PTIE, the TIE must be conducted within the allowed 180 calendar day time frame.

The Division recommends that the EPA guidance documents regarding TIEs be followed. If another method is to be used, this procedure should be submitted to the Division prior to initiating the TIE.

If the pollutant(s) causing toxicity is/are identified, and is/are controlled by a permit effluent limitation(s), this permit may be modified upon request to adjust permit requirements regarding the automatic compliance response.

If the pollutant(s) causing toxicity is/are identified, and is/are not controlled by a permit effluent limitation(s), the Division may develop limitations the parameter(s), and the permit may be reopened to include these limitations.

If the pollutant causing toxicity is not able to be identified, or is unable to be specifically identified, or is not able to be controlled by an effluent limit, the permittee will be required to perform either item 1 or item 2 below.

1) Conduct an investigation which demonstrates actual instream aquatic life conditions upstream and downstream of the discharge, or identify, for Division approval, and conduct an alternative investigation which demonstrates the actual instream impact. This should include WET testing and chemical analyses of the ambient water. Depending on the results of the study, the permittee may also be required to identify the control program necessary to eliminate the toxicity and its cost. Data collected may be presented to the WQCC for consideration at the next appropriate triennial review of the stream standards;

2) Move to a TRE by identifying the necessary control program or activity and proceed with elimination of the toxicity so as to meet the WET effluent limit.

If toxicity spontaneously disappears in the midst of a TIE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency of WET testing for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

The control program developed during a TRE consists of the measures determined to be the most feasible to eliminate WET. This may happen through the identification of the toxicant(s) and then a control program aimed specifically at that toxicant(s) or through the identification of more general toxicant treatability processes. A control program is to be developed and submitted to the Division within 180 calendar days of beginning a TRE. Status reports on the TRE are to be provided to the Division at the 60 and 120 calendar day points of the TRE investigation.

If toxicity spontaneously disappears in the midst of a TRE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

d. Toxicity Reopener

This permit may be reopened and modified to include additional or modified numerical permit limitations, new or modified compliance response requirements, changes in the WET testing protocol, the addition of both acute and chronic WET requirements, or any other conditions related to the control of toxicants.

2. **Chronic WET Testing – Outfall 010**

a. General Chronic WET Testing and Reporting Requirements

The permittee shall conduct the chronic WET test using *Ceriodaphnia dubia and Pimephales promelas*, as a static renewal 7-day test using three separate composite samples. The permittee shall conduct each chronic WET test in accordance with the 40 CFR Part 136 methods described in Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Fourth Edition, October 2002 (EPA-821-R-02-013) or the most current edition.

The following minimum dilution series should be used: 0% effluent (control), 20%, 40%, 60%, 80%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

Tests shall be done at the frequency listed in Part I.A.2. Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting period when the sample was taken. (i.e., WET testing results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, etc.) The permittee shall submit all laboratory statistical summary sheets, summaries of the determination of a valid, invalid or inconclusive test, and copies of the chain of custody forms, along with the DMR for the reporting period.

If a test is considered invalid, the permittee is required to perform additional testing during the monitoring period to obtain a valid test result. Failure to obtain a valid test result during the monitoring period shall result in a violation of the permit for failure to monitor.

b. Violations of the Permit Limit, Failure of One Test Statistical Endpoint and Division Notification

A chronic WET test is considered a violation of a permit limitation when both the NOEC and the IC25, for the same sub-lethal endpoint are at any effluent concentration less than the IWC. This determination is made independently for each test species. The IWC for this permit has been determined to be **100**% effluent.

A chronic WET test is considered to have failed one of the two statistical endpoints when either the NOEC or the IC_{25} are at any effluent concentration less than the IWC. Simultaneous failure of both the NOEC and IC25 for both sub-lethal endpoints, when tests are performed on identical split samples, constitutes only a single violation of the Daily Maximum Effluent Limitation for Chronic WET specified in Part I, §A-2 of this permit. The IWC for this permit has been determined to be **100**% effluent.

In the event of a permit violation, or during a report only period when both the NOEC and the IC25 are at any effluent concentration less than the IWC, or when two consecutive reporting periods have resulted in failure of one of the two statistical endpoints (regardless of which statistical endpoints are failed), the permittee must provide written notification to the Division. **Notification must be received by the Division within 14 calendar days of the permittee receiving notice of the WET testing results.** Such notification should explain whether it was a violation or two consecutive failures of a single endpoint, and, beginning September 1, 2023, the notification must indicate whether accelerated testing or a Toxicity Identification Evaluation or Toxicity Reduction Evaluation (TIE or TRE) is being performed, unless otherwise exempted, in writing, by the Division.

c. Automatic Compliance Response (Beginning 10/1/2023)

The permittee is responsible for implementing the automatic compliance response provisions of this permit when one of the following occurs:

1. there is a violation of the permit limit (both the NOEC and the IC25 endpoints are less than the applicable IWC)
2. during a report only period when both the NOEC and the IC25 are at any effluent concentration less than the IWC
3. two consecutive monitoring periods have resulted in failure of one of the two statistical endpoints (either the IC25 or the NOEC), including during a report-only period. This determination is made independently for each test species.
4. the permittee is otherwise informed by the Division that a compliance response is necessary

When one of the above listed events occurs, the following automatic compliance response shall apply. The permittee shall either:

1. conduct accelerated testing using the single species found to be more sensitive
2. conduct a Toxicity Identification Evaluation (TIE) or a Toxicity Reduction Evaluation (TRE) investigation as described below.

i. Accelerated Testing

If accelerated testing is being performed, testing will be at least once every two weeks for up to five tests, running only one test at a time, using only the IC25 statistical endpoint to determine if the test

passed or failed at the appropriate IWC. Accelerated testing shall continue until; 1) two consecutive tests fail or three of five tests fail, in which case a pattern of toxicity has been demonstrated or 2) two consecutive tests pass or three of five tests pass, in which case no pattern of toxicity has been found. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If accelerated testing is required due to failure of one statistical endpoint in two consecutive monitoring periods, and in both of those failures it was the NOEC endpoint that was failed, then the NOEC shall be the only statistical endpoint used to determined whether the accelerated testing passed or failed at the appropriate IWC. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a TIE/TRE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some other modified approach. The permittee shall provide written notification of the results within 14 calendar days of completion of the Pattern of Toxicity/No Toxicity demonstration.

ii. Toxicity Identification Evaluation (TIE) or Toxicity Reduction Evaluation (TRE)

If a TIE or a TRE is being performed, the results of the investigation are to be received by the Division within 180 calendar days of the demonstration chronic WET in the routine test, as defined above, or if accelerated testing was performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 60 and 120 calendar day points of the TIE or TRE investigation. The Division may extend the time frame for investigation where reasonable justification exists. A request for an extension must be made in writing and received prior to the 180 calendar day deadline. Such request must include a justification and supporting data for such an extension.

Under a TIE, the permittee may use the time for investigation to conduct a preliminary TIE (PTIE) or move directly into the TIE. A PTIE consists of a brief search for possible sources of WET, where a specific parameter(s) is reasonably suspected to have caused such toxicity, and could be identified more simply and cost effectively than a formal TIE. If the PTIE allows resolution of the WET incident, the TIE need not necessarily be conducted in its entirety. If, however, WET is not identified or resolved during the PTIE, the TIE must be conducted within the allowed 180 calendar day time frame.

The Division recommends that the EPA guidance documents regarding TIEs be followed. If another method is to be used, this procedure should be submitted to the Division prior to initiating the TIE.

If the pollutant(s) causing toxicity is/are identified, and is/are controlled by a permit effluent limitation(s), this permit may be modified upon request to adjust permit requirements regarding the automatic compliance response.

If the pollutant(s) causing toxicity is/are identified, and is/are not controlled by a permit effluent limitation(s), the Division may develop limitations the parameter(s), and the permit may be reopened to include these limitations.

If the pollutant causing toxicity is not able to be identified, or is unable to be specifically identified, or is not able to be controlled by an effluent limit, the permittee will be required to perform either item 1 or item 2 below.

l) Conduct an investigation which demonstrates actual instream aquatic life conditions upstream and downstream of the discharge, or identify, for Division approval, and conduct an alternative investigation which demonstrates the actual instream impact. This should include WET testing and chemical analyses of the ambient water. Depending on the results of the study, the permittee may also be required to identify the control program necessary to eliminate the toxicity and its cost. Data collected may be presented to the WQCC for consideration at the next appropriate triennial review of the stream standards;

2) Move to a TRE by identifying the necessary control program or activity and proceed with elimination of the toxicity so as to meet the WET effluent limit.

If toxicity spontaneously disappears in the midst of a TIE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency of WET testing for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

The control program developed during a TRE consists of the measures determined to be the most feasible to eliminate WET. This may happen through the identification of the toxicant(s) and then a control program aimed specifically at that toxicant(s) or through the identification of more general toxicant treatability processes. A control program is to be developed and submitted to the Division within 180 calendar days of beginning a TRE. Status reports on the TRE are to be provided to the Division at the 60 and 120 calendar day points of the TRE investigation.

If toxicity spontaneously disappears in the midst of a TRE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

d. Toxicity Reopener

This permit may be reopened and modified to include additional or modified numerical permit limitations, new or modified compliance response requirements, changes in the WET testing protocol, the addition of both acute and chronic WET requirements, or any other conditions related to the control of toxicants.

E. COMPLIANCE SCHEDULES

1. Activities to Meet Final Limits (outfalls 006 (AEL only), 010 (AEL only), 021, 022, 023, 024, 025,) – In order to meet the total recoverable iron limit, the following schedule is included in the permit.

Code	Event	Description	Due Date
CS010	Status/Progress Report	Submit a progress report summarizing the progress to meet the final effluent limitations.	July 31, 2019
CS010	Status/Progress Report	Submit a progress report summarizing the progress to meet the final effluent limitations.	July 31, 2020
CS010	Status/Progress Report	Submit a progress report summarizing the progress to meet the final effluent limitations.	July 31, 2021
CS017	Achieve Final compliance with discharge limits	Achieve final compliance with limitations.	July 31, 2022

2. Activities to Meet Final chronic WET (*Ceriodaphnia dubia* and *Pimephales promelas*) Limits (outfalls 010) – In order to meet the chronic WET limitation, the following schedule is included in the permit.

Code	Event	Description	Due Date
CS010	Status/Progress Report	-Provide summaries of design details, costs, power, and space requirements for the treatment options selected (reverse osmosis/nanofiltration, sulfate bioreactor, evaporator). -Provide updates on any other activities related to the installation of treatment undergone to ensure the final limitations will be met by 10/1/2023.	12/31/20
CS010	Status/Progress Report	-Provide update on bench-scale and pilot testing of treatment options. -Provide updates on any other activities related to the installation of treatment undergone to ensure the final limitations will be met by 10/1/2023.	5/31/21
CS010	Status/Progress Report	-Provide conclusions on bench-scale and pilot testing of treatment options. -Document selected treatment option. -Provide update in obtaining funding for selected treatment option. -Submit documentation that final designs of the treatment have been completed. -Provide updates on any other activities undergone related to the installation of treatment to ensure the final limitations will be met by 10/1/2023.	12/31/21
CS010	Status/Progress Report	-Submit documentation that construction of the treatment facility has begun. -Provide updates on any other activities undergone related to the installation of treatment to ensure the final limitations will be met by 10/1/2023.	7/31/22
CS010	Status/Progress Report	-Provide an update on the construction activities. -Provide updates on any other activities undergone to ensure the final limitations will be met by 10/1/2023.	12/31/22
CS016	Complete Required Work or On-Site Construction	Complete construction of facilities or other appropriate actions, which will allow the permittee to meet the final limitations.	9/30/23

Regulation 61.8(3)(n)(i) states that a report should be submitted to the Division no later than 14 calendar days following each date identified in the schedule of compliance. The 14 days have already been incorporated into the above dates and therefore all reports are due on or before the date listed in the table.

F. CONTROL MEASURES (Outfalls 001, 002, 004, 005, 007-009, 011-026)

All control measures used by the permittee to meet the effluent limitations contained in this permit must be selected, designed, installed, implemented, and maintained in accordance with good engineering hydrologic and pollution control, and the manufacturer's specifications, when applicable.

1. Installation and implementation specifications

Installation and implementation specifications for each control measure type used by the permittee to meet the effluent limitations contained in this permit must be retained with the SWMP (see STORMWATER MANAGEMENT PLAN section).

2. Maintenance of Control Measures and Associated Documentation

a. The permittee must maintain all control measures used to achieve the effluent limits required by this permit in effective operating condition. For this permit, maintenance includes preventative and routine maintenance, modification, repair, replacement, or installation of new control measures. Observations resulting in maintenance activities can be made during a site inspection, or during general observations of site conditions.

b. Corrective actions associated with maintaining control measures must be conducted with due diligence, as soon as possible after the need is discovered, to achieve the effluent limits required by this permit. The permittee must implement interim control measures to achieve the effluent limits required by this permit while performing maintenance of the primary control measure.

c. The permittee shall document corrective actions associated with maintaining control measures, in accordance with the CORRECTIVE ACTIONS section of this permit, and shall revise the facility SWMP to reflect replacement or installation of new control measures in accordance with the STORMWATER MANAGEMENT PLAN section requirements.

G. INSPECTIONS (Outfalls 001, 002, 004, 005, 007-009, 011-026)

1. Inspection Frequency and Personnel

The permittee shall conduct and document field inspections of all drainage areas contributing runoff to the outfalls referred to in this Part, as follows:

a. Conduct at least **two** comprehensive stormwater inspections per year (in spring and fall).

b. conduct a minimum of **one** (1) of the **two** (2) inspections during a runoff event, which for a rain event means during or within 24 hours after the end of a measureable storm event; and for a snowmelt event, means at a time when a measurable discharge occurs from the facility.

c. For the remaining two quarters of the year (summer and winter), conduct corrective actions across the facility for deficiencies represented by each DRMS inspection finding in one of the monthly (or as appropriate, quarterly) SMCRA inspections.

d. The permittee shall ensure that inspections are conducted by qualified personnel.

2. Inspection Scope

Each inspection shall include:

a. Observations made at stormwater sampling locations and areas where stormwater associated with industrial activity is discharged off-site; or discharged to waters of the state, or to a storm sewer system that drains to waters of the state.

b. Observations for the presence of floating materials, visible oil sheen, discoloration, turbidity, odor, etc. in the stormwater discharge(s).

c. Observations of the condition of and around stormwater outfalls, including flow dissipation measures to prevent scouring.

d. Observations for the presence of illicit discharges or other non-permitted discharges such as domestic wastewater, noncontact cooling water, or process wastewater (including leachate).

e. A verification that the descriptions of potential pollutant sources required under this permit are accurate.

f. A verification that the site map in the SWMP reflects current conditions.

g. An assessment of all control measures used to comply with the effluent limits contained in this permit, noting all of the following:

i. Effectiveness of control measures inspected.
ii. Locations of control measures that need maintenance or repair.
iii. Reason maintenance or repair is needed and a schedule for maintenance or repair.
iv. Locations where additional or different control measures are needed and the rationale for the additional or different control measures.

3. **Inspection Documentation**

The permittee shall document the findings for each inspection in an inspection report or checklist, and keep the record onsite with the facility SWMP. The permittee shall ensure each inspection report documents the observations, verifications and assessments required in this section, and additionally includes:

a. The inspection date and time;

b. Locations inspected;

c. Weather information and a description of any discharges occurring at the time of the inspection;

d. A statement that, in the judgment of 1) the person conducting the site inspection, and 2) the person described in the REPORTING AND RECORDKEEPING section, the site is either in compliance or out of compliance with the terms and conditions of this permit, with respect to this section;

e. A summary report and a schedule of implementation of the corrective actions that the permittee has taken or plans to take if the site inspection indicates that the site is out of compliance;

f. Name, title, and signature of the person conducting site inspection; and the following statement: "I certify that this report is true, accurate, and complete, to the best of my knowledge and belief.";

g. Certification and signature of the person described in REPORTING AND RECORDKEEPING, or a duly authorized representative of the facility thereof.

4. **Non-Compliance discovered during inspection**

Any corrective action required as a result of a facility inspection must be performed consistent with the CORRECTIVE ACTIONS section of this permit, and retained with the SWMP.

H. CORRECTIVE ACTIONS (Outfalls 001, 002, 004, 005, 007-009, 011-026)

1. **Conditions that must be Eliminated**

If any of the following conditions occur within the drainage areas associated with the referenced outfalls at the permitted facility (as identified by the permittee; the Division; or an EPA official, or local, or State entity), the

permittee must review and revise the selection, design, installation, and implementation of facility control measures to ensure that the condition is eliminated and will not be repeated in the future:

a. an unauthorized release or discharge (e.g., spill, leak, or discharge of non-stormwater not authorized by a CDPS permit) occurs;

b. facility control measures are not stringent enough for the discharge to meet applicable water quality standards;

c. modifications to the facility control measures are necessary to meet the practice-based effluent limits in this permit; or

d. the permittee finds in a facility inspection, that facility control measures are not properly selected, designed, installed, operated or maintained.

2. **Condition that Requires Review and Modification**

If the following condition occurs, the permittee must review the selection, design, installation, and implementation of facility control measures to determine the appropriate modifications necessary to attain the effluent limits in this permit:

a. construction or a change in design, operation, or maintenance at the facility significantly changes the nature of pollutants discharged in stormwater from the facility, or significantly increases the quantity of pollutants discharged.

3. **Corrective Action Reports and Deadlines**

The permittee must document discovery of any condition listed in the INSPECTIONS section above, within 24 hours and 5 days as described below, submit the documentation in an annual report as required in the REPORTING AND RECORDKEEPING section, and retain a copy onsite with the facility SWMP as required in the STORMWATER MANAGEMENT PLAN section.

a. **24 hour documentation requirement**:
Within 24 hours of discovery of any condition listed in the INSPECTIONS section, the permittee must document the following information:

i. Identification of the condition triggering the need for corrective action review;
ii. Description of the problem identified; and
iii. Date the problem was identified.

b. **Five (5) day documentation requirement:**
Within five (5) days of discovery of any condition listed in this section, the permittee must document the following information:

i. Summary of corrective action taken or to be taken (or, for triggering events that require Review and Modification and the permittee determines that corrective action is not necessary, the basis for this determination);
ii. Notice of whether SWMP modifications are required as a result of this discovery or corrective action;
iii. Date corrective action initiated; and
iv. Date corrective action completed or expected to be completed.

4. **Control measure modification**

Modification of any control measure as part of the corrective action required by the CORRECTIVE ACTIONS section must be performed consistent with the CONTROL MEASURES section of this permit.

I. STORMWATER MANAGEMENT PLAN (SWMP) (Outfalls 001, 002, 004, 005, 007-009, 011-026)

1. **General SWMP Requirements**

The following administrative requirements apply to the SWMP written to address all drainage areas contributing runoff to the outfalls referred to in this Part. **The permittee shall develop a facility SWMP to comply with the requirements of this permit within 90 days of the permit effective date.**

a. SWMP requirement: The permittee must develop, implement, and maintain a SWMP. The SWMP shall be prepared in accordance with good engineering, hydrologic and pollution control practices (the SWMP need not be prepared by a registered engineer). The permittee must modify the SWMP to reflect current site conditions.

b. Submission: The permittee must submit the SWMP to the Division if requested.

c. Signatory Requirements: The permittee must sign the SWMP in accordance with the REPORTING AND RECORDKEEPING section; this requirement applies to the original SWMP prepared for the facility, **and** each time the permittee modifies a SWMP.

d. Permit Retention: The permittee must maintain a copy of this permit with the SWMP.

e. SWMP Retention: The permittee must retain a copy of the SWMP at the facility unless another location, specified by the permittee, is approved by the Division.

f. Consistency with Other Plans: The permittee may incorporate, by reference, applicable portions of plans prepared for other purposes at their facility. Plans or portions of plans incorporated by reference into a SWMP become enforceable requirements of this permit and must be available along with the SWMP.

g. Required SWMP Modifications:

i. *Division initiated:*
   a) The permittee must modify the SWMP when notified by the Division that it does not meet one or more of the requirements of this permit. Unless otherwise provided by the Division, the permittee shall have 30 days after notification to make the necessary changes to the SWMP and implement them.
   b) The Division may require the permittee to submit the modified SWMP to the Division.
   c) If the Division determines that the permittee's stormwater discharges do not, or may not, achieve the effluent limits required by this permit, the Division may require the permittee, within a specified time period, to develop and implement a supplemental control measure action plan, which describes additional SWMP modifications to adequately address the identified water quality concerns.

ii. *Permittee initiated:*
   a) The permittee must modify the SWMP whenever necessary to address any of the triggering conditions for corrective action in the CORRECTIVE ACTIONS section to ensure that they do not reoccur.
   b) The permittee must modify the SWMP whenever there is a change in design, construction, operation, or maintenance at the facility that significantly changes the nature of pollutants discharged in stormwater from the facility, significantly increases the quantity of pollutants discharged, or that requires the permittee to implement new or modified control measures.
   c) The SWMP modifications may include a schedule for control measure design and implementation, provided that interim control measures needed to comply with the permit are documented in the SWMP and implemented during the design period.
   d) The permittee must make all SWMP modifications prior to changes in site conditions; or for changes in response to site conditions, as soon as practicable, but in no case more than 72 hours after the changes(s) in the field.

2. **Specific SWMP Requirements**

The SWMP shall contain the elements described in this section for all drainage areas contributing runoff to the outfalls referred to in this Part.

a. SWMP Administrator: The SWMP shall identify a specific individual(s) by name or by title whose responsibilities include: SWMP development, implementation, maintenance, and modification.

b. Facility Description: The facility description shall include:

i. A narrative description of the industrial activities conducted at the facility;
ii. The total size of the facility property in acres;
iii. The general layout of the facility including buildings and storage of raw materials, and the flow of goods and materials through the facility.

c. Facility Map: The SWMP shall include a legible site map(s), showing the entire facility, and vicinity as appropriate, identifying:

i. The location of the facility in relation to surface waters that receive industrial stormwater discharges from the facility (including the name of the surface water; if the name is not known, indicate that on the map); a separate vicinity map may be necessary to comply with this requirement;
ii. Location of significant impervious surfaces within the facility property boundaries, including paved areas and buildings;
iii. The locations of all facility stormwater conveyances including ditches, pipes, and swales;
iv. The locations of stormwater inlets and outfalls, with the identification code for each outfall (e.g., Outfall 001), and an approximate outline of the areas draining to each outfall;
v. Directions of stormwater flow indicated by arrows;
vi. The areas where industrial activities are conducted, where such activities are exposed to precipitation;
vii. Locations of all pollutant sources (actual or potential) associated with specific industrial activities as identified below;
viii. Location of all structural and applicable non-structural control measures used to meet the effluent limits required by this permit;
ix. Locations where significant spills or leaks identified below have occurred;
x. Locations of all stormwater monitoring points applicable to the facility.
xi. Locations and sources of run-on to the facility from adjacent property that contains significant quantities of pollutants.

d. Facility Inventory and Assessment of Pollutant Sources: The facility inventory and assessment shall include the following:

i. Inventory of facility activities and equipment

The inventory shall identify all areas (except interior areas that are not exposed to precipitation) associated with industrial activities that have been, or may potentially be, sources of pollutants, that contribute, or have the potential to contribute, any pollutants to stormwater, including but not limited to the following:

a) Loading and unloading of materials, including solids and liquids.
b) Outdoor storage of materials or products, including solids and liquids.
c) Outdoor manufacturing and processing.
d) On-site dust or particulate generating processes, including dust collection devices and vents.
e) On-site waste treatment, storage, or disposal, including waste ponds and solid waste management units.
f) Vehicle and equipment fueling, maintenance, and/or cleaning (includes washing).
g) Immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility.
h) Roofs or other surfaces exposed to air emissions from a manufacturing building or a process area, including vents and stacks from metal processing and similar operations.
i) Roofs and associated surfaces composed of galvanized materials that may be mobilized by stormwater (e.g., roofs, ducts, heating/air conditioning equipment, gutters and downspouts).

ii. Inventory of materials

The inventory shall list materials that contribute, or have the potential to contribute, pollutants to stormwater, including but not limited to the following:

a) The types of materials handled at the facility that may be exposed to precipitation or runoff and could result in stormwater pollution.

b) The types of materials handled at the facility that may leak or spill, and be exposed to precipitation or runoff and result in stormwater pollution.
c) A narrative description of any potential sources of pollutants from past activities, materials and spills that could contribute pollutants to stormwater discharges, and the corresponding outfall(s) that would be affected by such spills and leaks. The description shall include the method and location of any on-site storage or disposal; and documentation of all significant spills and leaks of oil or toxic or hazardous pollutants that occurred at exposed areas, or that drained to a stormwater conveyance, in the 3 years prior to the SWMP preparation date.

iii. Assessment of potential pollutant sources
The assessment of potential pollutant sources shall provide a short narrative or tabulation describing the potential of a pollutant to be present in stormwater discharges for each facility activity, equipment and material identified above. The permittee shall update this narrative when data become available to verify the presence or absence of these pollutants.

e. Description of Control Measures

i. The permittee shall document the location and type of each non-structural and structural control measure implemented at the facility to achieve meet the effluent limitations contained in this permit. Documentation must include those control measures implemented for stormwater run-on that commingles with any discharges covered under this permit.

ii. Installation and implementation specifications for each control measure used by the permittee to meet the effluent limitations contained in this permit must be retained with the SWMP.

f. Additional Control Measure Requirements: The permittee shall document the schedules, procedures, and evaluation results for the following subset of practice-based effluent limitations (see EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section).

i. Good Housekeeping – A schedule for regular pickup and disposal of waste materials, along with routine inspections for leaks and conditions of drums, tanks and containers.

ii. Maintenance – Preventative maintenance schedules for industrial equipment and systems; control measures; and any back-up practices in place should a runoff event occur while a control measure is off-line.

iii. Spill Prevention and Response Procedures – Procedures for preventing, responding to, and reporting spills and leaks. The permittee may reference other plans (e.g., a Spill Prevention Control and Countermeasure (SPCC) plan) otherwise required by a permit for the facility, provided that a copy of the other plan is kept onsite with the SWMP, and made available for review consistent with SWMP Requirements.

iv. Employee Training – A schedule for all types of training required by this permit, content of the training, and log of the dates on which specific employees received training.

v. Non-Stormwater Discharges – Documentation of the stormwater conveyance system evaluation for the presence of non-stormwater discharges not authorized in this permit, and the elimination of all unauthorized discharges. Documentation of the evaluation must include:

a) The date of any evaluation;
b) A description of the evaluation criteria used;
c) A list of the outfalls or onsite drainage points that were directly observed during the evaluation;
d) The different types of non-stormwater discharge(s) and source locations; and
e) The action(s) taken, such as a list of control measures used to eliminate unauthorized discharge(s), if any were identified.

g. Inspection Procedures and Documentation: The permittee shall document inspection procedures, and maintain such procedures and other documentation with the SWMP, as follows:

i. The permittee shall document procedures for performing the facility inspections required of the permit (see INSPECTIONS). Procedures must identify:

a) Person(s) or positions of person(s) responsible for inspection;
b) Schedules for conducting inspections; and
c) Specific items to be covered by the inspection, including inspection schedules for specific outfalls.

ii. The permittee shall maintain inspection documentation with the SWMP as required by this permit.

h. Monitoring Procedures and Documentation: The permittee shall document monitoring procedures, and maintain such procedures and other documentation with the SWMP, as follows:

i. The permittee shall document procedures for performing the monitoring required by the permit.

ii. For each type of monitoring, procedures must identify:

a) Locations where samples are collected, and outfall identification by its unique identifying number;
b) Staff responsible for conducting stormwater sampling;
c) Procedures for sample collection and handling, including any deviations from sampling within the first 30 minutes of a measurable storm event;
d) Parameters for analysis, holding times and preservatives, analytical methods, and laboratory quantitation levels;
e) Procedures for sending samples to a laboratory;
f) The numeric control values applicable to discharges from each outfall.

i. Corrective Action Documentation: The permittee must maintain a copy of all corrective actions documentation for actions taken consistent with of this permit (see CORRECTIVE ACTIONS section) with the facility SWMP.

J. PERMIT SPECIFIC MONITORING AND SAMPLING REQUIREMENTS

1. Representative Sampling

Samples and measurements taken for the respective identified monitoring points as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by the Division.

2. Alternative Analytical and Sampling Methods for Monitoring and Reporting

The permittee has an obligation to comply with the general monitoring requiremetns in Part II.J.5. The permittee may use an equivalent and acceptable alternative to an EPA-approved method without EPA review where the requirements of 40 CFR Part 136.6 are met and documented. The permittee may use an Alternative Test Procedure (ATP). An ATP is defined as a way in which an analyte is identified and quantified that is reviewed and approved by EPA in accordance with 40 CFR Part 136.4 for nationwide use, or a modification to a 40 CFR 136 approved method that is reviewed and approved by EPA in accordance with 40 CFR Part 136.5 for limited use.

a. The permittee must select a test procedure that is “sufficiently sensitive” for all monitoring conducted in accordance with this permit.

b. The PQLs for specific parameters are listed in tables.

c. If the permit contains an interim effluent limitation (a limit is report until such time as a numeric effluent limit becomes effective) for a parameter, the final numeric effluent limit shall be considered the AWQC for the purpose of determining whether a test method is sufficiently sensitive.

d. When the analytical method which complies with the above requirements has an ML greater than the permit limit, and the permittee’s analytical result is less than the ML, the permittee shall report "BDL" on the DMR. Such reports will not be considered as violations of the permit limit, as long as the method is sufficiently

sensitive. For parameters that have a report only limitation, and the permittee's analytical result is less than the ML, (where X = the ML) "< X" shall be reported on the DMR.

e. In the calculation of average concentrations (i.e. 7- day, 30-day average, 2-year rolling average) any individual analytical result that is less than the ML shall be considered to be zero for the calculation purposes. When reporting:

If all individual analytical results are less than the ML, the permittee shall report either "BDL" or "<X" (where X = the ML), following the guidance above.

If one or more individual results is greater than the ML, an average shall be calculated and reported. Note that it does not matter if the final calculated average is greater or less than the ML, it must be reported as a value.

Table Practical quantitation limits – Metals, inorganics, nutrients, radiological parameters, and nonylphenol

Parameter	Reporting Units	PQL	Parameter	Reporting Units	PQL
Aluminum	µg/L[1]	15	Ammonia Nitrogen	mg/L[2] N	0.2
Antimony	µg/L	2	Nitrate+Nitrite Nitrogen	mg/L N	0.1
Arsenic	µg/L	1	Nitrate Nitrogen	mg/L N	0.1
Barium	µg/L	1	Nitrite Nitrogen	mg/L N	0.05
Beryllium	µg/L	2	Total Kjeldahl Nitrogen	mg/L N	0.5
Boron	µg/L	20	Total Nitrogen	mg/L N	0.5
Cadmium	µg/L	0.5	Total Inorganic Nitrogen	mg/L N	0.2
Calcium	µg/L	120	Phosphorus	mg/L P	0.05[3]
Chromium	µg/L	20	BOD/CBOD	mg/L	2
Chromium, Trivalent	µg/L	---	Chloride	mg/L	2
Chromium, Hexavalent	µg/L	20[3, 4]	Total Residual Chlorine, DPD	mg/L	0.5
Copper	µg/L	2	Total Residual Chlorine, Amperiometric	mg/L	0.05
Iron	µg/L	20[3]	Cyanide	µg/L	10[3]
Lead	µg/L	0.5	Fluoride	mg/L	0.5
Magnesium	µg/L	35	Phenols	µg/L	30
Manganese	µg/L	2	Sulfate	mg/L	2
Mercury	µg/L	0.2[3]	Sulfide	mg/L H_2S	0.1
Mercury, Low Level	µg/L	0.002	Total Dissolved Solids (TDS)	mg/L	10
Molybdenum	µg/L	0.5	Total Suspended Solids (TSS)	mg/L	5
Nickel	µg/L	1	Radium-226	pCi/L	1
Selenium	µg/ L	1[3]	Radium-228	pCi/L	1
Silver	µg/ L	0.5	Uranium	µg/ L	1
Sodium	µg/ L	150	Nonylphenol, ASTM D7065	µg/ L	10
Thallium	µg/ L	0.5			
Zinc	µg/ L	10			

[1] µg/L = micrograms per liter
[2] mg/L = milligrams per liter
[3] PQL established based on parameter specific evaluation

Parameter	Reporting Units	PQL	Parameter	Reporting Units	PQL

[4] For hexavalent chromium, samples must be unacidified so dissolved concentrations will be measured rather than potentially dissolved concentrations.

3. **Flow Measuring Device**

If not already a part of the permitted facility, within ninety (90) days after the effective date of the permit, a flow measuring device shall be installed to give representative values of effluent quantities at the respective discharge points. Unless specifically exempted, or modified in the EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS section, a flow measuring device will be applicable at all designated discharge points.

At the request of the Division, the permittee shall show proof of the accuracy of any flow-measuring device used in obtaining data submitted in the monitoring report. The flow-measuring device must indicate values within ten (10) percent of the actual flow being measured.

4. **Extra Monitoring**

If the permittee, using an approved analytical method, monitors any parameter more frequently than required by this permit, then the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (DMRs) or other forms as required by the Division. Such increased frequency shall also be indicated.

5. **Adverse Weather Conditions**

When adverse weather conditions prevent sample collection according to the relevant monitoring schedule, the permittee must take a substitute sample, as possible, during the remaining monitoring period; for stormwater, the permittee must take a substitute sample during the next qualifying storm event. Adverse conditions are those that are dangerous or create inaccessibility for personnel, such as local flooding, high winds, winter weather, or electrical storms.

Adverse weather does not exempt the permittee from having to file timely DMRs. The permittee must report any failure to monitor, including the basis for not sampling during the usual reporting period. Evidence to support this basis may include the dates that monitoring attempts were made; photographs; field notes and official weather data from a scientifically recognized organization, such as NOAA or the NWS, that establish site inaccessibility, etc.

K. PERMIT SPECIFIC REPORTING AND RECORDKEEPING

1. **Routine Reporting of Data- Discharge Monitoring Report**

The permittee shall report the data gathered in compliance with this permit on a **monthly** basis. Reporting of all data gathered shall comply with the requirements of Part I.J and/or Part II. J of this permit. The permittee shall summarize monitoring results for each month and report on Division approved discharge monitoring report (DMR) forms (EPA form 3320-1).

The permittee must submit these forms either by mail, or by using the Division's Net-DMR service. If mailed, one form shall be mailed to the Division, as indicated below, so that the DMR is received no later than the 28th day of the following month (for example, the DMR for the first calendar month must be received by the Division by February 28th). If no discharge occurs during the reporting period, "**No Discharge**" shall be reported on the DMR.

The signed copy of each discharge monitoring report (DMR) shall be submitted to the Division at the following address:

Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

The Discharge Monitoring Report forms shall be filled out accurately and completely in accordance with requirements of this permit and the instructions on the forms. They shall be signed by an authorized person as identified in this section.

2. **Additional Reporting**

In addition to the reporting requirements stipulated in this Part, the permittee is also subject to the standard permit reporting provisions of Part II of this permit.

3. **Additional Stormwater- specific requirements (Outfalls 001, 002, 004, 005, 007-009, 011-026)**

a. Annual Report:

ICIS Code	Description	Due date	Frequency
00308	The permittee shall submit an annual report to the division for the reporting period January 1 through December 31	March 1	Annual

i. The Annual Report shall include:

- Name of permittee, address, phone number
- Permit certification number
- Facility name and physical address
- Contact person name, title, and phone number
- Summary of inspection dates
- Corrective action documentation as required in the CORRECTIVE ACTON section and status of any outstanding corrective action(s).

ii. The signed copy of each annual report shall be submitted to the Division at the address below, and a copy maintained with the SWMP.

Attn: Annual Report
Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

b. SWMP Records: The permittee shall retain copies of the facility SWMP, including any modifications made during the term of this permit, documentation related to corrective actions taken, all reports and certifications required by this permit, monitoring data, and records of all data used to complete the application to be covered by this permit, for a period of at least 3 years from the date that coverage under this permit expires or is terminated.

L. OTHER TERMS AND CONDITIONS

All dischargers must comply with the lawful requirements of counties, drainage districts and other state or local agencies regarding any discharges of stormwater to storm drain systems or other water courses under their jurisdiction.

PART II

A. DUTY TO COMPLY

1. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Colorado Water Quality Control Act and is grounds for: 1) enforcement action; 2) permit termination, revocation and reissuance, or modification; or 3) denial of a permit renewal application.
2. Federal Enforcement:
    a. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.
    b. The Clean Water Act provides that any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $25,000 per day for each violation. The Clean Water Act provides that any person who *negligently* violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both. Any person who *knowingly* violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.
    c. Any person may be assessed an administrative penalty by the Administrator for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

B. DUTY TO REAPPLY

If the permittee plans to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit a permit application at least 180 days before this permit expires as required by Regulation 61.4 and 61.10.

C. NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. DUTY TO MITIGATE

A permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. PROPER OPERATION AND MAINTENANCE

A permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed only when the operation is necessary to achieve compliance with the conditions of this permit. See 40 C.F.R. §122.41(e).

F. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. Any request for modification, revocation, reissuance, or termination under this permit must comply with all terms and conditions of Regulation 61.8(8). See also 40 C.F.R. § 122.41(f).

G. PROPERTY RIGHTS

In accordance with 40 CFR §122.41(g) and Regulation 61.8(9):

1. The issuance of a permit does not convey any property or water rights in either real or personal property, or stream flows or any exclusive privilege.
2. The issuance of a permit does not authorize any injury to person or property or any invasion of personal rights, nor does it authorize the infringement of federal, state, or local laws or regulations.
3. Except for any toxic effluent standard or prohibition imposed under Section 307 of the Clean Water Act or any standard for sewage sludge use or disposal under Section 405(d) of the Federal act, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301, 302, 306, 318, 403, and 405(a) and (b) of the Clean Water Act. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in Section 61.8(8) of the Colorado Discharge Permit System Regulations.

H. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the division, within a reasonable time, any information which the division may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the division, upon request, copies of records required to be kept by this permit in accordance with 40 C.F.R. §122.41(h) and/or Regulation 61.8(3)(q).

I. INSPECTION AND ENTRY

The permittee shall allow the division and the authorized representative, including U.S. EPA, and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials as required by law, to conduct inspections in accordance with 40 C.F.R. §122.41(i), Regulation 61.8(3), and Regulation 61.8(4):

1. To enter upon the permittee's premises where a regulated facility or activity is located or conducted in which any records are required to be kept under the terms and conditions of this permit;
2. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit and to inspect any facilities, equipment (including monitoring and control equipment), practices, operations or monitoring method regulated or required in the permit;
3. To enter upon the permittee's premises in a reasonable manner and at a reasonable time to inspect or investigate, any actual, suspected, or potential source of water pollution, or to ascertain compliance or noncompliance with the Colorado Water Quality Control Act or any other applicable state or federal statute or regulation or any order promulgated by the division, and;
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

J. MONITORING AND RECORD RETENTION

1. Samples and measurements taken for the purpose of monitoring must be representative of the volume and nature of the monitored activity. See 40 C.F.R. § 122.41(j)(1).
2. Monitoring must be conducted according to test procedures approved under 40 C.F.R. part 136 for the analyses of pollutants unless another method is required under 40 C.F.R. subchapters N or O. In the case of pollutants for which there are no approved methods under 40 C.F.R. part 136 or otherwise required under 40 C.F.R. subchapters N or O, monitoring must be conducted according to a test procedure specified in this permit for such pollutants. See 40 C.F.R. § 122.41(j)(4); 122.44(i)(1)(iv)(B).
3. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Division at any time.
4. Records of monitoring information must include:
    a. The date, exact place, and time of sampling or measurements;
    b. The individual(s) who performed the sampling or measurements;
    c. The date(s) analyses were performed
    d. The individual(s) who performed the analyses;
    e. The analytical techniques or methods used; and
    f. The results of such analyses.
5. The permittee shall install, calibrate, use and maintain monitoring methods and equipment, including biological and indicated pollutant monitoring methods. All sampling shall be performed by the permittee according to specified methods in 40 C.F.R. Part 136; methods approved by EPA pursuant to 40 C.F.R. Part 136; or methods approved by the National ATP Coordinator in the absence of a method specified in or approved pursuant to 40 C.F.R. Part 136.
6. The permittee shall retain for a minimum of three (3) years records of all monitoring information, including all original strip chart recordings for continuous monitoring instrumentation, all calibration and maintenance records, copies of all reports required by this permit and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Division or Regional Administrator.
7. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

K. SIGNATORY REQUIREMENTS

1. Authorization to Sign: All documents required to be submitted to the division by the permit must be signed in accordance with 40 CFR §122.22, Regulation 61.4, and the following criteria:
    a. For a corporation: By a responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
    b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or
    c. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency. (e.g., Regional Administrator of EPA).
    d. By a duly authorized representative in accordance with 40 C.F.R. 122.22(b), only if:
        i. the authorization is made in writing by a person described in Part II.K.1.a, b, or c above;
        ii. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and,
        iii. The written authorization is submitted to the Division.

2. Any person(s) signing documents required for submittal to the Division must make the following certification:
    "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

3. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both. See 40 C.F.R. §122.41(k)(2).

L. REPORTING REQUIREMENTS

1. Planned Changes: The permittee shall give advance notice to the division, in writing, of any planned physical alterations or additions to the permitted facility in accordance with 40 CFR §122.41(l) and Regulation 61.8(5)(a) and Part II.O. of this permit. Notice is required only when:
    a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR §122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR §122.41(a)(1).
c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. See 40 C.F.R. §122.41(l)(1)(ii).

2. Anticipated Non-Compliance: The permittee shall give advance notice to the division, in writing, of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements. The timing of notification requirements differs based on the type of non-compliance as described below.
3. Transfer of Ownership or Control: The permittee shall notify the division, in writing, thirty (30) calendar days in advance of a proposed transfer of the permit. This permit is not transferable to any person except after notice to the division. The division may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act. See Regulation 61.8(6); 40 C.F.R. §§ 122.41(l)(iii) and 122.61.
4. Monitoring reports: Monitoring results must be reported at the intervals specified in this permit.
    a. If the permittee monitors any pollutant at the approved monitoring locations listed in Part I.A.1 more frequently than that required by this permit using test procedures approved under 40 CFR Part 136, or another method required for an industry-specific waste stream under 40 CFR subchapters N or O, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Division.
    b. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Division in the permit.
5. Compliance Schedules: Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule in the permit, shall be submitted on the date listed in the compliance schedule section. The fourteen (14) calendar day provision in Regulation 61.8(4)(n)(i) has been incorporated into the due date.
6. Twenty-four hour reporting:
    a. In addition to the reports required elsewhere in this permit, the permittee shall report the following circumstances orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall mail to the division a written report containing the information requested within five (5) working days after becoming aware of the following circumstances:
        i. Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident;
        ii. Circumstances leading to any unanticipated bypass which exceeds any effluent limitations in the permit;
        iii. Circumstances leading to any upset which causes an exceedance of any effluent limitation in the permit; or
        iv. Daily maximum violations for any of the pollutants limited by Part I.A of this permit as specified in Part III of this permit. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.
    b. The report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times), and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
    c. For noncompliance events related to combined sewer overflows, sanitary sewer overflows, or bypass events, these reports must include the data described above (with the exception of time of discovery) as well as the type of event (combined sewer overflows, sanitary sewer overflows, or bypass events), type of sewer overflow structure (*e.g.,* manhole, combine sewer overflow outfall), discharge volumes

untreated by the treatment works treating domestic sewage, types of human health and environmental impacts of the sewer overflow event, and whether the noncompliance was related to wet weather.

7. Other non-compliance: A permittee must report all instances of noncompliance at the time monitoring reports are due. These reports may be submitted annually in accordance with Regulation 61.8(4)(p) and/or 61.8(5)(f), but may be submitted at a more frequent interval.
8. Other information: Where a permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the division it has a duty to promptly submit such facts or information.

M. BYPASS

1. Definitions:
    a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility in accordance with 40 CFR §122.41(m)(1)(i) and/or Regulation 61.2(12).
    b. Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. See 40 CFR §122.41(m)(1)(ii).
2. Bypass not exceeding limitations. You may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Appendix I, Subsections I.13.3 and I.13.4. See 40 CFR §122.41(m)(2).
3. Notice of bypass:
    a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, the permittee shall submit prior notice, if possible, at least ten (10) days before the date of the bypass. See 40 CFR §122.41(m)(3)(i) and/or Regulation 61.9(5)(c).
    b. Unanticipated bypass. You must submit notice of an unanticipated bypass as required in Part II.L.6. See 40 CFR §122.41(m)(3)(ii).
4. Prohibition of Bypass: Bypasses are prohibited and the division may take enforcement action against the permittee for bypass, unless:
    a. the bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;
    b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
    c. Proper notices were submitted to the division.
        i. The Division may approve an anticipated bypass, after considering its adverse effects, if the Division determines that it will meet the three conditions listed.

N. UPSET

1. Definition: "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation in accordance with 40 CFR §122.41(n) and Regulation 61.2(114),
2. Effect of an upset: An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 3 are met. A determination made during administrative review of claims that noncompliance was caused by upset is final administrative action subject to judicial review in accordance with Regulation 61.8(3)(j).

3. Conditions necessary for demonstration of an Upset: A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that
    a. an upset occurred and the permittee can identify the specific cause(s) of the upset;
    b. the permitted facility was at the time being properly operated and maintained; and
    c. the permittee submitted proper notice of the upset as required in Part II.L.6 (24-hour notice); and
    d. The permittee complied with any remedial measure necessary to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. See 40 C.F.R. 122.41(n)(3)(i)-(iv).
3. In addition to the demonstration required above, a permittee who wishes to establish the affirmative defense of upset for a violation of effluent limitations based upon water quality standards shall also demonstrate through monitoring, modeling or other methods that the relevant standards were achieved in the receiving water.
4. Burden of Proof: In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

O. REOPENER CLAUSE

Procedures for modification or revocation. Permit modification or revocation of this permit or coverage under this permit will be conducted according to Regulation 61.8(8). This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one of the following events occurs, including but not limited to:

1. Water Quality Standards: The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.
2. Wasteload Allocation: A wasteload allocation is developed and approved by the State of Colorado and/or EPA for incorporation in this permit.
3. Discharger-specific variance: A variance is adopted by the Water Quality Control Commission.

P. OTHER INFORMATION

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Division or U.S. EPA, the Discharger shall promptly submit such facts or information. See 40 C.F.R. § 122.41(l)(8).

Q. SEVERABILITY

The provisions of this permit are severable. If any provisions or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

R. NOTIFICATION REQUIREMENTS

1. Notification to Parties: All notification requirements shall be directed as follows:
    a. Oral Notifications, during normal business hours shall be to:

        CDPHE-Emergency Reporting Line: 1-877-518-5608; or

        Water Quality Protection Section – Compliance Program
        Water Quality Control Division
        Telephone: (303) 692-3500

        After hours notifications should be made to the CDPHE-Emergency Reporting Line: 1-877-518-5608.

    b. Written notification shall be to:

Water Quality Protection Section – Compliance Program
Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

S. RESPONSIBILITIES

Reduction, Loss, or Failure of Treatment Facility: The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the effluent limitations of the permit. It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

T. OIL AND HAZARDOUS SUBSTANCES LIABILITY

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 (Oil and Hazardous Substance Liability) of the Clean Water Act.

U. EMERGENCY POWERS

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority granted by Section 510 of the Clean Water Act. Nothing in this permit shall be construed to prevent or limit application of any emergency power of the division.

V. CONFIDENTIALITY

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, Colorado Open Records Act (CORA) request, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Water Quality Control Commission or the division, but shall be kept confidential. Any person seeking to invoke the protection of this section shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

W. FEES

The permittee is required to submit payment of an annual fee as set forth in the 2016 amendments to the Water Quality Control Act. Section 25-8-502 (1.1) (b), and the Regulation 61.15 as amended. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-601 et. seq., C.R.S.1973 as amended.

X. DURATION OF PERMIT

The duration of a permit shall be for a fixed term and shall not exceed five (5) years. If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least one hundred eighty (180) calendar days before this permit expires. Filing of a timely and complete application shall cause the expired permit to continue in force to the effective date of the new permit. The permit's duration may be extended only through administrative extensions and not through interim modifications. If the permittee anticipates there will be no discharge after the expiration date of this permit, the division should be promptly notified so that it can terminate the permit in accordance with Regulation 61.

Y. SECTION 307 TOXICS

If a toxic effluent standard or prohibition, including any applicable schedule of compliance specified, is established by regulation pursuant to Section 307 of the Clean Water Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in the discharge permit, the division shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

PART III

APPENDIX A-Categorical Industries and Pollutants

Table I—Testing Requirements for Organic Toxic Pollutants by Industrial Category for Existing Dischargers

Industry Category	
Adhesives and sealants	Ore mining
Aluminum forming	Organic chemicals manufacturing
Auto and other laundries	Paint and ink formulation
Battery manufacturing	Pesticides
Coal mining	Petroleum refining
Coil coating	Pharmaceutical preparations
Copper forming	Photographic equipment and supplies
Electrical and electronic components	Plastics processing
Electroplating	Plastic and synthetic materials manufacturing
Explosives manufacturing	Porcelain enameling
Foundries	Printing and publishing
Gum and wood chemicals	Pulp and paper mills
Inorganic chemicals manufacturing	Rubber processing
Iron and steel manufacturing	Soap and detergent manufacturing
Leather tanning and finishing	Steam electric power plants
Mechanical products manufacturing	Textile mills
Nonferrous metals manufacturing	Timber products processing

Table II—Organic Toxic Pollutants in Each of Four Fractions in Analysis by Gas Chromatography/Mass

Volatiles	Acid Compounds	Base/Neutral	Pesticides
1V acrolein	1A 2-chlorophenol	1B acenaphthene	1P aldrin
2V acrylonitrile	2A 2,4-dichlorophenol	2B acenaphthylene	2P alpha-BHC
3V benzene	3A 2,4-dimethylphenol	3B anthracene	3P beta-BHC
5V bromoform	4A 4,6-dinitro-o-cresol	4B benzidine	4P gamma-BHC
6V carbon tetrachloride	5A 2,4-dinitrophenol	5B benzo(a)anthracene	5P delta-BHC
7V chlorobenzene	6A 2-nitrophenol	6B benzo(a)pyrene	6P chlordane
8V chlorodibromomethane	7A 4-nitrophenol	7B 3,4-benzofluoranthene	7P 4,4′-DDT
9V chloroethane	8A p-chloro-m-cresol	8B benzo(ghi)perylene	8P 4,4′-DDE
10V 2-chloroethylvinyl ether	9A pentachlorophenol	9B benzo(k)fluoranthene	9P 4,4′-DDD
11V chloroform	10A phenol	10B bis(2-chloroethoxy)methane	10P dieldrin
12V dichlorobromomethane	11A 2,4,6-trichlorophenol	11B bis(2-chloroethyl)ether	11P alpha-endosulfan
14V 1,1-dichloroethane		12B bis(2-chloroisopropyl)ether	12P beta-endosulfan
15V 1,2-dichloroethane		13B bis (2-ethylhexyl)phthalate	13P endosulfan sulfate
16V 1,1-dichloroethylene		14B 4-bromophenyl phenyl ether	14P endrin
17V 1,2-dichloropropane		15B butylbenzyl phthalate	15P endrin aldehyde
18V 1,3-dichloropropylene		16B 2-chloronaphthalene	16P heptachlor
19V ethylbenzene		17B 4-chlorophenyl phenyl ether	17P heptachlor epoxide
20V methyl bromide		18B chrysene	18P PCB-1242
21V methyl chloride		19B dibenzo(a,h)anthracene	19P PCB-1254
22V methylene chloride		20B 1,2-dichlorobenzene	20P PCB-1221
23V 1,1,2,2-tetrachloroethane		21B 1,3-dichlorobenzene	21P PCB-1232
24V tetrachloroethylene		22B 1,4-dichlorobenzene	22P PCB-1248
25V toluene		23B 3,3′-dichlorobenzidine	23P PCB-1260
26V 1,2-trans-dichloroethylene		24B diethyl phthalate	24P PCB-1016
27V 1,1,1-trichloroethane		25B dimethyl phthalate	25P toxaphene
28V 1,1,2-trichloroethane		26B di-n-butyl phthalate	
29V trichloroethylene		27B 2,4-dinitrotoluene	
31V vinyl chloride		28B 2,6-dinitrotoluene	
		29B di-n-octyl phthalate	
		30B 1,2-diphenylhydrazine (as azobenzene)	
		31B fluroranthene	
		32B fluorene	
		33B hexachlorobenzene	
		34B hexachlorobutadiene	
		35B hexachlorocyclopentadiene	
		36B hexachloroethane	
		37B indeno(1,2,3-cd)pyrene	
		38B isophorone	
		39B napthalene	
		40B nitrobenzene	
		41B N-nitrosodimethylamine	
		42B N-nitrosodi-n-propylamine	
		43B N-nitrosodiphenylamine	
		44B phenanthrene	
		45B pyrene	
		46B 1,2,4-trichlorobenzene	

Table III—Other Toxic Pollutants (Metals and Cyanide) and Total Phenols

Antimony, Total
Arsenic, Total
Beryllium, Total
Cadmium, Total
Chromium, Total
Copper, Total
Lead, Total
Mercury, Total
Nickel, Total
Selenium, Total
Silver, Total
Thallium, Total
Zinc, Total
Cyanide, Total
Phenols, Total

Table IV—Conventional and Nonconventional Pollutants Required To Be Tested by Existing Dischargers if Expected to be Present

Bromide
Chlorine, Total Residual
Color
Fecal Coliform
Fluoride
Nitrate-Nitrite
Nitrogen, Total Organic
Oil and Grease
Phosphorus, Total
Radioactivity
Sulfate
Sulfide
Sulfite
Surfactants
Aluminum, Total
Barium, Total
Boron, Total
Cobalt, Total
Iron, Total
Magnesium, Total
Molybdenum, Total
Manganese, Total
Tin, Total
Titanium, Total

Table V—Toxic Pollutants and Hazardous Substances Required To Be Identified by Existing Dischargers if Expected To Be Present

Toxic Pollutants

Asbestos

Hazardous Substances

Acetaldehyde
Allyl alcohol
Allyl chloride
Amyl acetate
Aniline
Benzonitrile
Benzyl chloride
Butyl acetate
Butylamine
Captan
Carbaryl
Carbofuran
Carbon disulfide
Chlorpyrifos
Coumaphos
Cresol
Crotonaldehyde
Cyclohexane
2,4-D (2,4-Dichlorophenoxy acetic acid)
Diazinon
Dicamba
Dichlobenil
Dichlone
2,2-Dichloropropionic acid
Dichlorvos
Diethyl amine
Dimethyl amine
Dintrobenzene
Diquat
Disulfoton
Diuron
Epichlorohydrin
Ethion
Ethylene diamine
Ethylene dibromide
Formaldehyde
Furfural
Guthion
Isoprene
Isopropanolamine Dodecylbenzenesulfonate
Kelthane
Kepone
Malathion
Mercaptodimethur
Methoxychlor
Methyl mercaptan
Methyl methacrylate
Methyl parathion
Mevinphos
Mexacarbate
Monoethyl amine
Monomethyl amine
Naled
Napthenic acid
Nitrotoluene
Parathion
Phenolsulfanate
Phosgene
Propargite
Propylene oxide
Pyrethrins
Quinoline
Resorcinol
Strontium
Strychnine
Styrene
2,4,5-T (2,4,5-Trichlorophenoxy acetic acid)
TDE (Tetrachlorodiphenylethane)
2,4,5-TP [2-(2,4,5-Trichlorophenoxy) propanoic acid]
Trichlorofan
Triethanolamine dodecylbenzenesulfonate
Triethylamine
Trimethylamine
Uranium
Vanadium
Vinyl acetate
Xylene
Xylenol
Zirconium

APPENDIX B-Definitions

1. "Acute Toxicity" - The acute toxicity limitation is exceeded if the LC50 is at any effluent concentration less than or equal to the IWC indicated in this permit.

2. "Antidegradation limits" – See "Two (2) - Year Rolling Average".

3. "Applicable water quality criterion (AWQC)" is the quantitation target level or goal. The AWQC may be one of the following:

   Where an effluent limit has been established,
   i. The AWQC is the effluent limit.

   Where an effluent limit has not been established, the AWQC may be
   i. An applicable technology based effluent limit (TBEL);
   ii. Half of a water quality standard;
   iii. Half of a water quality standard as assessed in the receiving water, or potential WQBEL; or
   iv. Half of a potential antidegradation based effluent limitation, which can be an antidegradation based average concentration or a potential non-impact limit.

4. "Chronic toxicity", which includes lethality and growth or reproduction, occurs when the NOEC and IC25 are at an effluent concentration less than the IWC indicated in this permit.

5. "Composite" sample is a minimum of four (4) grab samples collected at equally spaced two (2) hour intervals and proportioned according to flow. For a SBR type treatment system, a composite sample is defined as sampling equal aliquots during the beginning, middle and end of a decant period, for two consecutive periods during a day (if possible).

6. "Continuous" measurement, is a measurement obtained from an automatic recording device which continually measures the effluent for the parameter in question, or that provides measurements at specified intervals.

7. "Daily Maximum limitation" for all parameters (except temperature, pH, dissolved oxygen, and WET) means the limitation for this parameter shall be applied as an average of all samples collected in one calendar day. For these parameters the DMR shall include the highest of the daily averages. For pH and dissolved oxygen, this means an instantaneous maximum (and/or instantaneous minimum) value. For WET, this means an instantaneous minimum value. The instantaneous value is defined as the analytical result of any individual sample. For pH and dissolved oxygen, DMRs shall include the maximum (and/or minimum) of all instantaneous values within the calendar month. For WET, DMRs shall include the minimum of all instantaneous values within the reporting period. For pH and dissolved oxygen, the value beyond the noted daily maximum limitation for the indicated parameter shall be considered a violation of this permit. For temperature, see Daily Maximum Temperature. For WET violation and failure descriptions, see Part I.B.5.

8. "Daily Maximum Temperature (DM)" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as the highest two-hour average water temperature recorded during a given 24-hour period. This will be determined using a rolling 2-hour maximum temperature. If data is collected every 15 minutes, a 2 hour maximum can be determined on every data point after the initial 2 hours of collection. Note that the time periods that overlap days (Wednesday night to Thursday morning) do not matter as the reported value on the DMR is the greatest of all the 2-hour averages.

   This would continue throughout the course of a calendar day. The highest of these 2 hour averages over a month would be reported on the DMR as the daily maximum temperature. At the end/beginning of a month, the collected data should be used for the month that contains the greatest number of minutes in the 2-hour maximum.

9. "Dissolved (D) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a water and suspended sediment sample which passed through a 0.40 or 0.45 UM (micron) membrane filter. Determinations of "dissolved" constituents are made using the filtrate. This may include some very small (colloidal) suspended particles which passed through the membrane filter as well as the amount of substance present in true chemical solution.

10. "Geometric mean" for *E. coli* bacteria concentrations, the thirty (30) day and seven (7) day averages shall be determined as the geometric mean of all samples collected in a thirty (30) day period and the geometric mean of all samples taken in a seven (7) consecutive day period respectively. The geometric mean may be calculated using two different methods. For the methods shown, a, b, c, d, etc. are individual sample results, and n is the total number of samples.

    Method 1:

    Geometric Mean = $(a*b*c*d*...)^{(1/n)}$ "*" - means multiply

    Method 2:

    Geometric Mean = antilog ([log(a)+log(b)+log(c)+log(d)+...]/n)

    Graphical methods, even though they may also employ the use of logarithms, may introduce significant error and may not be used.

    In calculating the geometric mean, for those individual sample results that are reported by the analytical laboratory to be "less than" a numeric value, a value of 1 should be used in the calculations. If all individual analytical results for the month are reported to be less than numeric values, then report "less than" the largest of those numeric values on the monthly DMR. Otherwise, report the calculated value.

    For any individual analytical result of "too numerous to count" (TNTC), that analysis shall be considered to be invalid and another sample shall be promptly collected for analysis. If another sample cannot be collected within the same sampling period for which the invalid sample was collected (during the same month if monthly sampling is required, during the same week if weekly sampling is required, etc.), then the following procedures apply:

    i. A minimum of two samples shall be collected for coliform analysis within the next sampling period.

    ii. If the sampling frequency is monthly or less frequent: For the period with the invalid sample results, leave the spaces on the corresponding DMR for reporting coliform results empty and attach to the DMR a letter noting that a result of TNTC was obtained for that period, and explain why another sample for that period had not been collected.

    If the sampling frequency is more frequent than monthly: Eliminate the result of TNTC from any further calculations, and use all the other results obtained within that month for reporting purposes. Attach a letter noting that a result of TNTC was obtained, and list all individual analytical results and corresponding sampling dates for that month.

11. "Grab" sample, is a single "dip and take" sample so as to be representative of the parameter being monitored.

12. "IC25" or "Inhibition Concentration" is a point estimate of the toxicant concentration that would cause a given percent reduction in a non-lethal biological measurement (e.g. growth or reproduction) calculated from a continuous model (i.e. interpolation method). IC25 is a point estimate of the toxic concentration that would cause a 25-percent reduction in a non-lethal biological measurement.

13. "In-situ" measurement is defined as a single reading, observation or measurement taken in the field at the point of discharge.

14. "Instantaneous" measurement is a single reading, observation, or measurement performed on site using existing monitoring facilities.

15. "Intermittent Discharges" for the purpose of the Implementation of the Narrative Standard for Toxicity in Discharge Permits using Whole Effluent Toxicity (WET) Testing policy, to be intermittent discharge and to qualify for acute testing, one of the following must apply:

A) The maximum discharge frequency is less than 3 consecutive days (72 hours), and less than 3 days per 7 day period, and less than 10 days per month.
B) The maximum discharge frequency is less than 5 consecutive days (120 hours) and less than 5 days per month.
C) It can be shown that discharge frequency and duration is tied solely to precipitation events, where the discharge starts and stops shortly after the precipitations event starts/stops.

16. "LC50" or "Lethal Concentration" is the toxic or effluent concentration that would cause death in 50 percent of the test organisms over a specified period of time.

17. "Maximum Weekly Average Temperature (MWAT)" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as an implementation statistic that is calculated from field monitoring data. The MWAT is calculated as the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day. For lakes and reservoirs, the MWAT is assumed to be equivalent to the maximum WAT from at least three profiles distributed throughout the growing season (generally July-September).

    The MWAT is calculated by averaging all temperature data points collected during a calendar day, and then averaging the daily average temperatures for 7 consecutive days. This 7 day averaging period is a rolling average, i.e. on the 8th day, the MWAT will be the averages of the daily averages of days 2-8. The value to be reported on the DMR is the highest of all the rolling 7-day averages throughout the month. For those days that are at the end/beginning of the month, the data shall be reported for the month that contains 4 of the 7 days.

    Day 1: Average of all temperature data collected during the calendar day.
    Day 2: Average of all temperature data collected during the calendar day.
    Day 3: Average of all temperature data collected during the calendar day.
    Day 4: Average of all temperature data collected during the calendar day.
    Day 5: Average of all temperature data collected during the calendar day.
    Day 6: Average of all temperature data collected during the calendar day.
    Day 7: Average of all temperature data collected during the calendar day.
    1st MWAT Calculation as average of previous 7 days
    Day 8: Average of all temperature data collected during the calendar day.
    2nd MWAT Calculation as average of previous 7 days
    Day 9: Average of all temperature data collected during the calendar day.
    3rd MWAT Calculation as average of previous 7 days

18. "Minimum level (ML)" means the lowest concentration of an analyte that can be accurately and precisely quantified using a given method, as determined by the laboratory.

19. "NOEC" or "No-Observed-Effect-Concentration" is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life cycle (short term) test, that causes no observable adverse effects on the test organisms (i.e. the highest concentration of toxicant in which the values for the observed responses are not statistically different from the controls). This value is used, along with other factors, to determine toxicity limits in permits.

20. "Potentially dissolved (PD) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a constituent measured from the filtrate of a water and suspended sediment sample that was first treated with nitric acid to a pH of 2 or less and let stand for 8 to 96 hours prior to sample filtration using a 0.40 or 0.45-UM (micron) membrane filter. Note the "potentially dissolved" method cannot be used where nitric acid will interfere with the analytical procedure used for the constituent measured.

21. "Practical Quantitation Limit (PQL)" means the minimum concentration of an analyte (substance) that can be measured with a high degree of confidence that the analyte is present at or above that concentration. The use of PQL in this document may refer to those PQLs shown in Part I.D of this permit or the PQLs of an individual laboratory.

22. "Quarterly measurement frequency" means samples may be collected at any time during the calendar quarter if a continual discharge occurs. If the discharge is intermittent, then samples shall be collected during the period that discharge occurs.

23. "Recorder" requires the continuous operation of an automatic data retention device for providing required records such as a data logger, a chart and/or totalizer (or drinking water rotor meters or pump hour meters where previously approved.)

24. SAR and Adjusted SAR - The equation for calculation of SAR-adj is:

$$SAR\text{-}adj = \frac{Na^{+}}{\sqrt{\frac{Ca_x + Mg^{++}}{2}}}$$

Where:

Na^{+} = Sodium in the effluent reported in meq/l
Mg^{++} = Magnesium in the effluent reported in meq/l
Ca_x = calcium (in meq/l) in the effluent modified due to the ratio of bicarbonate to calcium

The values for sodium (Na^{+}), calcium (Ca^{++}), bicarbonate (HCO_3^{-}) and magnesium (Mg^{++}) in this equation are expressed in units of milliequivalents per liter (meq/l). Generally, data for these parameters are reported in terms of mg/l, which must then be converted to calculate the SAR. The conversions are:

$$\text{meq/l} = \frac{Concentration\ in\ mg/l}{Equivalent\ weight\ in\ mg/meq}$$

Where the equivalent weights are determined based on the atomic weight of the element divided by the ion's charge:

Na^{+} = 23.0 mg/meq (atomic weight of 23, charge of 1)
Ca^{++} = 20.0 mg/meq (atomic weight of 40.078, charge of 2)
Mg^{++} = 12.15 mg/meq (atomic weight of 24.3, charge of 2)
HCO_3^{-} = 61 mg/mep (atomic weight of 61, charge of 1)

The *EC* and the HCO_3^{-}/Ca^{++} ratio in the effluent (calculated by dividing the HCO_3^{-} in meq/l by the Ca^{++} in meq/l) are used to determine the Ca_x using the following table.

Table – Modified Calcium Determination for Adjusted Sodium Adsorption Ratio

HCO_3/Ca Ratio And *EC* [1], [2], [3]													
Salinity of Effluent (*EC*)(dS/m)													
		0.1	**0.2**	**0.3**	**0.5**	**0.7**	**1.0**	**1.5**	**2.0**	**3.0**	**4.0**	**6.0**	**8.0**
Ratio of HCO_3/Ca	**.05**	13.20	13.61	13.92	14.40	14.79	15.26	15.91	16.43	17.28	17.97	19.07	19.94
	.10	8.31	8.57	8.77	9.07	9.31	9.62	10.02	10.35	10.89	11.32	12.01	12.56
	.15	6.34	6.54	6.69	6.92	7.11	7.34	7.65	7.90	8.31	8.64	9.17	9.58
	.20	5.24	5.40	5.52	5.71	5.87	6.06	6.31	6.52	6.86	7.13	7.57	7.91
	.25	4.51	4.65	4.76	4.92	5.06	5.22	5.44	5.62	5.91	6.15	6.52	6.82
	.30	4.00	4.12	4.21	4.36	4.48	4.62	4.82	4.98	5.24	5.44	5.77	6.04
	.35	3.61	3.72	3.80	3.94	4.04	4.17	4.35	4.49	4.72	4.91	5.21	5.45
	.40	3.30	3.40	3.48	3.60	3.70	3.82	3.98	4.11	4.32	4.49	4.77	4.98
	.45	3.05	3.14	3.22	3.33	3.42	3.53	3.68	3.80	4.00	4.15	4.41	4.61
	.50	2.84	2.93	3.00	3.10	3.19	3.29	3.43	3.54	3.72	3.87	4.11	4.30
	.75	2.17	2.24	2.29	2.37	2.43	2.51	2.62	2.70	2.84	2.95	3.14	3.28
	1.00	1.79	1.85	1.89	1.96	2.01	2.09	2.16	2.23	2.35	2.44	2.59	2.71
	1.25	1.54	1.59	1.63	1.68	1.73	1.78	1.86	1.92	2.02	2.10	2.23	2.33
	1.50	1.37	1.41	1.44	1.49	1.53	1.58	1.65	1.70	1.79	1.86	1.97	2.07

	1.75	1.23	1.27	1.30	1.35	1.38	1.43	1.49	1.54	1.62	1.68	1.78	1.86
	2.00	1.13	1.16	1.19	1.23	1.26	1.31	1.36	1.40	1.48	1.54	1.63	1.70
	2.25	1.04	1.08	1.10	1.14	1.17	1.21	1.26	1.30	1.37	1.42	1.51	1.58
	2.50	0.97	1.00	1.02	1.06	1.09	1.12	1.17	1.21	1.27	1.32	1.40	1.47
	3.00	0.85	0.89	0.91	0.94	0.96	1.00	1.04	1.07	1.13	1.17	1.24	1.30
	3.50	0.78	0.80	0.82	0.85	0.87	0.90	0.94	0.97	1.02	1.06	1.12	1.17
	4.00	0.71	0.73	0.75	0.78	0.80	0.82	0.86	0.88	0.93	0.97	1.03	1.07
	4.50	0.66	0.68	0.69	0.72	0.74	0.76	0.79	0.82	0.86	0.90	0.95	0.99
	5.00	0.61	0.63	0.65	0.67	0.69	0.71	0.74	0.76	0.80	0.83	0.88	0.93
	7.00	0.49	0.50	0.52	0.53	0.55	0.57	0.59	0.61	0.64	0.67	0.71	0.74
	10.00	0.39	0.40	0.41	0.42	0.43	0.45	0.47	0.48	0.51	0.53	0.56	0.58
	20.00	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30	0.32	0.33	0.35	0.37
	30.00	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.24	0.25	0.27	0.28

[1] Adapted from Suarez (1981).

[2] Assumes a soil source of calcium from lime ($CaCO_3$) or silicates; no precipitation of magnesium, and partial pressure of CO_2 near the soil surface (P_{CO2}) is 0.0007 atmospheres.

[3] Ca_x, HCO_3, Ca are reported in meq/l; EC is in dS/m (deciSiemens per meter).

Because values will not always be quantified at the exact *EC* or HCO_3^-/Ca^{++} ratio in the table, the resulting Ca_x must be determined based on the closest value to the calculated value. For example, for a calculated *EC* of 2.45 dS/m, the column for the *EC* of 2.0 would be used. However, for a calculated *EC* of 5.1, the corresponding column for the *EC* of 6.0 would be used. Similarly, for a HCO_3^-/Ca^{++} ratio of 25.1, the row for the 30 ratio would be used.

The Division acknowledges that some effluents may have electrical conductivity levels that fall outside of this table, and others have bicarbonate to calcium ratios that fall outside this table. For example, some data reflect HCO_3^-/Ca^{++} ratios greater than 30 due to bicarbonate concentrations reported greater than 1000 mg/l versus calcium concentrations generally less than 10 mg/l (i.e., corresponding to HCO_3^-/Ca^{++} ratios greater than 100). Despite these high values exceeding the chart's boundaries, it is noted that the higher the HCO_3^-/Ca^{++} ratio, the greater the SAR-adj. Thus, using the Ca_x values corresponding to the final row containing bicarbonate/calcium ratios of 30, the permittee will actually calculate an SAR-adj that is less than the value calculated if additional rows reflecting HCO_3^-/Ca^{++} ratios of greater than 100 were added.

25. "Seven (7) day average" means, with the exception of fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected in a seven (7) consecutive day period. Such seven (7) day averages shall be calculated for all calendar weeks, which are defined as beginning on Sunday and ending on Saturday. If the calendar week overlaps two months (i.e. the Sunday is in one month and the Saturday in the following month), the seven (7) day average calculated for that calendar week shall be associated with the month that contains the Saturday. Samples may not be used for more than one (1) reporting period. **(See the "Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

26. "Sufficiently sensitive test procedures":

    i. An analytical method is ''sufficiently sensitive'' when the method detects and accurately and precisely quantifies the amount of the analyte. In other words there is a valid positive result; or
    ii. An analytical method is "sufficiently sensitive" when the method accurately and precisely quantifies the result to the AWQC, as demonstrated by the ML is less than or equal to the AWQC. In other words, the level of precision is adequate to inform decision making; or
    iii. An analytical method is "sufficiently sensitive" when the method achieves the required level of accuracy and precision, as demonstrated by the ML is less than or equal to the PQL. In other words, the most sensitive method is being used and properly followed.

27. "Thirty (30) day average" means, except for fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected during a thirty (30) consecutive-day period. The permittee shall report the appropriate mean of all self-monitoring sample data collected during the calendar month on the

Discharge Monitoring Reports. Samples shall not be used for more than one (1) reporting period. **(See the "Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

28. Toxicity Identification Evaluation (TIE) is a set of site-specific procedures used to identify the specific chemical(s) causing effluent toxicity.

29. "Total Inorganic Nitrogen (T.I.N.)" is an aggregate parameter determined based on ammonia, nitrate and nitrite concentrations. To determine T.I.N. concentrations, the facility must monitor for total ammonia and total nitrate plus nitrite (or nitrate and nitrite individually) on the same days. The calculated T.I.N. concentrations in mg/L shall then be determined as the sum of the analytical results of same-day sampling for total ammonia (as N) in mg/L, and total nitrate plus nitrite (as N) in mg/L (or nitrate as N and nitrite as N individually). From these calculated T.I.N. concentrations, the daily maximum and thirty (30) day average concentrations for T.I.N. shall be determined in the same manner as set out in the definitions for the daily maximum and thirty (30) day average. **(See the "Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.5 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

30. "Total Metals" means the concentration of metals determined on an unfiltered sample following vigorous digestion (Section 4.1.3), or the sum of the concentrations of metals in both the dissolved and suspended fractions, as described in Manual of Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979, or its equivalent.

31. "Total Recoverable Metals" means that portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described in Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979 or its equivalent.

32. Toxicity Reduction Evaluation (TRE) is a site-specific study conducted in a step-wise process to identify the causative agents of effluent toxicity, isolate the source of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity after the control measures are put in place.

33. "Twenty four (24) hour composite" sample is a combination of at least eight (8) sample aliquots of at least 100 milliliters, collected at equally spaced intervals during the operating hours of a facility over a twenty-four (24) hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the wastewater or effluent flow at the time of sampling or the total wastewater or effluent flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.

34. "Twice Monthly" monitoring frequency means that two samples shall be collected each calendar month on separate weeks with at least one full week between the two sample dates. Also, there shall be at least one full week between the second sample of a month and the first sample of the following month.

35. "Two (2) -Year Rolling Average" (Antidegradation limits)- the average of all monthly average data collected in a two year period. Reporting of two-year rolling average results should begin in the first DMR due once the reporting requirements has been in place for a two year period. To calculate a two-year rolling average, add the current monthly average to the previous 23 monthly averages and divide the total by 24. This methodology continues on a rolling basis as long as the two year rolling average reporting and/or effluent limit applies (i.e., in the first reporting period use data from month 1 to month 24, in the second reporting period use data from month 2 to month 25, then month 3 to month 26, etc). Ongoing reporting is required across permit terms when data is available for a two year period.

36. "Visual" observation is observing the discharge to check for the presence of a visible sheen or floating oil.

37. "Water Quality Control Division" or "Division" means the state Water Quality Control Division as established in 25-8-101 et al.)

Additional relevant definitions are found in the Colorado Water Quality Control Act, CRS §§ 25-8-101 et seq., the Colorado Discharge Permit System Regulations, Regulation 61 (5 CCR 1002-61) and other applicable regulations.

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

August 2, 2019

Submitted via email (andrea.stucky@state.co.us) and hard copy

Ms. Andrea Stucky
Water Quality Control Division
Colorado Department of Public Health & Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

RE: Compliance Schedule CS010 Status/Progress Report
CDPS Permit No. CO-0045161
Colowyo Coal Company, L.P. – Colowyo Coal Mine

Dear Ms. Stucky:

In accordance with Part I.E.1. of the Colowyo Coal Company, L.P. – Colowyo Coal Mine Colorado Discharge Permit System (CDPS) Permit No. CO-0045161, the enclosed Narrative Conditions form provides the required progress report on meeting the total recoverable iron limits by August 1, 2022 at Outfalls 006 (AEL only), 010 (AEL only), 021, 022, 023, 024, and 025. Tri-State Generation and Transmission Association, Inc. (Tri-State) is the facility's parent company.

If you have any questions on the progress report, please contact Chantell Johnson (303-254-3185 or cjohnson@tristategt.org) or Chris Gilbreath (303-254-3291 or cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy & Compliance
Chief Compliance Officer

BAW:CJ

Enclosure

cc: Chantell Johnson (via email)
Chris Gilbreath (via email)
File G471 – 11.3(10)a-1

COLORADO
Water Quality Control Division
Department of Public Health & Environment

Permit Narrative Conditions Division Routing
Date received_____
Data entered_____
Permits Reviewed_____
Enforcement Reviewed_____
Engineering Reviewed_____

PERMIT NARRATIVE CONDITIONS REPORT FORM

Please print or type all information.
You must use this form whenever you are submitting any documents to the Water Quality Control Division (besides permit modification applications and annual reports) that are required by your permit, including documents you are submitting to comply with items listed in your permit's compliance schedules or any other reports or Special Studies required by your permit.

All items must be filled out completely and correctly.

Colorado Dept of Public Health and Environment
Water Quality Control Division - Records
4300 Cherry Creek Dr South WQCD-P-B2
Denver, CO 80246-1530

MAIL ORIGINAL FORM WITH INK SIGNATURES TO THE FOLLOWING ADDRESS:
FAXED or EMAILED FORMS WILL NOT BE ACCEPTED.

PART A. IDENTIFICATION OF PERMIT Please write the permit number

PERMIT NUMBER CO-0045161

TYPE OF PERMIT (Check as many as apply):
Individual Permit X
Domestic Wastewater Treatment Facility Discharging to Groundwater_____
Domestic Wastewater Treatment Facility Discharging to Surface Water_____
Industrial/Mining X
Dewatering_____
Other (Please describe)_____

PART B. PERMITTEE INFORMATION (form should be signed by the legal contact listed here)

Company Name: Colowyo Coal Company L.P.
Mailing Address: P.O. Box 33695
City: Denver State: CO Zipcode: 80233-0695
Legal Contact Name: Barbara A. Walz Phone Number: 303.452.6111
Title: Senior Vice President, Policy & Compliance, Chief Compliance Officer Email: bwalz@tristategt.org

PERMIT NARRATIVE CONDITIONS REPORT FORM (continued)

PART C. FACILITY/PROJECT INFORMATION

Facility/Project Name	Colowyo Coal Mine		
Location (address)	5731 State Highway 13		
City	Meeker	County	Moffat & Rio Blanco
Local Contact Name	Chantell Johnson	Phone Number	303.254.3185
Title	Senior Environmental Planner	Email	cjohnson@tristategt.org

PART D. CONTENTS AND PURPOSE OF SUBMISSION

1. **What is the nature of the attached document?**

   Status Report ☑
   Mixing Zone Study ☐
   Tracer Study ☐
   Sediment Control Plan ☐
   Documentation of Installation of Temperature Monitoring Equipment ☐
   Salinity Study ☐
   Inflow/Infiltration Study ☐
   85 Percent Removal Waiver Report ☐
   Groundwater Study ☐
   Seepage Rate Study ☐
   Other (please describe) _____

2. **Is this document submitted to comply with a compliance schedule in your permit? YES** ☑ **NO** ☐

3. **If this is a compliance schedule document, please answer the following:**
   a. **What is the name or description of the compliance schedule? (For example, Activities to Meet Total Ammonia Final Limits)**

      Activities to Meet Final Limits (outfalls 006 (AEL only), 010 (AEL only), 021, 022, 023, 02

   b. **What is the "code" in the compliance schedule chart for this item** CS010

PERMIT NARRATIVE CONDITIONS REPORT FORM (continued)

PART E. ADDITIONAL DESCRIPTION INFORMATION INCLUDED (a summary of information attached)

Since the permit was effective on October 1, 2018, the only applicable outfall that has discharged is Outfall 010. Therefore, the water quality (specifically total recoverable iron condition) of Outfalls 006, 021, 022, 023, 024, and 025 will be evaluated after discharges commence.

Sampling at Outfall 010 has been completed on the 2x/month frequency for total recoverable iron. The sampling data from October 2018 through June 2019 is provided in an attached time-series graph (Graph 1). For the sample collected on March 27, 2019, the facility reported results in accordance with the alternate limits based on "precipitation less than or equal to the 10yr, 24hr storm event (or snowmelt of equivalent volume)" on the Discharge Monitoring Report (DMR) submitted by April 28, 2019 via NetDMR. Monitoring will continue under this permit and the sources and possible treatments of iron will be evaluated. A drainage study is also planned to evaluate the impact of any discharge from this outfall and other outfalls on downstream segments. The results from these studies will be reported to the Division in accordance with the permit compliance schedule.

- **PART E. CERTIFICATION Required Signatures**

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

"I understand that submittal of this application is for coverage under the State of Colorado Discharge Permit System until such time as the application is amended or the certification is transferred, inactivated, or expired."

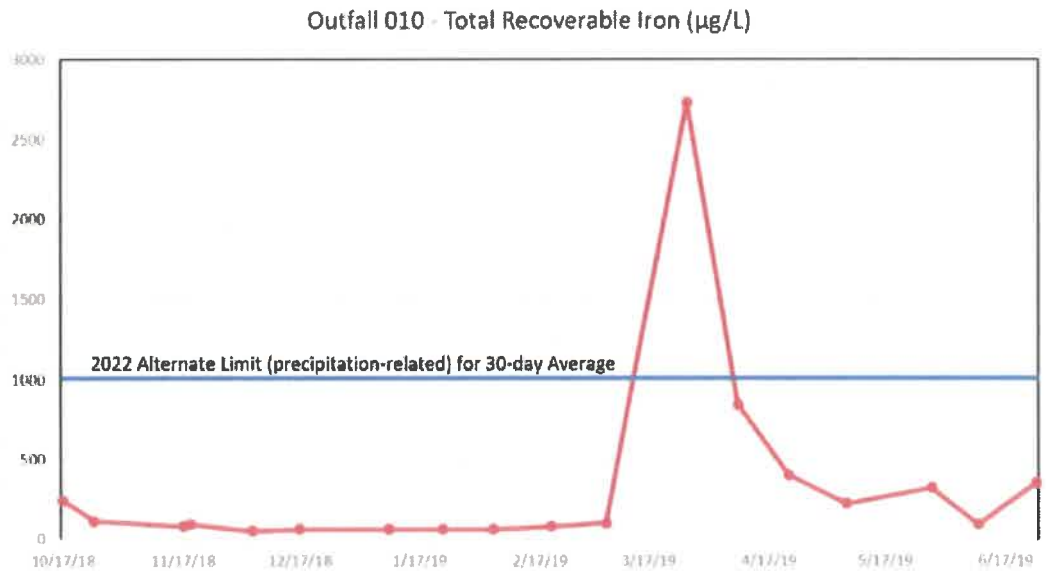
Signature of **Legally Responsible Party** — Date Signed: 8/5/19

Barbara A. Walz — Name (printed)

Title: Senior Vice President, Policy and Compliance, Chief Compliance Officer

PERMIT NARRATIVE CONDITIONS REPORT FORM
CDPS PERMIT #CO-0045161

Graph 1. Time-Series Graph of Total Recoverable Iron at Outfall 010



TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

August 28, 2018

Submitted via email *eric.mink@state.co.us*

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
60-day TIE Status Report on Q2 2019 Whole Effluent Toxicity and
Request for Waiver from TIE

Dear Mr. Mink:

As reported in July 2019, Whole Effluent Toxicity (WET) was observed for the second quarter 2019 at Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo. This letter serves as both the 60-day status report for the Toxicity Identification Evaluation (TIE) and a waiver request from future TIE requirements as the Q2 2019 Outfall 010 water quality is consistent with Q4 2018 and Q1 2019 (per the enclosed SeaCrest letter). Therefore, we anticipate the results of the TIE and Toxicity Reduction Evaluation already underway will be applicable to Q2 2019, as well. We request written approval of the waiver via email or letter.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

Enclosure

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)

File: G471-11.3(10)a-5

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

July 24, 2019

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

Ms. Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Dear Ms. Johnson and Ms. Aalbers:

SeaCrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of Colowyo Coal Company L.P. because of a WET result that required an automatic compliance response. The WET test was initially in quarter four (Q4) of 2018 and subsequently into quarter two (Q2) of 2019 suggesting toxicity to the *Ceriodaphnia dubia* test species. This document is an update of provide the status of the TIE and projected next steps in consideration of the recent additional failure of Colowyo's permitted quarterly WET test this past June.

The most recent effluent tests (initial & baseline) exhibited the same toxicity patterns as in previous TIE tiers and quarterly WET testing. Due to the lack of variability of the effluent, we conclude that under the current TIE investigations, testing can be applied to the current source of failure in the Q2 permitted WET test in 2019. A log of Colowyo's effluent details and test statistics from December, 2018 to the most recent samples, June, 2019, is provided in Appendix 1 of this update.

It is worth noting the most recent sample volume received from Colowyo for TIE testing was taken on June 10, 2019, and the Q2 WET test sample was taken on June 17, 2019. No distinct differences were observed. For this reason, it is recommended that a waiver request be made for the Q2 WET violation.

Continuing the TIE manipulations, our research on different limestone dosages and variations of R.O. treatment strengths would be useful for the next phase of refinement testing in order to uncover specific details/thresholds on toxicity removal for the Colowyo site discharge.

The initial observations made when comparing samples from December, 2018 to June, 2019 in the targeted species (*Ceriodaphnia dubia, C.dubia)* tests are as followed:

1) Statistically, the sublethal (reproduction) IC_{25} for *C. dubia* species remains between the values of 34% - 66%, and for lethal (survival), between 52% - 82%.
2) Conductivity in the effluent tests remain between 3810 - 4340 µmhos
3) pH at arrival remains around 7.8 – 8.3, and through the test remains around a pH of 7.8 – 8.5.
4) Hardness and alkalinity remain around 650 – 1000 for hardness and 830 – 1100 for alkalinity.
5) Residual chlorine and ammonia remain at low or non-concerning levels.

Our next projected phase of testing with the R.O and limestone manipulations is proposed to start in August, 2019 and should solidify findings from the TIE investigations and offer better application reference based on the previous set of TDS removal tests conducted in June, 2019. The next phase will continue to explore how different doses of ground limestone affect TDS removal, and the R.O. treatment is going to attempt to manipulate the strength of TDS removal (allow more TDS through, rather than taking out the maximum) to better establish *C. dubia* species sensitivity thresholds in which Colowyo's partnered engineering team can utilize in their TRE process.

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

Tessa Hunt-Woodland
Laboratory Manager
Enclosure(s): Appendix 1

Appendix 1: Colowyo *C. dubia* WET Summary Logs

Table 1: Colowyo *C. dubia* WET Summary Log; quarterly and TIE investigation testing comparison of the 100% effluent

Colowyo IWC: 100%	Lethality:		Reproduction:			
***Ceriodaphnia dubia* WET Summary:**	**NOEC**	**IC25**	**NOEC**	**IC25**	**Conductivity Range**	
Q4 2018	60%	65.0%	40%	47.8%	3900-4340	
Accelerated 1	60%	62.5%	20%	35.2%	4120-4230	
Accelerated 2	60%	56.0%	40%	44.4%	4130-4180	
Q1 2019	60%	61.7%	40%	34.40%	3950-4070	
TIE initial (5 reps)	80%	81.3%	60%	54.90%	3990-4240	*using bracketed dilution series
TIE tier 1baseline (5 reps)	75%	65.6%	50%	58.1%	4040-4120	*using bracketed dilution series
TIE baseline #2 (5 reps)	75%	76.6%	50%	54.8%	3810-4290	*using bracketed dilution series
TIE tier 2 baseline (5 reps)	75%	62.5%	50%	56.7%	4020-4250	*using bracketed dilution series
TIE tier 2 baseline#2 (5 reps)	50%	52.1%	50%	52.1%	4050-4180	*using bracketed dilution series
TIE Phase I confirmation baseline (10 reps)	60%	56.7%	40%	59.7%	4060-4260	*using regular permit dilution series
TIE Initial-10 rep (new sample collected)	80%	81.70%	60%	65.50%	3990-4170	*New sample volume & using regular permit dilution series
TIE Baseline (10 reps)	60%	65.60%	40%	61.80%	4010-4180	*using regular permit dilution series
Q2 2019	60%	64.3%	20%	47.5%	3980-4210*	*sample #3 =1206 from flash flooding at mine; outlier from normal discharge

Table 2: Colowyo Effluent (100%) Benchchemistry Summary Log; quarterly and TIE investigation testing comparison

Chemical analysis similarities- Test Type:	Date of analysis:	Sulfate (SO4)	Sodium (Na)	Calcium (Ca)	Potassium (k)	Magnesium (Mg)	
TIE initial (5 reps)	Mar-19	1450	788	144	19	126	*SCG
TIE tier 2 baseline#2 (5 reps)	Apr-19	1450	920	144	25	130	*SCG & TA
TIE Phase I conf. baseline (10 reps)	May-19	1600	920	97	23	130	*TA
TIE Initial-10 rep (new sample collected)	Jun-19	1500	810	140	22	120	*TA
TIE Baseline (10 reps)	Jun-19	1421	765	145	20	110	*SCG

Collection Notes:
Original sample: 2/20/19
New sample: 6/10/19

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

August 28, 2019

Submitted via email *eric.mink@state.co.us*

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
180-day TIE Report on Q1 2019 Whole Effluent Toxicity and
Commencement of Toxicity Reduction Evaluation

Dear Mr. Mink:

As reported on March 15, 2019, Whole Effluent Toxicity (WET) was observed for the first quarter 2019 at Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). This letter and enclosure comprise the 180-day submittal for the Toxicity Identification Evaluation (TIE) for this outfall. We are also commencing work on the Toxicity Reduction Evaluation (TRE). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo.

SeaCrest Group is conducting the TIE on behalf of the facility, combining the Q1 2019 and Q4 2018 TIEs. As reported in June 2019, SeaCrest completed Phase I, Tiers 1 and 2 of the TIE in accordance with EPA's 1991 *Methods for Aquatic Toxicity Identification Evaluations, Phase I Toxicity Characterization Procedures, Second Edition* (EPA/600/6-91/003) and 1992 *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I* (EPA/600/6-91/005F), and a Phase I confirmation analysis and pH gradient testing studies to investigate the pH 3 treatment results.

The enclosed SeaCrest Group report investigated Total Dissolved Solids (TDS) as the primary toxicant in response to previous work. The analyses included reverse osmosis (RO) treatment, C18 SPE column filtration treatment (used as negative control for RO treatment), and ground limestone dose treatment. The results indicated that the toxicant is not organic-based; however, additional work is required to investigate toxicity removal technologies. The additional work will be incorporated into the TRE analysis, and will be reported to the Division as appropriate.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

Enclosure

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471-11.3(10)a-5

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

August 8, 2019

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

Ms. Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Dear Ms. Johnson and Ms. Aalbers:

SeaCrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of Colowyo Coal Company L.P.. This testing is in response to a WET result that required an automatic compliance response initially in quarter four (Q4) of 2018 and continuing into quarter two (Q2) of 2019 suggesting toxicity to the *Ceriodaphnia dubia* test species. The manipulations and tests intended to characterize the potential group of toxicants responsible for the observed toxicity included a reverse osmosis (R.O.) treatment, a C18 SPE column filtration treatment (acting as a negative control for the R.O. test), and a ground limestone dose treatment. This report represents testing of Total Dissolved Solids (TDS) as the primary toxicant in response to findings from previous tiers. The TIE was performed in accordance with EPA protocols for the conduct of such investigations along with additional testing and chemical analysis.

This series of tests included an initial toxicity confirmation test followed by a baseline effluent, the R.O. treated effluent, the C18 filtered effluent, and the limestone treatment effluent. All tests were conducted under full, ten (10) replicate chronic conditions with the permitted dilution series. An aliquot from each effluent was chemically analyzed for characterization and comparison.

The initial and baseline tests exhibited the same toxicity patterns as in previous TIE tiers and quarterly WET testing. Lethal and sublethal toxicity were eliminated in the R.O. treated effluent as the TDS was substantially removed by the treatment. The limestone treated effluent eliminated all lethal toxicity, but not the sublethal toxicity. The C18 filtered effluent did not result in toxicity reduction, and the test can be used to support the conclusion that the toxicant is not organic based. It is believed that further research on limestone and extent of R.O. treatments would be useful for future testing as an option for toxicity removal.

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

Best regards,

Tessa Hunt-Woodland
Laboratory Manager
Enclosure(s): Report

RESULTS OF TDS AS PRIMARY TOXICANT TESTING OF THE CHRONIC TIE (TOXICITY IDENTIFICATION EVALUATION) CONDUCTED FOR COLOWYO COAL COMPANY L.P. ON THE COLOWYO 010A SITE

Prepared for:

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

Ms. Angela Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Prepared by:

SeaCrest Group
500 S Arthur Ave. Suite 450
Louisville, Colorado 80027-3065
(303) 661-9324

August 8, 2019

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Chronic Toxicity Test Summary

Test: 7-day static renewal using *Ceriodaphnia dubia*

Client: Colowyo Coal Company

Test Procedure/Method Followed: EPA/821/R-02-013. Method 1002.0 (2002)

Sample Description: 419331.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent	0855-0925	06-10-2019	1634	06-10-2019

	CONTROL (Initial/Treatment Testing)	100% (Initial Effluent)
Hardness (mg/L as $CaCO_3$)	96/84	680
Alkalinity (mg/L as $CaCO_3$)	57/57	841
Total residual chlorine (mg/L)	<0.01	<0.01
Total ammonia (mg/L as NH_3)	<0.03	1.19

Dilution Water:
- Moderately hard laboratory reconstituted water

Test Organism Source:
- *Ceriodaphnia dubia*
  SeaCrest Group

Reference Toxicant:
- Sodium Chloride

TDS as Primary Toxicant Testing

	Initial
Test Initiation Time	1330
Test Initiation Date	06-11-2019
Test Completion Time	1230
Test Completion Date	06-17-2019

	Baseline
Test Initiation Time	1500
Test Initiation Date	06-24-2019
Test Completion Time	1430
Test Completion Date	07-01-2019

	R.O.
Test Initiation Time	1540
Test Initiation Date	06-24-2019
Test Completion Time	1500
Test Completion Date	07-01-2019

	C18 Filtration
Test Initiation Time	1500
Test Initiation Date	06-24-2019
Test Completion Time	1400
Test Completion Date	07-01-2019

	Limestone
Test Initiation Time	1600
Test Initiation Date	06-24-2019
Test Completion Time	1530
Test Completion Date	07-01-2019

Abstract of TDS as Primary Toxicant Test Results

Test Concentrations (permitted series): Control (0%), 20%, 40%, 60%, 100%

Number of Organisms/Concentration: 10 for *Ceriodaphnia dubia*

Replicates at each Concentration: 10 for *Ceriodaphnia dubia*

Ceriodaphnia dubia	Initial	Baseline	R.O.	C18 Filtration	Limestone
Test vessel size	30ml	30ml	30ml	30ml	30ml
Exposure volume	15ml	15ml	15ml	15ml	15ml
Reproduction IC_{25}	**65.5%**	**61.8%**	**>100%**	**48.5%**	**58.5%**
Temperature Range (°C)	24.1 – 25.9	24.1 – 25.9	24.1 – 25.9	24.1 – 25.9	24.1 – 25.9
Dissolved Oxygen Range (mg/L)	6.8– 8.1	6.7 – 8.0	6.6 – 8.4	5.6 – 8.5	4.1 – 7.4
pH Range	7.7 – 8.4	7.8 – 8.5	6.8 – 8.4	7.9 – 8.4	7.7 – 8.8

INTRODUCTION

Toxicity was demonstrated to the *Ceriodaphnia dubia* test species after the Colowyo Coal Company L.P. 010A outfall effluent failed lethal and sub-lethal statistical endpoints for quarterly Whole Effluent Toxicity (WET) testing during the fourth quarter (Q4) of 2018. In accordance with generally accepted Environmental Protection Agency (EPA) and Colorado Department of Public Health and Environment (CDPHE) procedures, failure of accelerated tests demonstrates a pattern of toxicity and this triggers the need to initiate a TIE (Toxicity Identification Evaluation) to characterize the possible cause of the observed toxicity. After each manipulation of the effluent, chronic toxicity tests are run to determine the effects of the manipulation on the toxicity of the effluent. This report details the results of testing TDS as the primary toxicant group by different removal applications.

MATERIALS AND METHODS

Sample Collection

An effluent sample of 34 gallons was collected from the discharge system in June 2019. The sample was delivered chilled to the SeaCrest lab where it was held at 0-6°C.

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. 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)*.

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.

This series of tests were started on 06-11-2019 and 06-24-2019. The tests were performed according to the guidelines/procedures outlined in USEPA[3] and the Colorado Department of Public Health and Environment[4]. Manipulation tests were conducted accordingly alongside a baseline effluent test for comparison. The TIE guidelines describe suggested adjustments that the effluent should undergo and stipulate that a "baseline" test is run concurrently with all 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/effluent were used for the initial, 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.

TDS as Primary Toxicant Testing

When considering TDS as a primary toxicant, removal applications usually include ion removal, precipitation, filtering, and/or dilution. High TDS can be detected by monitoring conductivity of effluent and the use of evaporation dish TDS detection method. Historically the Colowyo effluent being tested ranges from 3460-4340 µmhos/cm in conductivity. With previous tiers ruling out toxicity groups such as major metals, oxidizable substances, non-polar organics, surfactants and volatile compounds, the remaining toxicant group in question was TDS.

TDS removal was attempted by an R.O. treatment and a limestone treatment. Effluent treated by a C18 SPE column was conducted alongside the treatments to ensure the R.O. treatment was removing more than just the non-polar organics (C18 test used as a negative control).

Initial Toxicity & Baseline Test

A new sample volume was delivered to the lab on June 10th of 2019 at the request to continue the TIE investigations; not enough of the original sample was remaining to conduct such testing. An initial toxicity test (full, 10 rep) chronic was tested to confirm persistence and pattern of toxicity in the new volume collected. A baseline test was conducted (full, 20 rep chronic) alongside treated effluent tests for comparison against original toxicity.

R.O. Test

The intention of treating effluent by a reverse osmosis (R.O.) system is to evaluate the effluent post treatment to determine the TDS removal efficiency. The treated effluent was tested by WET testing and analytical testing to ensure quantities of regularly problematic ions known to the Colowyo effluent had reduced and removed toxicity in the WET test. The R.O. treatment is a great tool for determining thresholds of TDS/ion concentrations not toxic to the testing species to aid in application options when implementing Colowyo's outfall discharge treatment.

C18 Filtration Test

The use of a C18 SPE column was used as a negative control against the TDS removal treatments in this series of testing. The C18 column is used to extract non-polar organics and confirm that the R.O. treatment removed more than non-polar organics to conclude the removal of TDS toxicity.

Limestone Test

The use of ground limestone was intended to aid in TDS removal in return for the removal of toxicity seen in the effluent WET test. We added 2.8g/gal. to each gallon of effluent, aerated each for 20mins then spun each on the stir plate for an additional hour to ensure proper dispersal. The effluent was then filtered through a glass fiber filter and the filtrate was used as the testing effluent.

Data Analysis

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

INITIAL TOXICITY TEST RESULTS

Initial Toxicity Test Results

Test results for the Initial test are summarized in Table 1 and provided on the data sheets located in Appendix 1. Survival was 20% in the 100% effluent and ranged from 80% to 100% in the remaining effluent concentrations. Control survival was 100%. The IC_{25} for survival was estimated at 81.7%.

Table 1. Summary of Initital 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	30.7	25	37		
20%	10	30.7	26	36		
40%	10	29.5	27	35		
60%	10	26.5	16	32		
80%	8	13.9	0	19		*
100%	2	5.0	0	19	*	*

Average numbers of neonates in the 100% effluent was 5.0 and ranged from 13.9 – 30.7 in the remaining effluent concentrations. Average number of neonates in the control was 30.7. The IC_{25} for reproduction was estimated at 65.5%.

BASELINE TEST RESULTS

Baseline Results

Test results for the baseline test are summarized in Table 2 and provided on the data sheets located in Appendix 1. Survival was 0% in the 100% effluent and ranged from 10% to 100% in the remaining effluent concentrations. Control survival was 100%. The IC_{25} for survival was 65.6%.

Table 2. Summary of the baseline 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	32.0	27	34		
20%	10	29.5	3	51		
40%	10	28.6	22	36		
60%	10	26.1	16	38		*
80%	1	3.2	0	27	*	*
100%	0	0.0	0	0	*	*

Average numbers of neonates was 0.0 in the 100% effluent and ranged from 3.2 – 29.5 in the remaining effluent concentrations. Average number of neonates in the control was 32.0. The IC_{25} for reproduction was 61.8%.

R.O. TEST RESULTS

R.O. Test Results

Test results for the R.O. test are summarized in Table 3 and provided on the data sheets located in Appendix 1. Survival was 100% in the 100% effluent and ranged from 90% to 100% in the remaining effluent concentrations. Control survival was 100%. The IC_{25} for survival was >100%.

Table 3. Summary of R.O. 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	29.1	0	38		
20%	10	29.1	17	35		
40%	10	34.8	29	39		
60%	10	33.8	30	39		
80%	9	29.7	16	39		
100%	10	33.8	30	36		

Average numbers of neonates was 33.8 in the 100% effluent and ranged from 29.1 – 34.8 in the remaining effluent concentrations. Average number of neonates in the control was 29.1. The IC_{25} for reproduction was >100%.

C18 FILTRATION TEST RESULTS

C18 Filtration Results

Test results for the C18 Filtration test are summarized in Table 4 and provided on the data sheets located in Appendix 1. Survival was 0% in the 100% effluent and ranged from 10% to 100% in the remaining effluent concentrations. Control survival was 100%. The IC_{25} for survival was 65.6%.

Table 4. Summary C18 Filtration 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	33.8	29	42		
20%	10	35.8	30	49		
40%	10	29.0	22	32		*
60%	10	21.7	16	29		*
80%	1	5.1	0	13	*	*
100%	0	2.4	0	7	*	*

Average numbers of neonates was 2.4 in the 100% effluent and ranged from 5.1 – 35.8 in the remaining effluent concentrations. Average number of neonates in the control was 33.8. The IC_{25} for reproduction was 48.5%.

LIMESTONE TEST RESULTS

Limestone Test Results

Test results for the Limestone test are summarized in Table 2 and provided on the data sheets located in Appendix 1. Survival was 80% in the 100% effluent and was 100% in the remaining effluent concentrations. Control survival was 100%. The IC_{25} for survival was >100%.

Table 2. Summary of Limestone 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	30.4	25	35		
20%	10	33.4	27	42		
40%	10	30.4	24	41		
60%	10	23.4	13	31		*
80%	10	19.2	7	25		*
100%	8	12.9	4	21		*

Average numbers of neonates was 12.9 in the 100% effluent and ranged from 19.2 – 33.4 in the remaining effluent concentrations. Average number of neonates in the control was 30.4. The IC_{25} for reproduction was 58.5%.

DISCUSSION

SeaCrest Group has undertaken the TIE at the request of Colowyo Coal Company L.P. and Tri-State Generation and Transmission Association, Inc. for the 010A outfall discharge. The TIE is being performed in accordance with EPA guidelines for the conduct of such investigations[7] with additional manipulation tests alongside.

An initial toxicity test with the following dilution series, 0%, 20%, 40%, 60%, 80%, and 100%, was initiated on February 21, 2019. This test confirmed the persistence of toxicity to the *C. dubia* test species resulting in a sub-lethal IC_{25} of 54.9%. The initial toxicity test conducted for this series of tests with the new sample provided resulted in a sub-lethal IC_{25} of 65.5%.

From the data collected so far, there are enough results to conclude the toxicant may not be primarily pH dependent, a metal, or an organic, but rather directs us to consider TDS/ionic imbalances as the primary toxicant present in the effluent.

An important factor in the characterization of this water is the elevated TDS levels. For the purposes of WET testing, TDS is often measured as conductivity µmhos/cm. The TDS is considered elevated when it exceeds 1,000 µmhos/cm at the LOEC of any test[9]. In Tier 1 of Phase I this was the case as the effluent ranged from 3810-4290 µmhos/cm (as seen in initial/Tier 1 baseline tests) and in Tier 2 the effluent ranged from 4020-4250 µmhos/cm (as seen in the two baseline tests). Phase I Confirmation testing effluent ranged from 4060-4260 µhmos/cm. For this series of tests conducted in June, the Colowyo effluent ranged from (3990-4180 µhmos/cm (as seen in initial/baseline tests). This suggests that TDS is a primary toxicant, secondary toxicant, or a mask to other toxicants. TDS has long been recognized as a difficult means of identifying or projecting potential toxicity in the field of aquatic toxicology[10, 11]. This is due to the complex interactions between the major ions that contribute to TDS, including, but not limited to, chloride, sodium, calcium, magnesium, potassium, bicarbonate, and sulfate.

Chemical analysis was conducted at SeaCrest Group and at TestAmerica on each effluent used in testing. Analytical results are shown in Appendix 2. The contributors to the TDS are SO_4, Na, Ca, Mg, K, and Cl (decreasing order). About one-half of the TDS appears to be due to SO_4 and Na. In addition, though less prevalent, K and HCO_3 are noted as contributing to the TDS of the effluent. Testing in this phase primarily targeted the reduction of effluent TDS by conducting a full-scale baseline effluent test alongside full-scale manipulated effluent tests under the permitted dilution series.

REFERENCES

1. **Hach Chemical Company.** 2002. *Hach Water Analysis Handbook.* Hach Chemical Company, Loveland, Colorado. 1260pp.
2. **APHA/AWWA/WEF.** 1998. *Standard Methods for the Examination of Water and Wastewater.* 20th Edition. American Public Health Association, Washington, D.C.
3. **USEPA.** 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA-821-R-02-013. 335 pp.
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6. **USEPA.** 2000. *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System Program.* EPA/833/R-00/003.
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8. **USEPA. 1992.** *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents Phase I.* EPA600/6-91-005F
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10. **Mount, D. R., Gulley, D. D., Hockett, J. R., Garrison, T. D., & Evans, J. M.** (1997). Statistical Models To Predict The Toxicity Of Major Ions To Ceriodaphnia Dubia, Daphnia Magna And Pimephales Promelas (Fathead Minnows). Environmental Toxicology and Chemistry, 16(10), 2009. doi:10.1897/1551-5028(1997)0162.3.co;2
11. **Tietge, J. E., Hockett, J. R., & Evans, J. M.** (1997). Major Ion Toxicity Of Six Produced Waters To Three Freshwater Species: Application Of Ion Toxicity Models And Tie Procedures. Environmental Toxicology and Chemistry, 16(10), 2002. doi:10.1897/1551-5028(1997)0162.3.co;2
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: Colowyo Coal Company

P. O./Project Number:

Contact: Angela Walters

Address: 5731 State Hwy 13 Meeker CO 81641

Phone # 970-824-1819 E-Mail:

Fax # Sampler: Ara / TF

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
EIC A	6/10/19	0855-0925	Grab	419331.B																34	34 Gal

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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Walters	6/10/19 16:34		06/10/19 1634				

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 419 331.B
Sample #: —
Date: 061019
Initials: NC

Samples Were:

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

2. Chilled to Ship — (Ambient) Chilled (circle one)
   Notes:

	Wet Ice	Blue Ice	(circle one)
3. Cooler Received Broken or Leaking	Y	(N)	NA
4. Sample Received Broken or Leaking	Y	(N)	NA
5. Received Within Holding Times	(Y)	N	
6. Aeration necessary	Y	(N)	NA
7. Sample Received at Temperature between 0-6° C.	Y	N	(NA)

Notes: Sampled same day

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
   eff: clear, no visible ppt

   rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	19.1	7.2	99.6	7.9	412.0				

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 *Ceriodaphnia dubia* Tests

TDS AS PRIMARY TOXICANT

WET TEST REPORT FORM – CHRONIC

INITIAL TEST

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A

Permit No.: CO0045161

Test Type: Routine ☐ TIE ☒

Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1330	06-11-2019	1230	06-17-2019

Test Results	Lethality	Reproduction
IC_{25}	81.7%	65.5%

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	70
% Survival for day 3	100	100	100	100	80	50
% Survival for day 4	100	100	100	100	80	30
% Survival for day 5	100	100	100	100	80	30
% Survival for day 6	100	100	100	100	80	20
3 Mean Brood Total	30.7	30.7	29.5	26.5	13.9	5.0

Recon Water: 96
Recon Water: 57

pH (initial/final) – Control: 8.1/8.3 100%: 7.9/8.4

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: Jacquelyn Weaver, Sarah Adler, and Daniela Thornton

Signature Jacquelyn Weaver *Date* 08/08/19

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

(initial test)

Permittee: Colo WYO Coal Co. Lab #: 419 331.B Site: ~~Bio A CC~~ OVO A

IWC %: 100 Template #: 5 Dilution Water: MH19-013 Sample Date: 061019

Age & Source: cerio 061119 1038 Test Start: 061119 1330 Test End: 061719 1230

Test Conditions: Filter for native species

		0	1	2	3	4	5	6	7	8	Total
	(C)	0	0	0	6	0	10	14			30
		0	0	0	0	6	12	13			31
		0	0	0	6	9	0	17			32
		0	0	0	6	0	12	16			34
		0	0	0	6	0	14	17			37
	0	0	0	0	6	9	0	15			30
		0	0	0	6	8	0	14			28
		0	0	0	7	9	0	16			32
		0	0	0	5	7	0	13			25
		0	0	0	6	8	0	14			28
*7.4	DO	6.9	6.8 | 7.3	7.5 | 7.1	~~8.3~~ | 6.8	7.1 | 6.9	7.0 | 6.8	6.8			STAT
	Temp	24.1	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.6 | 24.1	25.5			30.7
	pH	8.1	8.3 | 8.1	8.4 | 8.2	8.3 | 8.3	8.2 | 8.2	8.2 | 7.7	8.3			ACCP
	Cond	315	310	302	315	317	314				
	(1)	0	0	0	6	0	10	16			32
		0	0	0	5 +1	0	10	17			33
		0	0	0	5	5 -1	0	15			26
		0	0	0	6	0	12	18			36
		0	0	0	0	5	10	11			26
	20	0	0	0	6	8	0	13			27
		0	0	0	5	8	0	15			28
		0	0	0	7	12	0	15			34
		0	0	0	6	0	12	17			35
		0	0	0	6	9	0	15			30
*7.4	DO	7.0	7.0 | 7.5	7.5 | 7.1	~~8.3~~ | 6.9	7.1 | 6.9	7.1 | 6.9	6.9			
	Temp	24.4	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.6 | 24.1	25.5			
	pH	8.1	8.3 | 8.1	8.4 | 8.2	8.3 | 8.2	8.2 | 8.1	8.2 | 7.8	8.3			
	Cond	1199	1212	1157	1224	1205	1145				30.1
		0	1	2	3	4	5	6	7	8	Total
	(2)	0	0	0	7	0	11	11			29
		0	0	0	4 +1	0	11	11			27
		0	0	0	7	11	0	16			34
		0	0	0	6	0	11	14			31
		0	0	0	5	0	13	17			35
		0	0	0	5	8	0	14			27
	40	0	0	0	6	8	0	13			27
		0	0	0	7	7	0	16			30
		0	0	0	5	7	0	15			27
		0	0	0	6	8	0	14			28
*7.5	DO	7.2	7.2 | 7.7	7.6 | 7.1	~~8.3~~ | 7.0	7.2 | 6.9	7.2 | 7.1	7.0			
	Temp	24.6	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.6 | 24.1	25.5			
	pH	8.0	8.3 | 8.1	8.3 | 8.1	8.3 | 8.1	8.2 | 8.0	8.2 | 7.8	8.3			
	Cond	1864	1851	1770	1836	1814	1747				29.5
	(3)	0	0	0	7	0	10	15			32
		0	0	0	6	0	9	12			27
		0	0	0	7	7	0	11			25
		0	0	0	5	0	10	12			27
		0	0	0	4 +1	0	11	15			31
	60	0	0	0	4	5	0	13			22
		0	0	0	6	8	0	14			28
		0	0	0	4	0	0	12			16
		0	0	0	5	0	9	15			24
		0	0	0	5	8	0	15			28
*7.5	DO	7.2	7.4 | 7.9	7.6 | 7.1	~~8.3~~ | 7.1	7.2 | 7.0	7.3 | 7.2	7.1			
	Temp	24.9	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.6 | 24.1	25.5			
	pH	8.0	8.2 | 8.1	8.3 | 8.1	8.3 | 8.1	8.2 | 8.0	8.2 | 7.8	8.4			
	Cond	2690	2660	2610	2780	2760	1925				26.5

40

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0	0	1	6			7
	0	0	0	0	3	7	7			17
	0	0	0	5	7	0	7			19
	0	0	0	0 D						0 D
	0	0	0	1	0	9	9			19
	0	0	0	4	6	0	9			19
	0	0	0	3	5	0	10			18
80	0	0	0	3	9	0	7			19
	0	0	0	2	0	9	8			19
	0	0	0	2 D						2 D
7.6 DO	7.3	7.6 | 8.0	7.7 | 7.1	8.3 | 7.2	7.3 | 7.0	7.4 | 7.4	7.2			
Temp	25.1	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.4 | 24.1	25.5			
pH	7.9	8.2 | 8.0	8.2 | 8.0	8.3 | 8.0	8.2 | 7.9	8.2 | 7.8	8.4			
Cond	3380	3350	2300	3450	3480	3380				13.9
(5)	0	0	0 D							0 D
	0	0	0	0	0	5	0 D			5 D
	0	0	0	5	6	0	8			19
	0	0	0	0 D						0 D
	0	0	0	0 D						0 D
	0	0	0 D							0 D
100	0	0	0	5	D					5 D
	0	0	0	3	6	0	10			19
	0	0	0	2	D					2 D
	0	0	0 D							0 D
7.6 DO	7.4	8.0 | 8.1	7.7 | 7.1	8.3 | 7.3	7.3 | 7.0	7.5 | 7.5	7.3			
Temp	25.4	25.9 | 25.9	25.9 | 24.5	25.9 | 25.0	25.9 | 24.2	25.6 | 24.1	25.5			
pH	7.9	8.2 | 8.0	8.2 | 8.0	8.3 | 8.0	8.2 | 7.9	8.2 | 7.9	8.4			
Cond	4030	4030	3990	4170	4160	4110				5.0
Algae	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD				
YCT	1903	1903	1903	1903	1903	1903				
H_2O										
Initials	DT	SA	SW	SA	DT	SW	DT			

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	680						96		
Alkalinity	841						57		
Chlorine	<0.01						<0.01		
Ammonia	1.19						<0.03		

1. Exposure Chamber
   Total Capacity: 30 ml
   Test Solution Surface Area: _____ cm^2
   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: _____
   #2 None: _____
   #3 None: _____
   Before Use: _____ minutes @ ~100 bubbles/min)
   Before Use: _____ minutes @ ~100 bubbles/min)
   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.,):
   Control through 60% dilution: alive and mobile; 80% dilution: most are pale but mobile
   100% dilution: pale but mobile

6. Comments:

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

1	2	3	4	5	6	7	8	9	10
A3	A5	A6	A7	A8	B4	B7	B9	B10	C5

WET TEST REPORT FORM – CHRONIC

BASELINE TEST

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A
Permit No.: CO0045161

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

Test Start Time	Test Start Date	Test End Time	Test End Date
1500	06-24-2019	1430	07-01-2019

Test Results	Lethality	Reproduction
IC_{25}	65.6%	61.8%

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	80
% Survival for day 3	100	100	100	100	60	10
% Survival for day 4	100	100	100	100	20	0
% Survival for day 5	100	100	100	100	10	0
% Survival for day 6	100	100	100	100	10	0
% Survival for day 7	100	100	100	100	10	0
3 Mean Brood Total	32.0	29.5	28.6	26.1	3.2	0.0

Recon Water: 84
Recon Water: 57

pH (initial/final) – Control: 8.1/8.2 100%: 7.8/8.3

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: Jacquelyn Weaver, , Daniela Thornton, and Sarah Adler

Signature [signature] *Date* 08/08/19

SeaCrest Group
Louisville, CO

"419331Base"

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Baseline - COLOWXO TIE Lab #: 419 331 Site: ~~NBDES013~~ outfall

IWC %: 100 Template #: 5 Dilution Water: MH19-014 Sample Date: 061019

Age & Source: cerio 062419 4039 Test Start: 062419 1500 Test End: 070119 1430

Test Conditions: 7days Filter for native species

	0	1	2	3	4	5	6	7	8	Total
(C)	0	0	0	6	7	C	14	19		27
	0	0	0	6+1	0	12	13	18		32
0	0	0	0	6	8+1	0	19	17		34
	0	0	0	6	0	10	15	18		31
	0	0	0	4	13	0	17	20		34
	0	0	0	0	5	11	18	0		34
	0	0	0	6	0	10	13	16		29
	0	0	0	6	11+1	0	15	18		~~32~~ 33 EC
	0	0	0	7	0	11	14	17		32
	0	0	0	0	6	12	16	0		34
DO	7.1	7.0 | 7.2	6.8 | 7.0	7.0 | 6.8	7.1 | 7.0	6.9 | 6.8	6.7 | 6.8	6.8		STAT
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24.9 | 24.1	26.9 | 24.2	25.9		32.0
pH	8.1	8.2 | 8.1	8.0 | 8.2	8.2 | 8.2	8.1 | 8.2	7.8 | 8.2	8.0 | 8.1	8.2		ACCP
Cond	306	304	315	304	302	305	307			
(1)	0	0	0	3	0	0	0	tr 0		3
	0	0	0	5	0	12	15	16		32
	0	0	0	4	0	10	17	17		31
20	0	0	0	4	0	7	16	17		27
	0	0	0	5	16	0	18	19		33
	0	0	0	0	6	8	14	0		28
	0	0	0	5	0	11	13	11		29
	0	0	0	3 →	10	0	17	22		EC ~~29~~ 51
	0	0	0	6	0	10	15	16		31
	0	0	0	0	7	10	13	0		30
DO	7.2	7.0 | 7.4	6.9 | 7.0	7.0 | 6.9	7.1 | 7.2	6.9 | 7.0	6.7 | 6.8	6.8		
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24.9 | 24.1	26.9 | 24.2	25.9		29.5
pH	8.0	8.2 | 8.1	8.0 | 8.1	8.2 | 8.1	8.1 | 8.1	7.9 | 8.0	8.0 | 8.1	8.2		
Cond	1189	1173	1155	1173	1177	1241	1226			
	0	1	2	3	4	5	6	7	8	Total
(2)	0	0	0	0	6	0	11	16		33
	0	0	0	0	6	12	18	16		36
	0	0	0	0	0	7	8	7		22
40	0	0	0	4+1	0	9	16	17		30
	0	0	0	0	6	8	10	0		24
	0	0	0	7	10	0	16	17		33
	0	0	0	7	0	8	9	18		34
	0	0	0	4	9	3	16	19		29
	0	0	0	6	0	8	11	17		25
	0	0	0	0	6	9	15	0		30
DO	7.3	7.1 | 7.5	7.0 | 7.0	7.1 | 7.0	7.1 | 7.4	6.9 | 7.3	6.8 | 6.9	6.9		
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24.9 | 24.1	26.9 | 24.2	25.9		28.6
pH	7.9	8.2 | 8.0	8.1 | 8.0	8.3 | 8.1	8.2 | 8.0	8.0 | 7.9	8.1 | 8.1	8.2		
Cond	1840	1830	1881	1843	1844	1877	1835			
(3)	0	0	0	0	10	0	16	7		33
	0	0	0	0	1 →	10	13	14		38
	0	0	0	2	0	7	7	0		16
60	0	0	0	6	0	8	15	13		29
	0	0	0	4	9	0	14	17		27
	0	0	0	0	5	9	8	0		22
	0	0	0	0	1	7	8	0		16
	0	0	0	4	8	0	15	17		27
	0	0	0	5	0	11	12	13		28
	0	0	0	0	4	8	12 +1	0		25
DO	7.4	7.2 | 7.6	7.1 | 6.9	7.2 | 7.0	7.2 | 7.6	6.6 | 7.5	6.8 | 6.9	6.9		
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24.9 | 24.1	25.9 | 24.2	25.9		26.1
pH	7.9	8.2 | 8.0	8.1 | 8.0	8.1 | 8.0	8.2 | 7.9	8.1 | 7.9	8.2 | 8.1	8.3		
Cond	2660	2680	2750	2660	2650	2740	2680			

TRW

*Died on Day 4

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0 D						0
	0	0	0	0	0	D				5
80	0	0	0	4 D						0
	0	0	0	4	0	9	14	13		27
	0	0	0	0 D	0 D					0
	0	0	0	0 D	0 D					0
	0	0	0	0 D	0 D					0
	0	0	0	5 D	0 D					5 FE
	0	0	0	0 D						0
	0	0	0	0 D						0
DO	7.5	7.3 | 7.8	7.2 | 6.9	7.3 | 7.1	7.2 | 7.8	6.8 | 7.7	6.9 | 7.0	7.1		
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24.9 | 24.1	25.9 | 24.2	25.9		3.2
pH	7.9	8.2 | 8.0	8.2 | 8.0	8.5 | 8.0	8.3 | 7.9	8.3 | 7.9	8.3 | 8.0	8.3		
Cond	3350	3370	3420	3360	3370	3460	3390			
(5)	0	0	0	0 D						0
	0	0	0	0 D						0
100	0	0	0	0 D						0
	0	0	0 D							0
	0	0	0	0 D						0
	0	0	0	0 D	0 D					0
	0	0	0 D							0
	0	0	0	0 D						0
	0	0	0	0 D						0
	0	0	0	0 D						0
DO	7.6	7.4 | 8.0	7.3 | 6.9	7.3 | 7.2	7.2 | 8.0	6.8 | 7.1	7.0			
Temp	24.1	24.9 | 25.9	25.2 | 24.3	25.6 | 25.9	25.6 | 24.1	24	24.2			0.0
pH	7.8	8.2 | 7.9	8.2 | 8.0	8.5 | 8.0	8.3 | 7.9	7.9	8.0			
Cond	4020	4040	4180	4030	4010	4180	4040			
Algae	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD	ABS/ARD			
YCT	1903	1903	1903	1903	1903	1903	1903			
H_2O	—	—	—	—	—	—	—			
Initials	JT	SA	[illegible]	SA	SA	JT	JT	[illegible]		

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	711						84		
Alkalinity	833						57		
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.,):
   The adult in dilution 4 was paler than in the other dilutions. The adults in the other dilutions were active and mobile.
6. Comments:

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

1	2	3	4	5	6	7	8	9	10
A2	A4	A5	A6	A9	A10	B1	B4	B6	B10

WET TEST REPORT FORM – CHRONIC

R.O. TEST

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A

Permit No.: CO0045161

Test Type: Routine ☐ TIE ☒

Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1540	06-24-2019	1500	07-01-2019

Test Results	Lethality	Reproduction
IC_{25}	>100%	>100%

Measurements	Control (0%)	20%	40%	60%	80%	100%
% 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	100
% Survival for day 4	100	100	100	100	100	100
% Survival for day 5	100	100	100	100	100	100
% Survival for day 6	100	100	100	100	90	100
% Survival for day 7	100	100	100	100	90	100
3 Mean Brood Total	29.1	29.1	34.8	33.8	29.7	33.8

Recon Water: 84
Recon Water: 57

pH (initial/final) – Control: 8.0/8.2 100%: 6.8/8.2

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: Jacquelyn Weaver, Daniela Thornton, Taylor Couillard-Rodak, and Sarah Adler

Signature [signature] *Date* 08/08/19

SeaCrest Group
Louisville, CO

"419331 RO"

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: R.O. - Calumet TIE Lab #: 419 331 Site: ~~Anderson~~ CC Anderson outfall
IWC %: 100 Template #: 5 Dilution Water: MH19-014 Sample Date: 061019
Age & Source: cerio 062419 4039 Test Start: 062419 1540 Test End: 070119 1500
Test Conditions: 7 days

	0	1		2		3		4		5		6		7	8	Total
(C)	0	0		0		7		0		11		20		15		38
	0	0		0		5		11		0		17		22		33
0	0	0		0		6		0		10		18		14		34
	0	0		0		5		10		0		17		18		~~32~~
	0	0		0		0		7		13		15		0		35
	0	0		0		0		6		10		17		0		33
	0	0		0		0		6		12		14		0		32
	0	0		0		0		6		11		10		0		27
	0	0		0		0		6		9		16		0		27
	0	0		0		0		0		0		0		0		0
DO	7.2	7.0	6.9	7.2	7.0	6.8	6.8	7.0	6.9	6.7	6.8	7.1	6.9	6.6		STAT 29.1
Temp	24.1	24.7	24.4	25.5	25.9	25.4	25.8	25.6	24.3	25.7	25.8	25.5	24.1	25.5		
pH	8.0	8.1	8.2	8.0	8.0	8.0	8.0	8.0	8.0	8.3	8.2	8.2	8.3	8.2		ACCP
Cond	306	302		314		305		304		310		304				
(1)	0	0		0		4		8		0		13		16		25
	0	0		0		4		10		0		17		20		31
	0	0		0		5		0		14		12		17		31
20	0	0		0		6		10		0		19		20		35
	0	0		0		0		5		8		13		0		26
	0	0		0		0		7		10		0		12		29
	0	0		0		0		5		14		16		0		35
	0	0		0		0		6		12		14		0		~~32~~
	0	0		0		0		6		13		11		0		30
	0	0		0		0		0		6		0		11		17
DO	7.2	7.0	7.0	7.2	7.1	6.8	6.9	7.0	6.9	6.7	7.2	7.0	7.0	6.6		29.1
Temp	24.1	24.7	24.4	25.5	25.9	25.4	25.8	25.6	24.4	25.7	25.8	25.5	24.1	25.5		
pH	7.5	8.1	7.6	8.0	7.7	8.0	7.6	8.0	7.9	8.3	7.9	8.2	7.9	8.2		
Cond	306	306		316		306		305		303		302				
	0	1		2		3		4		5		6		7	8	Total
(2)	0	0		0		8		0		13		17		18		38
	0	0		0		4		9+1		0		15		15		29
	0	0		0		7		0		12		17		19		36
40	0	0		0		6		9		0		17		16		32
	0	0		0		0		7		14		14		0		35
	0	0		0		0		6		10		19		0		35
	0	0		0		0		6		12		16		0		34
	0	0		0		0		6		15		18		0		39
	0	0		0		0		8		8		17		14		33
	0	0		0		0		7		12		18		0		37
DO	7.3	7.1	7.1	7.3	7.2	6.8	7.1	6.9	6.9	6.8	7.6	6.9	7.2	6.7		34.8
Temp	24.1	24.7	24.4	25.5	25.9	25.4	25.8	25.6	24.5	25.7	25.8	25.5	24.1	25.5		
pH	7.2	8.1	7.4	8.0	7.4	8.0	7.4	8.0	7.4	8.3	7.6	8.2	7.5	8.2		
Cond	306	307		316		306		306		295		293				
(3)	0	0		0		7		8		0		22		22		37
	0	0		0		7		8		0		15		19		30
60	0	0		0		5		0		13		20		18		38
	0	0		0		6		9		0		21		20		36
	0	0		0		0		6		15		18		0		39
	0	0		0		0		6		14		12		0		32
	0	0		0		0		6		12		17		0		35
	0	0		0		0		6		11		13		0		30
	0	0		0		0		6		12		13		0		31
	0	0		0		0		4		9		17		0		30
DO	7.3	7.2	7.2	7.3	7.4	6.9	7.3	6.9	7.0	6.8	7.8	6.8	7.4	6.7		33.8
Temp	24.1	24.7	24.4	25.5	25.9	25.4	25.8	25.6	24.6	25.7	25.8	25.5	24.1	25.5		
pH	7.1	8.0	7.2	8.0	7.3	7.9	7.2	7.9	7.2	8.4	7.5	8.2	7.4	8.2		
Cond	304	305		315		307		306		288		284				

TRW

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	6	11	0	20	20		37
	0	0	0	5	7	0	18	18		30
	0	0	0	6	0	11	20	17		37
	0	0	0	6	9	0	1 D			16
	0	0	0	0	6	10	10	0		26
	0	0	0	0	5	10	8	0		23
	0	0	0	0	8	13	10	0		31
	0	0	0	0	5	8	16	0		29
	0	0	0	0	5	14	17	14		39
	0	0	0	0	6	10	13	0		29
DO	7.4	7.3 | 7.3	7.4 | 7.6	6.9 | 7.4	6.8 | 7.0	6.9 | 8.0	6.7 | 7.6	6.8 |		29.7
Temp	24.1	24.7 | 24.4	25.5 | 25.9	25.4 | 25.8	25.6 | 24.7	25.7 | 25.8	25.5 | 24.1	25.5 |		
pH	6.9	8.0 | 7.1	8.0 | 7.2	7.9 | 7.1	7.9 | 7.1	8.4 | 7.4	8.2 | 7.3	8.2 |		
Cond	303	304	316	306	305	280	274			
(5)	0	0	0	6	7	8	19	22		32
	0	0	0	6	6	0	18	20		30
	0	0	0	6	0	10	19	20		35
	0	0	0	7	10	0	19	21		36
	0	0	0	0	6	13	17	0		36
	0	0	0	0	5	12	15	0		32
	0	0	0	0	7	11	12	0		35
	0	0	0	0	8	10	16	0		34
	0	0	0	0	7	12	13	0		~~22~~ 32
	0	0	0	0	7	11	18	18		36
DO	7.5	7.3 | 7.4	7.4 | 7.7	6.9 | 7.5	6.8 | 7.0	6.4 | 8.4	6.6 | 7.7	6.8 |		33.8
Temp	24.1	24.7 | 24.4	25.5 | 25.9	25.4 | 25.8	25.6 | 24.8	25.7 | 25.8	25.5 | 24.1	25.5 |		
pH	6.8	8.0 | 7.0	8.0 | 7.0	7.9 | 7.1	7.9 | 7.1	8.4 | 7.3	8.2 | 7.3	8.2 |		
Cond	303	304	316	307	305	271	266			
Algae	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO			
YCT	1903	1903	1903	1903	1903	1903	1903			
H_2O	—	—	—	—	—	—	—			
Initials	DT	DW	SA	SA	TR	SA	DT	DT		

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	53 72	post treatment					84		
Alkalinity							57		
Chlorine							<0.01		
Ammonia							<0.173		

1. Exposure Chamber
   - Total Capacity: 30 ml
   - Test Solution Surface Area: _____ cm^2
   - 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,): alive and mobile

6. Comments: pre analysis before treatment: pH: 7.3, Cond: 3880, D.O: 7.9
post analysis of treated effluent (permeate): pH: 6.3, Cond: 303, D.O = 7.9
each gallon of effluent ran through system for 6-15 mins (4 gallons used)

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

1	2	3	4	5	6	7	8	9	10
A6	A9	B6	C3	C4	C5	C6	D4	D5	D10

WET TEST REPORT FORM – CHRONIC

C18 FILTRATION TEST

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A

Permit No.: CO0045161

Test Type: Routine ☐ TIE ☒

Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1500	06-24-2019	1400	07-01-2019

Test Results	Lethality	Reproduction
IC_{25}	65.6%	48.5%

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	90
% Survival for day 3	100	100	100	100	70	60
% Survival for day 4	100	100	100	100	50	40
% Survival for day 5	100	100	100	100	20	20
% Survival for day 6	100	100	100	100	20	10
% Survival for day 7	100	100	100	100	10	0
3 Mean Brood Total	33.8	35.3	29.0	21.7	5.1	2.4

Recon Water: 84
Recon Water: 57

pH (initial/final) – Control: 8.1/8.2 100%: 8.4/8.0

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: Jacquelyn Weaver, Daniela Thornton, and Sarah Adler

Signature [signature] *Date* 08/07/19

SeaCrest Group
Louisville, CO

11 419331 c18

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: CX Filtered-Colorado TIE Lab #: 419 331 Site: ~~NPES~~ 010A outfall
IWC %: 100 Template #: 5 Dilution Water: MH19-014 Sample Date: 062619
Age & Source: cerio 062419 5039 Test Start: 062419 1500 Test End: 070119 1400
Test Conditions: 7 days

	0	1	2	3	4	5	6	7	8	Total
(C) 0	0	0	0	5	12	0	12	19		29
	0	0	0	6	12	0	16	22		34
	0	0	0	0	6	10	13	19		29
	0	0	0	5	10	0	17	18		32
	0	0	0	6	12	0	19	ee ~~0~~ 23		37
	0	0	0	6	11	0	16	18		33
	0	0	0	6	12	0	14	ee ~~0~~ 22		37
	0	0	0	0	6	11	14	ee ~~0~~ 17		31
	0	0	0	0	0	10	10	ee ~~0~~ 14		34
	0	0	0	0	0	12	16	ee ~~0~~ 14		42
DO	7.0	7.0 / 7.3	6.9 / 6.9	6.4 / 6.9	6.9 / 6.8	7.0 / 6.8	6.6 / 6.8	6.6		STAT 33.8
Temp	24.1	25.4 / 24.1	25.1 / 25.9	25.9 / 25.8	25.8 / 25.8	25.9 / 25.9	24.8 / 24.2	25.5		
pH	8.1	8.1 / 8.1	7.9 / 8.0	7.9 / 8.1	8.0 / 8.1	8.2 / 8.0	8.0 / 8.2	8.2		ACCP
Cond	307	306	313	306	304	306	306			
(1) 20	0	0	0	0	9	0	14	16		39
	0	0	0	6	13	0	18	20		37
	0	0	0	0	6	12	14	ee ~~18~~ 6		32
	0	0	0	4	10	0	18	20		32
	0	0	0	6	11	0	17	ee ~~0~~ 24		34
	0	0	0	2	→ 9	0	17	ee ~~12~~ 21		49
	0	0	0	8	12	0	18	ee ~~0~~ 18		38
	0	0	0	0	6	12	13	ee ~~0~~ 13		31
	0	0	0	6	0	10	14	8		30
	0	0	0	0	5	12	14	11		31
DO	6.7	7.1 / 7.3	6.9 / 7.0	6.7 / 6.9	6.8 / 6.9	7.0 / 7.1	6.4 / 6.9	6.6		
Temp	24.1	25.4 / 24.1	25.1 / 25.9	25.9 / 25.8	25.8 / 25.8	25.9 / 25.9	24.8 / 24.2	25.5		35.3
pH	8.4	8.1 / 8.4	8.0 / 8.3	8.0 / 8.64	8.1 / 8.2	8.2 / 8.0	8.0 / 8.2	8.2		
Cond	1102	1120	1192	1135	1151	1200	1182			
	0	1	2	3	4	5	6	7	8	Total
(2) 40	0	0	0	7	10	0	15	18		32
	0	0	0	5	11	0	16	15		32
	0	0	0	0	6	9	14	ee ~~19~~ 12		29
	0	0	0	5	8	0	16	16		29
	0	0	0	4	0	12	15 +1	ee ~~0~~ 16		32
	0	0	0	6	11	0	12	10		29
	0	0	0	7	10	0	13	ee ~~0~~ 15		30
	0	0	0	0	6	11	12	ee ~~0~~ 14		29
	0	0	0	5	0	EE ~~8~~ 8	9	14		22
	0	0	0	0	5	9	12	10		26
DO	6.4	7.1 / 7.4	6.9 / 7.1	6.8 / 7.0	6.7 / 7.0	7.0 / 7.5	6.3 / 7.1	6.7		
Temp	24.1	25.4 / 24.1	25.1 / 25.9	25.9 / 25.8	25.8 / 25.8	25.9 / 25.9	24.8 / 24.2	25.5		29.0
pH	8.4	8.2 / 8.4	8.1 / 8.3	8.1 / 8.1	8.2 / 8.2	8.2 / 8.0	8.1 / 8.1	8.3		
Cond	1800	1811	1862	1815	1841	1877	1853			
(3) 60	0	0	0	1	→ 7	0	6	ee ~~22~~ 7		21
	0	0	0	0	4	0	6	ee ~~19~~ 10		20
	0	0	0	0	6	5	9	ee ~~18~~ 7		20
	0	0	0	2	0	7	7	ee ~~20~~ 10		16
	0	0	0	2	0	8	6	ee ~~0~~ 12		16
	0	0	0	0	4	0	6 ~~14~~ ee	ee ~~0~~ 17		27
	0	0	0	6	8	0	9	ee ~~0~~ 15		23
	0	0	0	0	5	9	15	0		29
	0	0	0	4	0	8	11	ee ~~0~~ 8		23
	0	0	0	0	3	10	9	10		22
DO	6.1	7.2 / 7.4	7.0 / 7.1	6.9 / 7.1	6.6 / 7.0	7.0 / 7.8	6.2 / 7.2	6.7		
Temp	24.1	25.4 / 24.1	25.1 / 25.9	25.9 / 25.8	25.8 / 25.8	25.9 / 25.9	24.8 / 24.2	25.5		21.7
pH	8.4	8.2 / 8.3	8.1 / 8.3	8.2 / 8.2	8.2 / 8.1	8.2 / 8.0	8.2 / 8.1	8.4		
Cond	2640	2660	2750	2650	2630	2750	2710			

TLW

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0 D						0
	0	0	0	0	0	3 D				3
	0	0	0	0	2	5	0	6		13
	0	0	0	2	0 D					2
	0	0	0	2	8	6	0	0 D		8
	0	0	0	4	8 D					12
	0	0	0	2 D						2
	0	0	0	0	0	0 D				0
	0	0	0	4	0	7 D				11
	0	0	0	0 D						0
DO	5.9	7.3 | 7.5	7.0 | 7.2	7.0 | 7.2	6.5 | 7.1	7.0 | 8.2	6.1 | 7.3	6.8		
Temp	24.1	25.4 | 24.1	25.1 | 25.9	25.9 | 25.8	25.8 | 25.8	25.9 | 25.9	24.8 | 24.2	25.5		
pH	8.4	8.3 | 8.3	8.2 | 8.3	8.3 | 8.2	8.3 | 8.1	8.2 | 8.0	8.3 | 8.1	8.5		5.1
Cond	3340	3310	3460	3350	3340	3460	3360			
(5)	0	0	0 D							0
	0	0	0	0	0	4 D				4
	0	0	0	0 D						0
	0	0	0	4	0	0 D				4
	0	0	0	0 D						0
	0	0	0	0 D						0
	0	0	0	3	0 D					3
	0	0	0	0	2	4	D			6
	0	0	0	0	0 D					0
	0	0	0	0	2	5	0	0 D		7
DO	5.6	7.4 | 7.5	7.0 | 7.3	7.1 | 7.2	6.4 | 7.2	7.0 | 8.5	5.9 | 7.4	6.8 | 6.7		
Temp	24.1	25.4 | 24.1	25.1 | 25.9	25.9 | 25.8	25.8 | 25.8	25.9 | 25.9	24.8 | 24.2	25.5 | 25.7		
pH	8.4	8.3 | 8.3	8.3 | 8.2	8.4 | 8.2	8.4 | 8.1	8.2 | 8.0	8.4 | 8.0	8.2 | 8.0		2.4
Cond	7990	4040	4180	4020	4020	4150	4050			
Algae	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO			
YCT	1903	1903	1903	1903	1903	1903	1903			
H_2O	—	—	—	—	—	—	—			
Initials	SW	JT	SA	SW	SA	SA	JT	JT		

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	1090						84		
Alkalinity	894						57		
Chlorine							<0.01		
Ammonia							<0.03		

1. Exposure Chamber
   - Total Capacity: 30 ml
   - Test Solution Surface Area: _____ cm^2
   - 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.,): alive and mobile

6. Comments: No pH/cond change after glass fiber filter (D.O. from 7.3 → 5.0). Pre ABS/ARO = pH = 7.9, cond 4160, post = pH = 8.4, cond: 3990, D.O. = 5.1 e)

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

1	2	3	4	5	6	7	8	9	10
C8	C10	D3	D7	D9	D10	E1	E3	E4	E5

WET TEST REPORT FORM – CHRONIC

LIMESTONE TEST

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A

Permit No.: CO0045161

Test Type: Routine ☐ TIE ☒

Test Species: *Ceriodaphnia dubia* **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1600	06-24-2019	1530	07-01-2019

Test Results	Lethality	Reproduction
IC_{25}	>100%	58.5%

Measurements	Control (0%)	20%	40%	60%	80%	100%
% 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	100
% Survival for day 4	100	100	100	100	100	100
% Survival for day 5	100	100	100	100	100	80
% Survival for day 6	100	100	100	100	100	80
% Survival for day 7	100	100	100	100	100	80
3 Mean Brood Total	30.4	33.4	30.4	23.4	19.2	12.9

Recon Water: 84
Recon Water: 57

pH (initial/final) – Control: 8.1/8.1 100%: 8.7/8.7

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: Jacquelyn Weaver, Daniela Thornton, and Sarah Adler

Signature [signature] *Date* 08/08/19

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Lime - Arkansas Inc Lab #: 419 331 Site: ~~TP26~~ 013A outfall
IWC %: 100 Template #: 5 Dilution Water: MHW-CL4 Sample Date: 06/24/19
Age & Source: cerio 062419 5039 Test Start: 062419 1600 Test End: 070119 1530
Test Conditions: 7 days 2.89 $NaHCO_3$ per gallon, 20min aerate, 1hr spin.

	0	1	2	3	4	5	6	7	8	Total
(C)	0	0	0	6	11	0	15	19		32
	0	0	0	0	6	12	16	0		34
0	0	0	0	0	7	12	16	0		35
	0	0	0	0	7	12	13 +1	0		33
	0	0	0	0	6	11	14	0		31
	0	0	0	4	0	10	12	14		26
	0	0	0	0	6	10	12	14		28
	0	0	0	5	0	10	16	16		31
	0	0	0	4	8	0	13	18		25
	0	0	0	0	7	8	13 +1	4.8 0		29
DO	7.0	7.1 | 7.0	6.8 | 7.0	6.8 | 6.9	6.9 | 7.0	6.9 | 6.8	6.6 | 6.8	8.1 EG		STAT 30.4
Temp	25.0	25.6 | 24.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1		
pH	8.1	8.0 | 8.1	8.0 | 8.0	8.0 | 8.1	8.2 | 7.7	8.2 | 8.2	8.1 | 7.9	8.1		ACCP
Cond	308	307	316	305	305	313	310			
(1)	0	0	0	0	12	0	14	16		42
	0	0	0	0	6	11	16	0		33
	0	0	0	0	6	12	16 +1	0		35
20	0	0	0	0	7	13	14	0		34
	0	0	0	0	7	11	15	0		33
	0	0	0	0	8	13	17	0		38
	0	0	0	0	6	7	15	0		28
	0	0	0	3	0	12	16	15		31
	0	0	0	5	10	0	12	16		27
	0	0	0	0	6	13	13 +1	0		33
DO	6.5	7.1 | 7.1	6.8 | 7.0	6.8 | 6.9	6.9 | 6.9	6.6 | 6.8	6.6 | 6.9	6.8		33.4
Temp	25.0	25.6 | 24.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1		
pH	8.3	8.1 | 8.4	8.1 | 8.04	8.1 | 8.5	8.3 | 8.2	8.3 | 8.6	8.2 | 8.2	8.2		
Cond	1093	1132	1052	1103	1145	1177	1146			
	0	1	2	3	4	5	6	7	8	Total
(2)	0	0	0	7	12	0	13	19		32
	0	0	0	0	5	9	12	0		26
40	0	0	0	0	4	11	13	0		28
	0	0	0	0	6	12	13	0		31
	0	0	0	0	6	10	11	0		27
	0	0	0	0	7	11	13	0		31
	0	0	0	0	7	10	9	0		26
	0	0	0	0	1 →	11	16	13		41
	0	0	0	0	10	0	13	15		38
	0	0	0	0	4	10	10	13		24
DO	6.0	7.2 | 7.2	6.8 | 6.9	6.8 | 6.9	6.9 | 6.8	6.3 | 6.9	6.5 | 6.9	6.8		30.4
Temp	25.0	25.6 | 24.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1		
pH	8.3	8.3 | 8.4	8.2 | 8.4	8.3 | 8.5	8.5 | 8.2	8.5 | 8.6	8.3 | 8.3	8.3		
Cond	1773	1791	1816	1777	1773	1830	1825			
(3)	0	0	0	4	10	0	13	16		27
	0	0	0	6	0	5	8	0		13
	0	0	0	0	6	10	9	0		25
80	0	0	0	0	5	12	11	0		28
	0	0	0	0	3	8	10	0		21
	0	0	0	0	6	12	13	0		31
	0	0	0	0	6	9	6	0		21
	0	0	0	0	0	7	14	0		21
	0	0	0	4	0	8	10	12		22
	0	0	0	0	6	8	11	0		25
DO	5.3	7.2 | 7.2	6.7 | 6.9	6.7 | 6.8	7.0 | 6.7	6.0 | 6.9	6.4 | 7.0	6.9		23.4
Temp	25.0	25.6 | 24.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1		
pH	8.3	8.4 | 8.4	8.4 | 8.4	8.4 | 8.5	8.5 | 8.2	8.6 | 8.6	8.4 | 8.3	8.5		
Cond	2550	2570	2640	2580	2540	2630	2620			

TUR

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0	0	4	3	0		7
	0	0	0	0	5	8	6	0		19
	0	0	0	0	4	10	10 +1	0		25
	0	0	0	0	5	8	10	0		23
	0	0	0	0	4	6	11	0		21
	0	0	0	0	6	9	9	0		24
	0	0	0	0	6	6	9	0		21
	0	0	0	0	2	6	10	0		18
	0	0	0	3	0	7	3 →	7		~~13~~ 20
	0	0	0	0	1	5	7 +1	0		14
DO	4.7	7.3 | 7.3	6.7 | 6.8	6.7 | 6.8	7.0 | 6.6	5.7 | 7.0	6.4 | 7.0	6.9 |		
Temp	25.0	25.6 | 24.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1 |		19.2
pH	8.3	8.5 | 8.4	8.5 | 8.4	8.6 | 8.5	8.7 | 8.2	8.7 | 8.6	8.5 | 8.3	8.6 |		
Cond	3210	3230	3330	3210	3240	3320	3270			
(5)	0	0	0	0	0	6 D				6 D
	0	0	0	0	4	7	~~2~~ 7 +1	0		21
	0	0	0	0	1	4	5	0		10
	0	0	0	0	4	7	7	0		18
	0	0	0	0	4	0 D				4 D
	0	0	0	0	4	7	0	7		18
	0	0	0	0	3	4	8	0		15
	0	0	0	0	3	~~2~~ 6	0	0		9
	0	0	0	0	0	6	4	0		10
	0	0	0	0	3	7	8	0		18
DO	4.1	7.3 | 7.4	6.7 | 6.8	6.7 | 6.8	7.0 | 6.5	5.5 | 7.0	6.3 | 7.1	6.9 |		
Temp	25.0	25.6 | 25.1	25.3 | 24.5	25.5 | 24.4	25.6 | 25.7	24.8 | 24.1	25.9 | 24.2	25.1 |		12.9
pH	~~8.7~~ 8.3	8.6 | 8.4	8.6 | 8.4	8.7 | 8.5	8.8 | 8.2	8.8 | 8.6	8.7 | 8.3	8.7 |		
Cond	3870	3880	4020	3920	3900	3990	3940			
Algae	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO			
YCT	1903	1903	1903	1903	1903	1903	1903			
H_2O	—	—	—	—	—	—	—			
Initials	DW	DT	DW	DW	SA	DT	DT	DW		
	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3	
Hardness	~~558~~ 773						84			
Alkalinity							57			
Chlorine							<0.01			
Ammonia							<0.05			

1. Exposure Chamber
   - Total Capacity: 30 ml
   - Test Solution Volume: 15 ml
   - Test Solution Surface Area: _____ cm^2
   - 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.,): Half of the adults in dilution 4 were smaller than those in dilutions C-3. Adultis in dilution 5 were slightly smaller as well. All were active and mobile.
6. Comments: Pre treatment = pH: 7.7, Cond: 3890, D.O. 7.69 2.5g/gal added (HCO3) aerated 20 mins, magnetic stir plate 1hr (each gallon)
   post treatment = pH: 8.2, Cond: 3870, D.O. 6.1.0
   pre H/A = 711/833
   post H/A = 558/773

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

1	2	3	4	5	6	7	8	9	10
A2	A4	A6	A8	B6	B7	B8	C1	C3	C4

Appendix 2-Chemical Analysis

Table A: Initial effluent analysis as determined by SeaCrest Group (SCG) and Test America (TA)

Colowyo Initial Eff. Analysis- Sample 419331.B, June 2019		
Analyte	SeaCrest Concentration (mg/L)	Test America Concentration (mg/L)
Ca	148.32	140
Cl-	30	30
Cu	0.0003	0.0012
Fe	0.02	0.054
K	19.47	22
Mg	116.02	120
Mn	0.205	0.21
Na	809.68	810
Se	ND	0.00057
$SO_4(2-)$	1473.3	1500
Sr	NA	2.8
Zn	ND	0.0052
Alkalinity	841	NA

NA-not tested at SCG/TA

ND- no detection

Initial analytical conclusions:

The effluent discharging from outfall 010A continues to be high in the following analytes/compounds, which may be contributing to the toxicity we see when conducting WET tests: calcium, magnesium, sodium, sulfate, and high TDS concentration (please see relative effluent conductivity values recorded on test benchsheets).

Table B: Analysis of treatment effluents compared to baseline effluent; each analyzed by SCG & TA

Colowyo Treatment comparison to Baseline Eff. TIE Analytical-New Sample June 2019

	Baseline		R.O.		Concentrate (R.O.)		C18 Filtration		Limestone	
Analyte	SCG conc. (mg/L)	TA conc. (mg/L)	SCG conc. (mg/L)	TA conc. (mg/L)	SCG conc. (mg/L)	TA conc. (mg/L)	SCG conc. (mg/L)	TA conc. (mg/L)	SCG conc. (mg/L)	TA conc. (mg/L)
Ca	145	110	4	3	245	200	144	110	58	44
Cl-	34	24	17	3.6	238	210	32	23	33	24
Cu	0.0002	ND	ND	ND	0.0003	ND	0.0009	ND	0.00011	ND
Fe	0.025	0.58	0.017	ND	0.022	0.039	0.016	0.095	0.019	0.065
K	20	23	0.944	1.5	33	41	20	23	20	24
Mg	110	110	0.975	2.9	182	200	236	110	112	110
Mn	0.0534	0.057	ND	0.0011	0.056	0.058	0.0334	0.032	ND	0.00052
Na	765	820	43	43	1399	1500	787	830	777	830
Se	ND	0.0019	ND	0.0011	ND	0.0021	ND	0.0018	ND	0.0017
$SO_4^{(2-)}$	1421	1400	40	42	2517	2500	1406	1400	1419	1400
Sr	NA	2.7	NA	0.072	NA	4.7	NA	2.7	NA	2.1
Zn	ND	0.0031	ND	0.0041	0.0068	0.0098	0.00003	0.0051	0.0023	0.0081
Hardness	711	NA	53	NA	NA	NA	690	NA	558	NA
Alkalinity	833	NA	72	NA	1640	NA	894	NA	773	NA
Alkalinity as HCO3	898	NA	79	NA	NA	NA	864	NA	633	NA

NA-not tested at SCG/TA
ND-no detection

Analytical comparison conclusion:

When comparing the analysis of the effluent from each treatment to each other and to the baseline analysis, the R.O. treatment removed the majority of all TDS make-up, significantly reducing major items of concern such as SO_4, Ca, and Na, as well as reducing the hardness and alkalinity significantly. The concentrate of the R.O. treated effluent was analyzed as well for conclusive evaluations; the analytes appear to be about double the original analysis values as expected (permeate:concentrate was about a 50:50 yield). The C18 SPE column filtered effluent analysis appeared to be unchanged as expected. The limestone treatment effluent reduced the level of Ca and HCO_3. The other anions appear unaffected.

Appendix 3 – QA/QC and Reference Toxicant Test Chart

Quality Assurance Check List – Chronic Whole Effluent Toxicity Test

Client: Colowyo Coal Company L.P. **SeaCrest Sample No.:** 419331.B

Species Tested: *Ceriodaphnia dubia*

Start Date of Initital Test & Treatment Tests

06-11-2019 & 06-24-2019

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

*Samples received at 19.1 °C same day as sampling event.

Signature [signature] *Date* 08/08/19
Position Laboratory Manager

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

METHOD QC

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	7/3/2019	104.00%	104.47%	0.84%	± 5.00%
2320 B	Alkalinity - Total	7/10/2019	104.00%	103.40%	4.92%	± 5.00%
2320 B	Alkalinity - Total	7/17/2019	104.80%	98.17%	-1.71%	± 5.00%
2320 B	Alkalinity - Total	7/23/2019	104.80%	98.78%	2.64%	± 5.00%
4500 NH_3 D	Ammonia	7/3/2019	104.40%	103.60%	-2.41%	± 10.00%
4500 NH_3 D	Ammonia	7/11/2019	104.80%	104.94%	2.78%	± 10.00%
4500 NH_3 D	Ammonia	7/15/2019	104.00%	104.00%	2.21%	± 10.00%
4501 NH_3 D	Ammonia	7/24/2019	97.40%	104.70%	0.00%	± 10.00%
4500 Cl D	Chlorine	7/8/2019	103.13%	100.00%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	7/2/2019	101.75%	97.72%	0.00%	± 5.00%
2340 B	Hardness - Total	7/10/2019	104.00%	104.00%	1.25%	± 5.00%
2340 B	Hardness - Total	7/17/2019	98.00%	101.00%	0.58%	± 5.00%
2340 B	Hardness - Total	7/30/2019	96.49%	100.30%	1.30%	± 5.00%

		Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	7/2/2019	N/A	98.55%	98.55%	± 5.00%
4500 O	DO - Winkler	7/10/2019	N/A	98.57%	100.00%	± 5.00%
4500 O	DO - Winkler	7/16/2019	N/A	98.57%	100.00%	± 5.00%
4500 O	DO - Winkler	7/24/2019	N/A	98.57%	100.00%	± 5.00%

		Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	7/18/2019	99.99988%	2.00%	106.50%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	7/18/2019	99.99999%	0.00%	105.50%	±20%, ± 15%

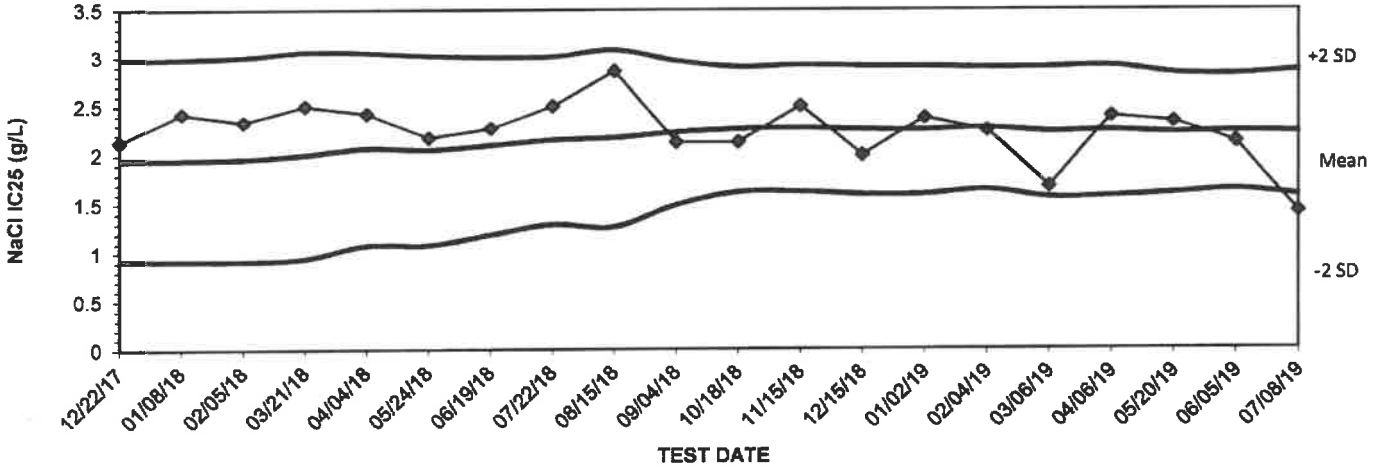
Signature: Kara Olivia

Date: 7/30/2019

Signature: [signature]

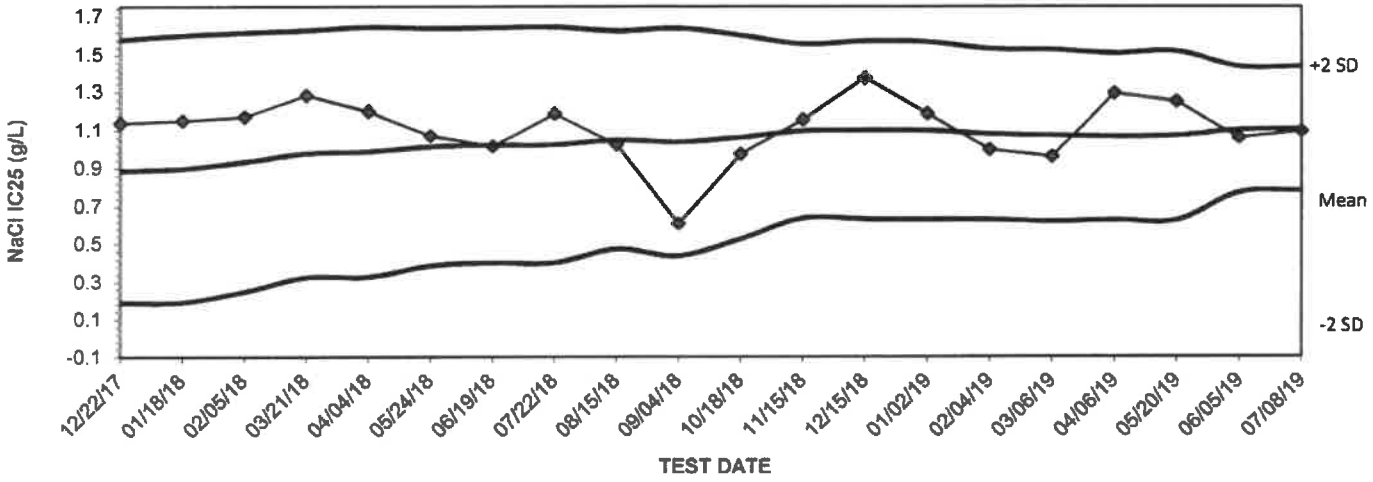
Date: 7/30/2019

CERIODAPHNIA SURVIVAL IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
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
06/19/18	2.2692	2.0957	1.1883	3.0032
07/22/18	2.5000	2.1497	1.2907	3.0086
08/15/18	2.8571	2.1726	1.2640	3.0812
09/04/18	2.1250	2.2258	1.4889	2.9627
10/18/18	2.1250	2.2599	1.6218	2.8979
11/15/18	2.5000	2.2725	1.6261	2.9188
12/15/18	1.9924	2.2520	1.5983	2.9057
01/02/19	2.3745	2.2498	1.5982	2.9014
02/04/19	2.2423	2.2693	1.6462	2.8924
03/06/19	1.6792	2.2302	1.5662	2.8942
04/06/19	2.3947	2.2431	1.5772	2.9089
05/20/19	2.3330	2.2195	1.6078	2.8311
06/05/19	2.1250	2.2334	1.6457	2.8210
07/08/19	1.4167	2.2234	1.5876	2.8592

CERIODAPHNIA REPRODUCTION IC25 NaCl
REFTOX



Date	IC25	Mean	-2 SD	+2 SD
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
06/19/18	1.0137	1.0217	0.4008	1.6425
07/22/18	1.1886	1.0234	0.4008	1.6460
08/15/18	1.0246	1.0483	0.4711	1.6255
09/04/18	0.6078	1.0377	0.4356	1.6398
10/18/18	0.9733	1.0632	0.5239	1.6026
11/15/18	1.1578	1.0979	0.6375	1.5584
12/15/18	1.3741	1.1028	0.6324	1.5733
01/02/19	1.1897	1.1007	0.6324	1.5690
02/04/19	0.9971	1.0817	0.6299	1.5335
03/06/19	0.9597	1.0739	0.6192	1.5286
04/06/19	1.2943	1.0687	0.6275	1.5098
05/20/19	1.2523	1.0731	0.6262	1.5200
06/05/19	1.0625	1.1043	0.7718	1.4369
07/08/19	1.0976	1.1102	0.7829	1.4376

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

September 6, 2019

Submitted via email eric.mink@state.co.us

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
60-day TRE Status Report on Q4 2018 Whole Effluent Toxicity for Outfall 010

Dear Mr. Mink:

This letter serves as the 60-day Toxicity Reduction Evaluation (TRE) status update for the Q4 2018 Whole Effluent Toxicity (WET) for Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo. As reported in July 2019, the Toxicity Identification Evaluation (TIE) results for Q4 2018 were inconclusive; however, the primary toxicant was anticipated to be total dissolved solids. As reported on August 28th, the additional studies (reverse osmosis treatment, C18 SPE column filtration treatment (used as negative control for RO treatment), and ground limestone dose treatment) found that the toxicant is not organic-based. Work is continuing on the TRE to investigate toxicity removal technologies.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File: G471-11.3(10)a-5

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

October 1, 2019

Submitted via email *eric.mink@state.co.us*

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
Notification of Chronic WET Results – 3Q 2019 and Waiver Request for TIE

Dear Mr. Mink:

On September 26, 2019, the third party laboratory, The SeaCrest Group, provided the enclosed analytical report containing the third quarter 2019 Whole Effluent Toxicity (WET) test results for Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo. Therefore, we are providing the required notification of WET results, in accordance with Part I.D.1.b. of the permit.

Outfall	Species	Reproduction/Growth Results		IWC
		NOEC*	IC25**	
010	*Ceriodaphnia dubia*	40%	45.2%	100%
010	*Pimephales* (fathead minnow)	100%	95.2%	100%

*NOEC means "no observed effect concentration" at which concentration there are no observable adverse effects on the organisms.
**IC25 means inhibition concentration causing a 25% reduction in the biological measurement.

The enclosed report also provides the documentation that the Q3 2019 water quality was consistent with previous samples, for which a Toxicity Identification Evaluation (TIE) was already conducted. Therefore, the TIE and the currently-underway comprehensive Toxicity Reduction Evaluation will also address conditions from Q3 2019. We are requesting written confirmation (email) that no further automatic compliance responses (i.e., separate TIEs or TREs) are required for this outfall.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ

Enclosure

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471-11.3(10)a-5

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

September 26, 2019

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

Ms. Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Dear Ms. Johnson and Ms. Aalbers:

SeaCrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of Colowyo Coal Company L.P. because of a WET result that required an automatic compliance response. The WET test was initially in quarter four (Q4) of 2018 and subsequently continued through into quarter three (Q3) of 2019 suggesting toxicity to the *Ceriodaphnia dubia* test species. This document is an update to provide the status of the TIE and projected next steps in consideration of the recent additional failure of Colowyo's permitted quarterly WET test this past September.

Historically, the most recent effluent tests (initial & baseline) exhibited the same toxicity patterns as in previous TIE tiers and quarterly WET testing. Due to the lack of variability of the effluent, we conclude that under the current TIE investigations, testing can be applied to the current source of failure in the Q3 permitted WET test in 2019. A log of Colowyo's effluent details and test statistics from December, 2018 to the most recent samples, September, 2019, is provided in Appendix 1 of this update.

It is worth noting the most recent sample volume received from Colowyo for TIE testing was taken on June 10, 2019, and the Q3 WET test sample was taken on September 9, 2019. No distinct differences were observed. For this reason, it is recommended that a waiver request be made for the Q3 WET violation.

Continuing the TIE manipulations, our research on different limestone dosages and variations of R.O. treatment strengths are being conducted for the next phase of refinement testing in order to uncover specific details/thresholds on toxicity removal for the Colowyo site discharge.

The initial observations made when comparing samples from December, 2018 to September, 2019 in the targeted species (*Ceriodaphnia dubia, C.dubia)* tests are as followed:

1) Statistically, the sublethal (reproduction) IC_{25} for *C. dubia* species remains between the values of 34% - 66%, and for lethal (survival), between 52% - 82%.
2) Conductivity in the effluent tests remain between 3810 - 4370 µmhos
3) pH at arrival remains around 7.8 – 8.4, and through the test remains around a pH of 7.8 – 8.5.
4) Hardness and alkalinity measurements remain around 650 – 1000 mg/L 830 – 1100 mg/L respectively.
5) Residual chlorine and ammonia remain at low or non-concerning levels.

Our next phase of testing with the R.O and limestone manipulations began in September, 2019 and should solidify findings from the TIE investigations and offer better application reference based on the previous set of TDS removal tests conducted in June, 2019. The next phase will continue to explore how different doses of ground limestone affect TDS removal. The R.O. treatment is going to manipulate the strength of TDS removal (allow more TDS through, rather than taking out the maximum) to better establish *C. dubia* species sensitivity thresholds in which Colowyo's partnered engineering team can utilize in their TRE process.

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

Tessa Hunt-Woodland
Laboratory Manager
Enclosure(s): Appendix 1

Appendix 1: Colowyo *C. dubia* WET Summary Logs

Table 1: Colowyo *C. dubia* WET Summary Log; quarterly and TIE investigation testing comparison of the 100% effluent

Colowyo IWC: 100%	Lethality:		Reproduction:			
***Ceriodaphnia dubia* WET Summary:**	**NOEC**	**IC25**	**NOEC**	**IC25**	**Conductivity Range**	
Q4 2018	60%	65.0%	40%	47.8%	3900-4340	
Accelerated 1	60%	62.5%	20%	35.2%	4120-4230	
Accelerated 2	60%	56.0%	40%	44.4%	4130-4180	
Q1 2019	60%	61.7%	40%	34.40%	3950-4070	
TIE initial (5 reps)	80%	81.3%	60%	54.90%	3990-4240	*using bracketed dilution series
TIE tier 1baseline (5 reps)	75%	65.6%	50%	58.1%	4040-4120	*using bracketed dilution series
TIE baseline #2 (5 reps)	75%	76.6%	50%	54.8%	3810-4290	*using bracketed dilution series
TIE tier 2 baseline (5 reps)	75%	62.5%	50%	56.7%	4020-4250	*using bracketed dilution series
TIE tier 2 baseline#2 (5 reps)	50%	52.1%	50%	52.1%	4050-4180	*using bracketed dilution series
TIE Phase I confirmation baseline (10 reps)	60%	56.7%	40%	59.7%	4060-4260	*using regular permit dilution series
TIE Initial-10 rep (new sample collected)	80%	81.70%	60%	65.50%	3990-4170	*New sample volume & using regular permit dilution series
TIE Baseline (10 reps)	60%	65.60%	40%	61.80%	4010-4180	*using regular permit dilution series
Q2 2019	60%	64.3%	20%	47.5%	3980-4210*	*sample #3 =1206 from flash flooding at mine; outlier from normal discharge
Q3 2019	60%	61.4%	40%	45.2%	4080-4370	

Table 2: Colowyo Effluent (100%) Benchchemistry Summary Log; TIE investigation testing comparison

Chemical analysis similarities- Test Type:	Date of analysis:	Sulfate (SO4)	Sodium (Na)	Calcium (Ca)	Potassium (k)	Magnesium (Mg)	
TIE initial (5 reps)	Mar-19	1450	788	144	19	126	*SCG
TIE tier 2 baseline#2 (5 reps)	Apr-19	1450	920	144	25	130	*SCG & TA
TIE Phase I conf. baseline (10 reps)	May-19	1600	920	97	23	130	*TA
TIE Initial-10 rep (new sample collected)	Jun-19	1500	810	140	22	120	*TA
TIE Baseline (10 reps)	Jun-19	1421	765	145	20	110	*SCG

Collection Notes (TIE):
Original sample: 2/20/19
New sample: 6/10/19

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

September 26, 2019

Ms. Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Dear Ms. Aalbers:

Enclosed are the results from chronic biomonitoring tests performed for the Colowyo Coal Company L.P. on effluent from the Colowyo 010A outfall discharge. There were significant lethal and sublethal toxicity effects to both test species. The effluent fails WET (Whole Effluent Toxicity) testing requirements for this sampling period.

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

Best regards,

Taylor Couillard-Rodak
Aquatic Toxicologist
Enclosure(s): Invoice
Report

500 S. Arthur Avenue, Unit 450 • Louisville, CO 80027 • 303.661.9324 • 303.661.9325 fax • www.seacrestgroup.com

RESULTS OF CHRONIC BIOMONITORING TESTS CONDUCTED FOR COLOWYO COAL COMPANY L.P. ON THE COLOWYO 010A SITE

Prepared for:

Ms. Angela Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, Colorado 81641

Prepared by:

SeaCrest Group
500 S Arthur Ave. Suite 450
Louisville, Colorado 80027-3065
(303) 661-9324

September 26, 2019

Chronic Toxicity Test Summary

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

Client: Colowyo Coal Company

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: 419511.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent 1	0754	09-09-2019	0750	09-10-2019
Effluent 2	0850	09-11-2019	0820	09-12-2019
Effluent 3	0805	09-13-2019	0819	09-14-2019

	Ceriodaphnia dubia	Fathead minnow
Test Initiation Time	1320	1245
Test Initiation Date	09-10-2019	09-10-2019
Test Completion Time	1220	1200
Test Completion Date	09-16-2019	09-17-2019

Dilution Water:
- Moderately hard laboratory reconstituted water

Test Organism Source:
- *Ceriodaphnia dubia*
  SeaCrest Group
- Fathead minnow
  SeaCrest Group

Reference Toxicant:
- Sodium Chloride

INTRODUCTION

Biomonitoring provides an effective means by which the toxicity of discharges from municipal, industrial and mining operations can be tested. Among the advantages of biomonitoring is the ability to test complex effluents containing a broad range of contaminants. Biomonitoring, when used in conjunction with chemical analyses, can generate data capable of identifying a much wider range of contaminants.

The Colorado Water Quality Control Division requires certain NPDES permittees to perform acute and/or chronic biomonitoring tests. The chronic test measures significant differences in lethality and in reproduction (*Ceriodaphnia dubia*) or growth (Fathead minnow – *Pimephales promelas*) between control and exposed organisms.

The present report discusses the results of chronic biomonitoring tests conducted on effluent from the Colowyo Coal Company on the 010A discharge. These tests were conducted in September 2019.

MATERIALS AND METHODS

Sample Collection

Three or two gallons of the effluent were collected on three separate dates. Samples were delivered chilled to the SeaCrest lab where they were held at 0-6°C. Chain of custody forms showing sample collection and lab arrival times are included in Appendix 1.

Dilution Water

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

Test Organisms

The tests were conducted with *Ceriodaphnia dubia* and Fathead minnows. *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)*.

Less than one-day-old Fathead minnow, cultured in the laboratory, were also used in the test. Adult fish are maintained in 10-gallon aquaria where females deposit their eggs on the under-surface of split PVC pipe sections. The eggs are collected daily and transferred to aerated containers where they hatch after three to four days. The larval fish are fed newly hatched Brine shrimp *(Artemia* sp.) at least twice per day.

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

Species	Normality	Homogeneity
Ceriodaphnia dubia	Kolmogorov Test	Bartlett's Test
Fathead minnow	Shapiro – Wilk's Test	Bartlett's Test

Statistical Difference				
	Survival	Growth	Reproduction	IC_{25}
Ceriodaphnia dubia	Fisher's Exact Test	N/A	Steel's Many-One Rank Test	ICp
Fathead minnow	Dunnett's Test	Dunnett's Test	N/A	ICp

RESULTS

Ceriodaphnia dubia 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 20% in the 100% effluent concentration and ranged from 0% - 100% in the remaining effluent concentrations. Control survival was 100%. Statistically significant lethality was measured in the 80% and 100% effluent concentrations. The NOEC for lethality was 60%. The IC_{25} for lethality was 61.4%.

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%)	10	24.4	15	33		
20%	10	22.4	14	33		
40%	10	19.9	11	29		
60%	8	13.7	0	25		*
80%	0	0.5	0	4	*	*
100%	2	0.9	0	7	*	*

Average numbers of neonates was 0.9 in the 100% effluent concentration and ranged from 0.5 – 22.4 in the remaining effluent concentrations. Average number of neonates in the control was 24.4 for statistical analyses and test acceptability criteria. Statistically significant differences in the number of neonates were found between the control and the 60%, 80%, and 100% effluent concentrations. The NOEC for reproduction was 40%. The IC_{25} for reproduction was 45.2%.

DISCUSSION

A chronic WET test is considered a **violation** of a permit limitation when both the NOEC and the IC25, for the same sub-lethal endpoint are at any effluent concentration less than the IWC. This determination is made independently for each test species. A chronic WET test is considered to have **failed** one of the two statistical endpoints when either the NOEC or the IC25 are at any effluent concentration less than the IWC. The IWC for this permit has been determined to be 100% effluent. Since the *Ceriodaphnia dubia* species meet these criteria, the discharge fails WET testing requirements.

REFERENCES

1. **Hach Chemical Company.** 2008. *Hach's Water Analysis Handbook.* Fifth Edition. Hach Chemical Company, Loveland, Colorado. Digital Medium.
2. **APHA/AWWA/WEF.** 1998. *Standard Methods for the Examination of Water and Wastewater.* 20th Edition. American Public Health Association, Washington, D.C.
3. **USEPA.** 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA-821-R-02-013. 335 pp.
4. **CDPHE (Colorado Department of Public Health and Environment).** 1998. *Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests.* Water Quality Control Division.
5. **USEPA.** 2000. *Method of Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136). EPA/821/B-00/004.
6. **USEPA.** 2000. *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System Program.* EPA/833/R-00/003.

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: Colowyo Coal Company
P. O./Project Number: 00270871
Contact: Angela Aalbers / Tom Fry
Address: 5731 State Hwy 13 Meeker CO 81641
Phone # 970-82-1219 E-Mail: aaalbers@tristategt.org
Fax # Sampler: Tom 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
010A	9/9/19	0754	Grab	419511.B#1		X															

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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Aalbers	9/9/19 1130	UPS		UPS		Nick Giulietti	091019 0750

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: COLOWYO COAL COMPANY

P. O./Project Number: 0027087|

Contact: TOM FRY / ANGELA AMBERS

Address: 5731 HWY 13 MEEKER CO

Phone # 970 824 1231 E-Mail: THOMAS.FRY@TRISTATEGT.ORG

Fax # Sampler: TFRY

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
010A	9.11.19	0850	G	419511.B#2		✓											2	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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	9.11.19 1100	UPS		UPS			09/12/19 0823

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: Colowyo Coal Company

P. O./Project Number:

Contact: Angela Aalbers / Tom Fry

Address: 5731 State Hwy 3 Meeker CO 81641

Phone # 970 824 1219 E-Mail: aaalbers@tristatefg.org

Fax # Sampler: A. Aalbers

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
B10A	9/13/19	0805	Grab	419511.13#3		X															

Turnaround Requirements (Analytical Testing Only)

_X_ 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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Aalbers	9/13/19 1130	UPS		UPS			09/14/19 0819

Appendix 2 – Data Sheets for the *Ceriodaphnia dubia* Test

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: ColoWyo Coal Co. Lab #: 419511.B Site: 010A
IWC %: 100 Template #: 5 Dilution Water: MH19-020 Sample Date: 090919
Age & Source: cerio 091019 5045 Test Start: 091019 1320 Test End: 091619 1220
Test Conditions:

	0	1	2	3	4	5	6	7	8	Total
(C)	0	0	0	0	6	9 +1	0			16
	0	0	0	5	0	8	12			25
	0	0	0	0	6	12	10			28
	0	0	0	0	5	12	0			17
	0	0	0	6	0	10	17			33
0	0	0	0	6	0	11	16			33
	0	0	0	6	0	8	15			29
	0	0	0	0	6	9	0			15
	0	0	0	0	6	10	0			16
	0	0	0	6	0	11	15			32
DO	7.1	7.1 | 7.8	7.3 | 7.1	7.4 | 7.3	7.3 | 7.2	7.4 | 7.3	7.3			STAT
Temp	24.2	24.2 | 24.1	24.4 | 24.1	24.2 | 24.4	24.6 | 24.1	24.2 | 24.1	24.3			24.4
pH	8.2	8.0 | 8.1	8.2 | 8.0	8.1 | 8.1	8.0 | 8.1	8.2 | 8.2	7.9			ACCP
Cond	316	317	320	318	311	317				
(1)	0	0	0	0	6	13	0			19
	0	0	0	5	7	0	11			23
	0	0	0	0	6	13	14			33
	0	0	0	0	5	9	0			14
	0	0	0	5 +1	0	9	14			29
20	0	0	0	6	0	9	13			28
	0	0	0	0	6	9	9			24
	0	0	0	0	6	12	0			18
	0	0	0	0	7	10	0			17
	0	0	0	2	0	8	8			19
DO	7.2	7.1 | 7.4	7.3 | 7.2	7.5 | 7.5	7.3 | 7.4	7.4 | 7.5	7.3			
Temp	24.4	24.2 | 24.1	24.4 | 24.1	24.2 | 24.4	24.6 | 24.1	24.2 | 24.1	24.3			22.4
pH	8.1	8.0 | 8.1	8.2 | 8.1	8.1 | 8.1	8.0 | 8.2	8.2 | 8.2	8.0			
Cond	1274	1235	1324	1218	1251	1304				
	0	1	2	3	4	5	6	7	8	Total
(2)	0	0	0	0	3	7 +1	0			11
	0	0	0	6	0	10	11			27
	0	0	0	0	4	9	0			13
	0	0	0	0	5	7	0			12
40	0	0	0	4	0	9	8			21
	0	0	0	6	0	4	14			29
	0	0	0	6	0	10	11			27
	0	0	0	0	5	12	0			17
	0	0	0	0	6	8	0			14
	0	0	0	5	0	11	12			28
DO	7.3	7.2 | 7.6	7.4 | 7.4	7.6 | 7.7	7.3 | 7.6	7.5 | 7.7	7.4			
Temp	24.6	24.2 | 24.1	24.4 | 24.1	24.2 | 24.4	24.6 | 24.1	24.2 | 24.1	24.3			19.9
pH	8.1	8.1 | 8.0	8.3 | 8.0	8.1 | 8.1	8.1 | 8.1	8.2 | 8.1	8.1			
Cond	1914	1939	1964	1961	1933	1920				
(3)	0	0	0	0	4	8	0			12
	0	0	0	5	0	3	11			19
	0	0	0	0 D						0 D
	0	0	0	0	4	4	0			8
60	0	0	0	5	0	10	10			25
	0	0	0	5	0	9	9			23
	0	0	0	0	5	9	7			21
	0	0	0	0	6	9 +1	0			16
	0	0	0	0	5	8	6			13
	0	0	0	0	0 D					0 D
DO	7.4	7.2 | 7.8	7.5 | 7.6	7.6 | 8.0	7.3 | 7.9	7.6 | 7.9	7.4			
Temp	24.8	24.2 | 24.1	24.4 | 24.1	24.2 | 24.4	24.6 | 24.1	24.2 | 24.1	24.3			13.7
pH	8.0	8.1 | 7.9	8.3 | 8.0	8.2 | 8.1	8.1 | 8.1	8.1 | 8.1	8.2			
Cond	2840	2910	3010	2910	2890	2900				

* 7.2

MG

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	9/10/2019	Test ID:	419511cd	Sample ID:	XX9999999-NPDES Permit #
End Date:	9/16/2019	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD
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
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
40	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	1.0000	1.0000	0.0000
80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000

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		
20	1.0000	1.0000	0	10	10	10	1.0000	0.0500
40	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
*80	0.0000	0.0000	10	0	10	10	0.0000	0.0500
*100	0.2000	0.2000	8	2	10	10	0.0004	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	60	80	69.282	1.66667
Treatments vs D-Control				

Reviewed by: [signature]

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	9/10/2019	Test ID:	419511cd	Sample ID:	XX9999999-NPDES Permit #
End Date:	9/16/2019	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	16.000	25.000	28.000	17.000	33.000	33.000	29.000	15.000	16.000	32.000
20	19.000	23.000	33.000	14.000	29.000	28.000	24.000	18.000	17.000	19.000
40	11.000	27.000	13.000	12.000	21.000	29.000	27.000	17.000	14.000	28.000
60	12.000	19.000	0.000	8.000	25.000	23.000	21.000	16.000	13.000	0.000
80	4.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
100	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	7.000	0.000

			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	24.400	1.0000	24.400	15.000	33.000	31.284	10		
20	22.400	0.9180	22.400	14.000	33.000	27.131	10	99.50	75.00
40	19.900	0.8156	19.900	11.000	29.000	36.809	10	84.50	75.00
*60	13.700	0.5615	13.700	0.000	25.000	64.927	10	73.50	75.00
*80	0.500	0.0205	0.500	0.000	4.000	253.859	10	55.00	75.00
*100	0.900	0.0369	0.900	0.000	7.000	248.176	10	55.00	75.00

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)					1.09999	0.895	-0.1513	-0.4022
Bartlett's Test indicates unequal variances (p = 2.98E-06)					33.5108	15.0863		
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**				
Steel's Many-One Rank Test	40	60	48.9898	2.5				
Treatments vs D-Control								

Reviewed by: MCV

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	9/10/2019	Test ID:	419511cd	Sample ID:	XX9999999-NPDES Permit #
End Date:	9/16/2019	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	16.000	25.000	28.000	17.000	33.000	33.000	29.000	15.000	16.000	32.000
20	19.000	23.000	33.000	14.000	29.000	28.000	24.000	18.000	17.000	19.000
40	11.000	27.000	13.000	12.000	21.000	29.000	27.000	17.000	14.000	28.000
60	12.000	19.000	0.000	8.000	25.000	23.000	21.000	16.000	13.000	0.000
80	4.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
100	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	7.000	0.000

			Transform: Untransformed					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	24.400	1.0000	24.400	15.000	33.000	31.284	10	24.400	1.0000
20	22.400	0.9180	22.400	14.000	33.000	27.131	10	22.400	0.9180
40	19.900	0.8156	19.900	11.000	29.000	36.809	10	19.900	0.8156
60	13.700	0.5615	13.700	0.000	25.000	64.927	10	13.700	0.5615
80	0.500	0.0205	0.500	0.000	4.000	253.859	10	0.700	0.0287
100	0.900	0.0369	0.900	0.000	7.000	248.176	10	0.700	0.0287

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	1.09999	0.895	-0.1513	-0.4022
Bartlett's Test indicates unequal variances (p = 2.98E-06)	33.5108	15.0863		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	12.200	11.316	4.083	42.450	0.7944
IC10	23.520	11.752	8.166	45.234	0.3894
IC15	33.280	11.523	12.250	48.936	-0.1226
IC20	41.226	10.627	16.333	57.350	-0.5113
IC25	45.161	9.438	21.336	60.912	-0.4988
IC40	56.968	5.724	43.987	64.965	-0.3564
IC50	62.308	4.127	51.267	67.592	-0.6651

* indicates IC estimate less than the lowest concentration

WET TEST REPORT FORM – CHRONIC

Permittee: Colowyo Coal Company L.P. **Outfall:** 010A

Permit No.: CO0045161

Test Type: Routine ☒ Accelerated ☐

Test Species: Fathead minnow **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1245	09-10-2019	1200	09-17-2019

Test Results	Lethality	Growth
NOEC	80%	100%
	FAIL	**PASS**
IC_{25}	84.3%	95.2%
	FAIL	**FAIL**

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	95
% Survival for day 2	100	100	100	98	78	73
% Survival for day 3	100	100	100	98	78	63
% Survival for day 4	98	100	93	98	78	60
% Survival for day 5	95	100	90	98	75	60
% Survival for day 6	95	98	90	98	75	58
% Survival for day 7	93	98	90	98	75	58
Mean Dry Wt. (mg)	0.358	0.415	0.427	0.432	0.368	0.287

Hardness (mg/L) – Receiving Water: N/A Effluent: 953/972/888 Recon Water: 89
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 968/1028/1008 Recon Water: 58
Chlorine (mg/L) – Effluent: pH (initial/final) – Control: 8.0/7.4 100%: 8.4/7.8
<0.01/0.01/<0.01
Total Ammonia as NH_3 (mg/L) - Effluent: 1.81/1.75/1.92

Were all Test Conditions in Conformance with Division Guidelines? YES ☐ NO ☒
If **NO**, list deviations from test specifications: Dissolved oxygen fell below 4.0mg/L in effluent test chambers.
Laboratory: SeaCrest Group
Comments:
Analyst's Name: Nicholas Cipoletti, Daniela Thornton, and Daniel Hillenburg

Signature *Date* 09-26-2019

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	9/10/2019	Test ID:	419511fhm	Sample ID:	XX9999999-NPDES Permit #
End Date:	9/17/2019	Lab ID:		Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
ON-Control	1.0000	1.0000	1.0000	1.0000
SN--Control	1.0000	1.0000	0.8000	0.9000
20	0.9000	1.0000	1.0000	1.0000
40	1.0000	0.7000	0.9000	1.0000
60	1.0000	1.0000	1.0000	0.9000
80	0.7000	0.8000	0.6000	0.9000
100	0.5000	0.6000	0.4000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
ON-Control	1.0000	1.0811	1.4120	1.4120	1.4120	0.000	4			
SN--Control	0.9250	1.0000	1.2951	1.1071	1.4120	11.347	4	*		
20	0.9750	1.0541	1.3713	1.2490	1.4120	5.942	4	-0.729	2.410	0.2521
40	0.9000	0.9730	1.2661	0.9912	1.4120	15.696	4	0.277	2.410	0.2521
60	0.9750	1.0541	1.3713	1.2490	1.4120	5.942	4	-0.729	2.410	0.2521
80	0.7500	0.8108	1.0584	0.8861	1.2490	14.733	4	2.263	2.410	0.2521
*100	0.5750	0.6216	0.8658	0.6847	1.1071	20.865	4	4.103	2.410	0.2521

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.96841	0.916	-0.2562	-0.4623
Bartlett's Test indicates equal variances (p = 0.63)	3.46278	15.0863		
The control means are not significantly different (p = 0.16)	1.5918	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	80	100	89.4427	1.25	0.17956	0.19394	0.16293	0.02189	6.1E-04	5, 18
Treatments vs SN--Control										

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	9/10/2019	Test ID:	419511fhm	Sample ID:	XX9999999-NPDES Permit #
End Date:	9/17/2019	Lab ID:		Sample Type:	EFF1-POTW
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
ON-Control	0.3840	0.4120	0.3060	0.3290
SN--Control	0.3840	0.4120	0.3825	0.3656
20	0.4460	0.4590	0.3920	0.3610
40	0.4800	0.4090	0.4250	0.3930
60	0.4600	0.4510	0.4370	0.3800
80	0.3750	0.3940	0.3270	0.3740
100	0.2900	0.3050	0.1750	0.3760

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
ON-Control	0.3577	0.9268	0.3577	0.3060	0.4120	13.634	4	*		
SN--Control	0.3860	1.0000	0.3860	0.3656	0.4120	4.984	4			
20	0.4145	1.0738	0.4145	0.3610	0.4590	11.092	4	-1.607	2.410	0.0851
40	0.4268	1.1055	0.4268	0.3930	0.4800	8.864	4	-1.954	2.410	0.0851
60	0.4320	1.1191	0.4320	0.3800	0.4600	8.318	4	-2.103	2.410	0.0851
80	0.3675	0.9520	0.3675	0.3270	0.3940	7.762	4	-0.276	2.410	0.0851
100	0.2865	0.7422	0.2865	0.1750	0.3760	29.061	4	2.018	2.410	0.0851

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.97646	0.916	-0.4096	0.56659
Bartlett's Test indicates equal variances (p = 0.54)	4.0447	15.0863		
The control means are not significantly different (p = 0.32)	1.07814	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.0851	0.23786	0.01238	0.00249	0.00497	5, 18
Treatments vs ON-Control										

Appendix 4 – QA/QC and Reference Toxicant Test Chart

SeaCrestGroup
An Environmental Services Company

METHOD QC

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	8/8/2019	100.00%	101.51%	1.45%	± 5.00%
2320 B	Alkalinity - Total	8/16/2019	100.00%	99.60%	3.05%	± 5.00%
2320 B	Alkalinity - Total	8/22/2019	100.00%	100.97%	0.78%	± 5.00%
2320 B	Alkalinity - Total	8/29/2019	100.00%	96.91%	-1.62%	± 5.00%
4500 NH_3 D	Ammonia	8/7/2019	96.60%	104.80%	-2.68%	± 10.00%
4500 NH_3 D	Ammonia	8/14/2019	105.00%	103.41%	4.88%	± 10.00%
4500 NH_3 D	Ammonia	8/21/2019	104.00%	101.00%	3.09%	± 10.00%
4501 NH_3 D	Ammonia	8/28/2019	103.00%	104.20%	2.17%	± 10.00%
4500 Cl D	Chlorine	8/28/2019	96.88%	96.88%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	8/10/2019	98.25%	98.53%	-2.05%	± 5.00%
2340 B	Hardness - Total	8/12/2019	98.20%	103.00%	3.51%	± 5.00%
2340 B	Hardness - Total	8/22/2019	100.00%	100.00%	-1.48%	± 5.00%
2340 B	Hardness - Total	8/26/2019	96.49%	103.48%	2.15%	± 5.00%

		Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	8/6/2019	N/A	100.00%	101.45%	± 5.00%
4500 O	DO - Winkler	8/14/2019	N/A	98.57%	100.00%	± 5.00%
4500 O	DO - Winkler	8/22/2019	N/A	100.00%	N/A*	± 5.00%
4500 O	DO - Winkler	8/28/2019	N/A	98.61%	N/A*	± 5.00%

		Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	8/11/2019	99.99820%	1.11%	108.40%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	8/11/2019	99.99996%	0.00%	92.24%	±20%, ± 15%

Signature: Kara Olivia

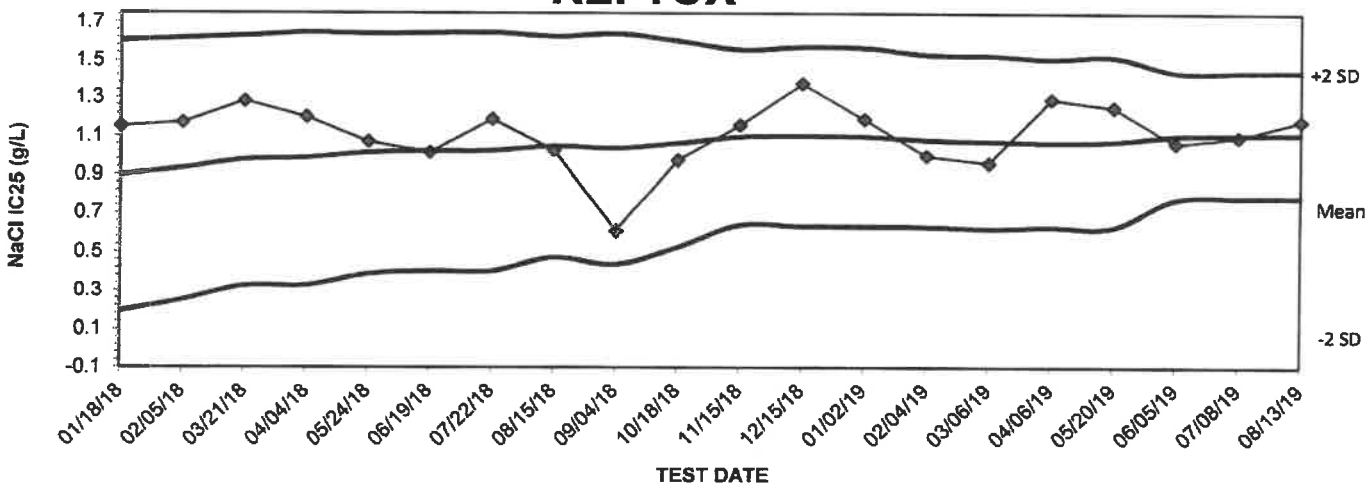
Date: 8/30/2019

Signature: Justin Hurlbert

Date: 08/30/2019

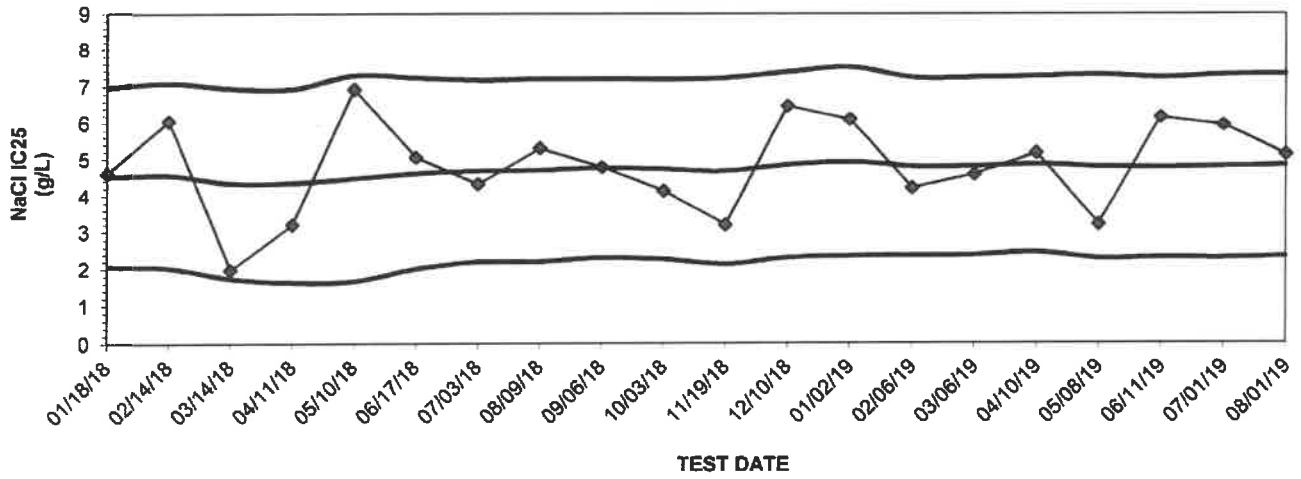
* DO probe M2 not in use

CERIODAPHNIA REPRODUCTION IC25 NaCl
REFTOX



Date	IC25	Mean	-2 SD	+2 SD
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
06/19/18	1.0137	1.0217	0.4008	1.6425
07/22/18	1.1886	1.0234	0.4008	1.6460
08/15/18	1.0246	1.0483	0.4711	1.6255
09/04/18	0.6078	1.0377	0.4356	1.6398
10/18/18	0.9733	1.0632	0.5239	1.6026
11/15/18	1.1578	1.0979	0.6375	1.5584
12/15/18	1.3741	1.1028	0.6324	1.5733
01/02/19	1.1897	1.1007	0.6324	1.5690
02/04/19	0.9971	1.0817	0.6299	1.5335
03/06/19	0.9597	1.0739	0.6192	1.5286
04/06/19	1.2943	1.0687	0.6275	1.5098
05/20/19	1.2523	1.0731	0.6262	1.5200
06/05/19	1.0625	1.1043	0.7718	1.4369
07/08/19	1.0976	1.1102	0.7829	1.4376
08/13/19	1.1825	1.1125	0.7837	1.4412

FHM GROWTH IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
01/18/18	4.6026	4.5178	2.0648	6.9708
02/14/18	6.0526	4.5642	2.0311	7.0973
03/14/18	1.9741	4.3487	1.7382	6.9592
04/11/18	3.1946	4.3561	1.6297	6.9441
05/10/18	6.9363	4.4790	1.6637	7.2943
06/17/18	5.0573	4.6170	2.0023	7.2317
07/03/18	4.3186	4.6879	2.1990	7.1768
08/09/18	5.3043	4.7061	2.2045	7.2078
09/06/18	4.7865	4.7629	2.3137	7.2122
10/03/18	4.1318	4.7278	2.2638	7.1917
11/19/18	3.1832	4.6770	2.1291	7.2249
12/10/18	6.4714	4.8436	2.3063	7.3809
01/02/19	6.0965	4.9313	2.3525	7.5101
02/06/19	4.2083	4.8042	2.3693	7.2390
03/06/19	4.5795	4.8091	2.3766	7.2416
04/10/19	5.1689	4.8637	2.4540	7.2734
05/08/19	3.1977	4.8012	2.2871	7.3152
06/11/19	6.1639	4.7836	2.3157	7.2516
07/01/19	5.9415	4.8088	2.3034	7.3142
08/01/19	5.1270	4.8424	2.3399	7.3449

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

January 6, 2020

Submitted via email eric.mink@state.co.us

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
Toxicity Reduction Evaluation Report on Q4 2018 Whole Effluent Toxicity

Dear Mr. Mink:

The enclosed Toxicity Reduction Evaluation (TRE) was conducted by Stantec Consultants on behalf of Tri-State Generation and Transmission Association, Inc. and Elk Ridge Mining and Reclamation LLC/Colowyo Coal Company, LP (Colowyo) for Outfall 010 at the Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo, which operates under the wholly-owned subsidiary Elk Ridge Mining and Reclamation LLC.

As reported previously in 2019, a pattern of Whole Effluent Toxicity (WET) was demonstrated through accelerated testing for the fourth quarter 2018 at Outfall 010 at the Colowyo Mine. The results of the Toxicity Identification Evaluation were reported in July 2019, with non-definitive conclusions indicating the primary toxicant is anticipated to be total dissolved solids (TDS). Further analyses found TDS or ionic imbalance (comprised of sulfate, sodium, and to a lesser degree potassium and bicarbonate) are the primary toxicants.

Stantec evaluated various active and passive conceptual treatment technologies to remove TDS and/or remove (or rebalance) sulfate, sodium, potassium and bicarbonate as noted in the TRE report. Preliminary source information is also provided in the TRE report. The next steps in Stantec's analyses include more rigorous source water evaluation, additional data collection on the outfall (WET testing only began in 4th quarter 2018), laboratory (bench scale) testing of conceptual treatment systems and an alternatives analysis, pilot-scale testing of the most feasible conceptual treatment system(s), and engineering design and construction (including approvals by various regulatory agencies).

Given the significant capital and operations/maintenance costs associated with any of the conceptual treatment technologies described in the TRE report and the unknown feasibility (technical or otherwise) of these technologies, we submitted a request for permit modification on December 19, 2019, to extend the delayed effective date for WET at Outfall 010 for five years to conduct the needed investigations. We could provide periodic updates to the Division as needed, during the five-year period.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471-11.3(10)a-5

Toxicity Reduction Evaluation

Colowyo Mine Outfall 010

January 6, 2020

Prepared for:

Elk Ridge Mining and Reclamation
Craig, CO

Prepared by:

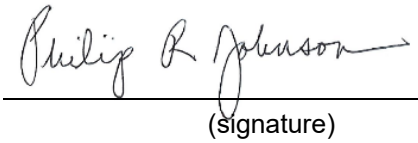
Stantec Consulting Services Inc.
2000 South Colorado Blvd, Suite 2-300
Denver, CO 80222

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	PK	1-6-20	DG	1-6-20	PJ	1-6-20

This document entitled Toxicity Reduction Evaluation was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Elk Ridge Mining and Reclamation (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)

Paul Kos

Reviewed by 
(signature)

Philip Johnson

Approved by 
(signature)

David Grills

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EXECUTIVE SUMMARY

This Toxicity Reduction Evaluation (TRE) has been prepared to assist Elk Ridge Mining and Reclamation with addressing whole effluent toxicity (WET) in discharges from Outfall 010 associated with the East Taylor Pond. This report summarizes the TRE process, evaluation of treatment technologies, and recommends additional studies before selecting a treatment option. The TRE process follows the methodology recommended by USEPA, which is a systematic investigation into the sources of toxicity, evaluation of treatment options, and selection of a treatment technology. In addition to the TRE process and goal established by USEPA, the project goals include evaluating active and passive treatment technologies to reduce maintenance and operational requirements.

Colowyo Mine discharges permitted wastewaters from the surface coal mine areas. Starting in October 2018, the mine was required to commence chronic WET testing. There is a "pattern" of WET in the Outfall 010 samples with sublethal impacts to *Ceriodaphnia dubia*. Outfall 010 is associated with the East Taylor Pond sediment control pond. The East Taylor Pond is located in a remote part of the mine property and can be difficult to access during the winter months and during spring runoff. Discharges from Outfall 010 have varied as mining and reclamation in the watershed progressed, and recent flow measurements suggest a winter baseflow value of 100 gallons per minute (gpm) and a summer flow value of approximately 350 gpm.

The SeaCrest Group performed a Toxicity Identification Evaluation (TIE) and concluded the primary toxicant is Total Dissolved Solids (TDS) and/or ionic imbalance. The TIE found the contributors to TDS include sulfate (SO_4), sodium (Na), calcium (Ca), magnesium (Mg), potassium (K), and chloride (Cl) (decreasing order), and approximately half of the TDS is comprised of SO_4 and Na. The TRE focused on treatment technologies that reduce TDS and/or Na.

Stantec identified and evaluated 11 treatment and water management options as part of the TRE. Options selected for further evaluation are established technologies known to provide adequate treatment and passive technologies that are expected to provide treatment. Eliminated options are more costly, require more operational interaction, will not adequately treat the water, or are less understood and available than the selected options. Treatment technologies investigated include:

- ***Options for Further Evaluation***: Reverse Osmosis/Nanofiltration, Sulfate Bioreactor, Evaporators
- ***Eliminated Options***: Ion Exchange, Freeze-Thaw/Evaporation, Electronic Distillation, Barite Precipitation, Lime Precipitation, Ettringite Precipitation, Water Use Onsite, Injection

Additional analysis of design details, costs, power, and space requirements will be evaluated for the treatment alternatives selected. This includes communication with equipment vendors and treatment professionals, bench-scale testing, and design details associated with each option. Design requirements include determining the exact footprint required and location of the treatment plant, power requirements, chemical storage, and brine stream/residuals management.

ABBREVIATIONS

CDPS	Colorado Discharge Permit System
Colowyo	Elk Ridge Mining and Reclamation's Colowyo Mine
DMR	Discharge monitoring report
EPA	Environment Protection Agency
FTE	Freeze-thaw/evaporation
gpm	Gallons per minute
µmhos/cm	Micromhos per centimeter
RO	Reverse osmosis
SRB	Sulfate-reducing bacteria
Stantec	Stantec Consulting Services, Inc.
TDS	Total dissolved solids
TIE	Toxicity Identification Evaluation
TOC	Total organic carbon
TRE	Toxicity Reduction Evaluation
WET	Whole effluent toxicity
XRD	X-Ray diffraction
XRF	X-Ray fluorescence

GLOSSARY

Active Treatment	Treatment technology that requires regular inputs, maintenance and reagents for operation.
Aerogel	Material used for water treatment that removes constituents.
Anaerobic	Condition where there is little to no oxygen.
Ceriodaphnia dubia	Species used during Whole Effluent Toxicity testing to determine toxicity of water sample.
Distillation	Water treatment process where electrically charged plates remove ions from process water.
Outfall	Point of discharge and where samples are collected as stipulated by Colorado discharge permit.
Passive Treatment	Technology that requires little to no maintenance, reagents or operations.
Precipitation	Process in which dissolved ions in the water chemically combine with other ions to create a solid.
Reverse Osmosis	Membrane filtration process using osmotic pressure as the driving force.
Sublethal	Inhibition of fertilization, growth, and reproduction that occur over a longer exposure period (e.g., 7 days) (EPA 1999).
Toxicity	Property that can show adverse side effects.

1.0 INTRODUCTION

1.1 PURPOSE

Elk Ridge Mining and Reclamation (Colowyo) engaged Stantec Consulting Services Inc. (Stantec) to provide professional engineering services related to the water treatment options at their Colowyo Mine in northwestern Colorado, near the town of Meeker. This memorandum summarizes Stantec's evaluations of water treatment technologies as part of the Toxicity Reduction Evaluation (TRE) being performed to address the Whole Effluent Toxicity (WET) in waters discharged from Outfall 010.

This TRE report for Colowyo is intended to provide a path forward for treating water discharged from the East Taylor Pond at the Colowyo Mine near Meeker, Colorado. There have been repeated sublethal impacts to *Ceriodaphnia dubia* at Outfall 010. The Colorado Discharge Permit System (CDPS) required WET testing beginning in October 2018.

1.2 PROJECT BACKGROUND

Elk Ridge Mining and Reclamation operates the Colowyo Mine, a coal mine in the Moffat and Rio Blanco Counties of northwestern Colorado. The mine is located approximately 20 miles north of Meeker, Colorado. The regional location map is included as **Figure 1.1**.

Operational areas at the mine comprise surface mining excavations, stockpiles, crushing and processing facilities, access roads, administrative offices, and equipment storage facilities. Other predominantly undisturbed areas are held in reserve for future mining or to buffer operational areas from adjacent land uses. The East Taylor Pond is located in the central portion of the mine property along Taylor Creek. Taylor Creek runs south to north, and the watershed includes undisturbed areas, areas disturbed by mining operations, and reclaimed areas. Essentially all of the watershed that contributes to East Taylor Pond is reclaimed land that was previously mined, backfilled with mine spoils, and then reclaimed. **Figure 1.2** shows a plan view of the site and the East Taylor Pond watershed.

Colowyo Mine discharges permitted wastewaters (generally stormwater runoff and springs) from the surface coal mine areas, per the CDPS Permit No. CO-0045161. Starting in October 2018, the mine was required to commence chronic WET testing at several locations that receive "process waters" such as springs in contact with backfilled overburden (spoil) and other processes. There is a "pattern" of WET in the Outfall 010 samples with sublethal impacts to *Ceriodaphnia dubia*. Outfall 010 is associated with the East Taylor Pond sediment control pond. The East Taylor Pond is shown on **Figure 1.3**.

1.3 SCOPE OF WORK

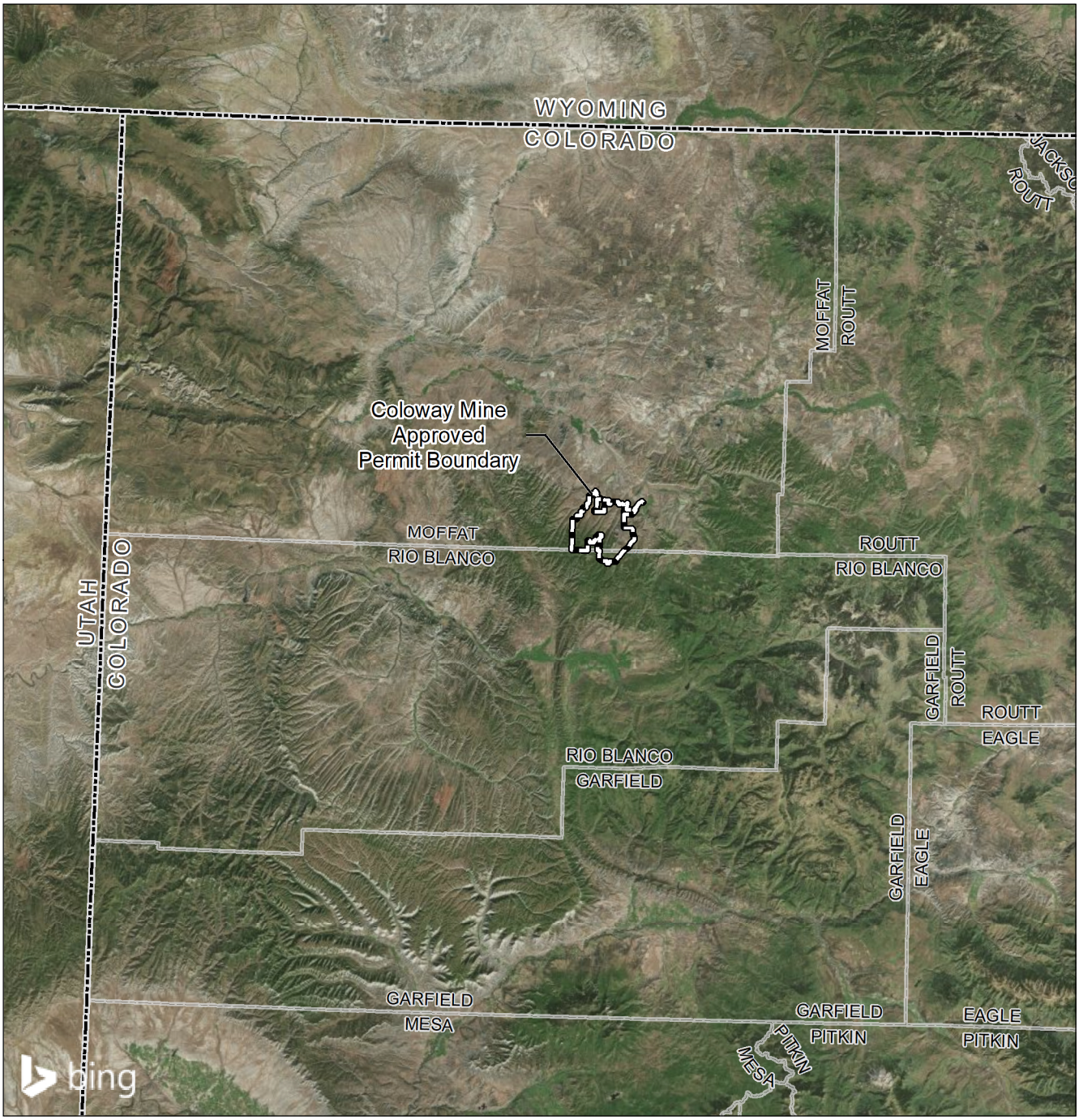
Colowyo retained Stantec to prepare this report to summarize the TRE process, results, and recommendations. Stantec's scope of work includes:

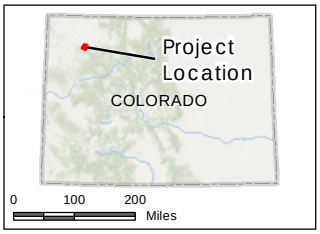
- Review previous toxicity studies.
- Evaluate historic and new data to determine water quality and quantity at Outfall 010.
- Establish TRE methodology.
- Evaluate potential treatment technologies.
- Perform bench-scale testing of selected treatment technologies.
- Recommend a preferred treatment option.
- Prepare a TRE report to document analysis and findings in support of the TRE.

1.4 GOALS AND OBJECTIVES

The primary goal of any TRE, as established by the Environmental Protection Agency (EPA) is to "develop a sound scientific and engineering basis for the selection and implementation of toxicity control methods" (EPA 1999). The project objectives, established by EPA and Colowyo, include:

- Evaluate the operation and performance of the facility to identify and correct treatment deficiencies contributing to effluent toxicity.
- Identify the compounds causing effluent toxicity.
- Trace the effluent toxicants and/or toxicity to their sources.
- Evaluate toxicity reduction methods or technologies to control effluent toxicity, including passive and active systems.
- Select and implement toxicity reduction technology to control effluent toxicity.
- Minimize maintenance and operational requirements due to the remote location and limited access to Outfall 010.





Approved Permit Boundary

Colorado County Boundary

State Boundary

0 10 20 Miles

(At original document size of 8.5x11)
1:1,250,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 StatePlane Colorado North FIPS 0501 Feet

2. Background: © 2019 Microsoft Corporation Earthstar Geographics SIO Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Project Location
T03N & 04N, R93W & 94W
Moffat & Rio Blanco Counties, CO

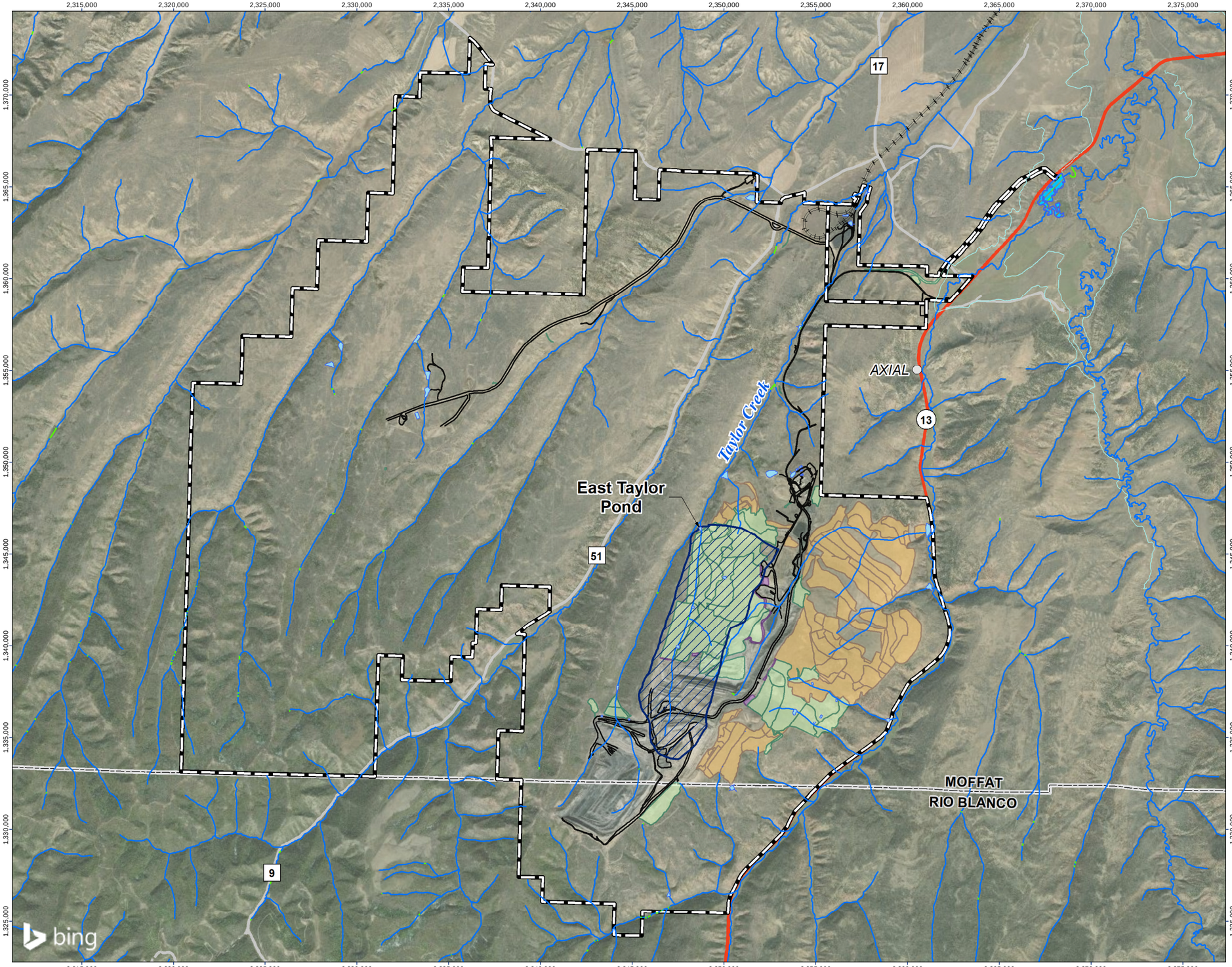
Review
Prepared by JAJ on 2019-12-31
Internal Review by CBB on 2019-12-31
Technical Review by PK on 2019-12-31

Client/Project
Elk Ridge Mining and Reclamation
Project Toxicity Reduction Evaluation for Outfall 010

Figure No.
1.1

Title
Colowyo Mine Regional Overview

U:\233001407\ GIS\ MXDs\RegionalOverview_11x17_Portrait_20191230.mxd Revised: 2019-12-31 By: JaJarvis



Stantec

- City/Town
- Artificial Path
- Canal/Ditch
- StreamRiver
- Project Road
- Highway
- County Road
- Railroad
- Approved Permit Boundary
- Project Ponds
- Wilson Reservoir
- East Taylor Pond Watershed
- Reclaimed Area
- Regrade Area
- Phase III Release
- Colorado County Boundary

N

0 1 2 Miles

1:65,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 StatePlane Colorado North FIPS 0501 Feet
2. Basemap Image: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors © 2019 Microsoft Corporation © 2019 DigitalGlobe ©CNES (2019) Distribution Airbus DS

Project Location
T03N & 04N, R93W & 94W
Moffat & Rio Blanco Counties, CO

Review
Prepared by JAJ on 2020-01-03
Internal Review by CBB on 2020-01-03
Technical Review by PK on 2020-01-03

Client/Project
Elk Ridge Mining and Reclamation
Project Toxicity Reduction Evaluation for Outfall 010

Figure No.
1.2

Title
Colowyo Mine Project Overview

U:\23001407\1 GIS\1 MXDs\ProjectOverview_11x17_Landsc_20200102.mxd Revised: 2020-01-02 By: JaJarvis

Stantec

- Seep
- Contour
- Index Contour
- Inclusion
- Waterline
- Ditch
- Stream

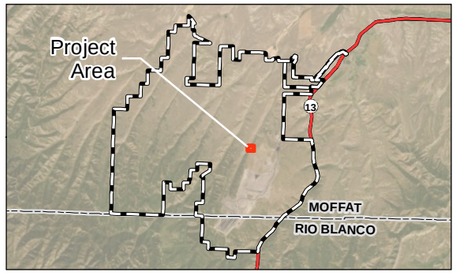
N

0 100 200 Feet

1:1,200 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 StatePlane Colorado North FIPS 0501 Feet
2. Basemap Image: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community © 2019 Microsoft Corporation © 2019 DigitalGlobe ©CNES (2019) Distribution Airbus DS



Project Location

T03N & 04N, R93W & 94W
Moffat & Rio Blanco Counties, CO

Review

Prepared by JAJ on 2020-01-03
Internal Review by CBB on 2020-01-03
Technical Review by PK on 2020-01-03

Client/Project

Elk Ridge Mining and Reclamation
Project Toxicity Reduction Evaluation for Outfall 010

Figure No.

1.3

Title

Colowyo Mine Project Facility

U:\233001407\1 GIS\MXDs\WETPond10 FacilityMap 11x17 Landsc 20200103.mxd Revised: 2020-01-03 By: JaJarvis

2.0 METHODOLOGY

2.1 TRE PROCESS

Once WET is identified, the proposed TRE process has six steps and follows the EPA guidance. This process is summarized in the flowchart included as **Figure 2.1**.

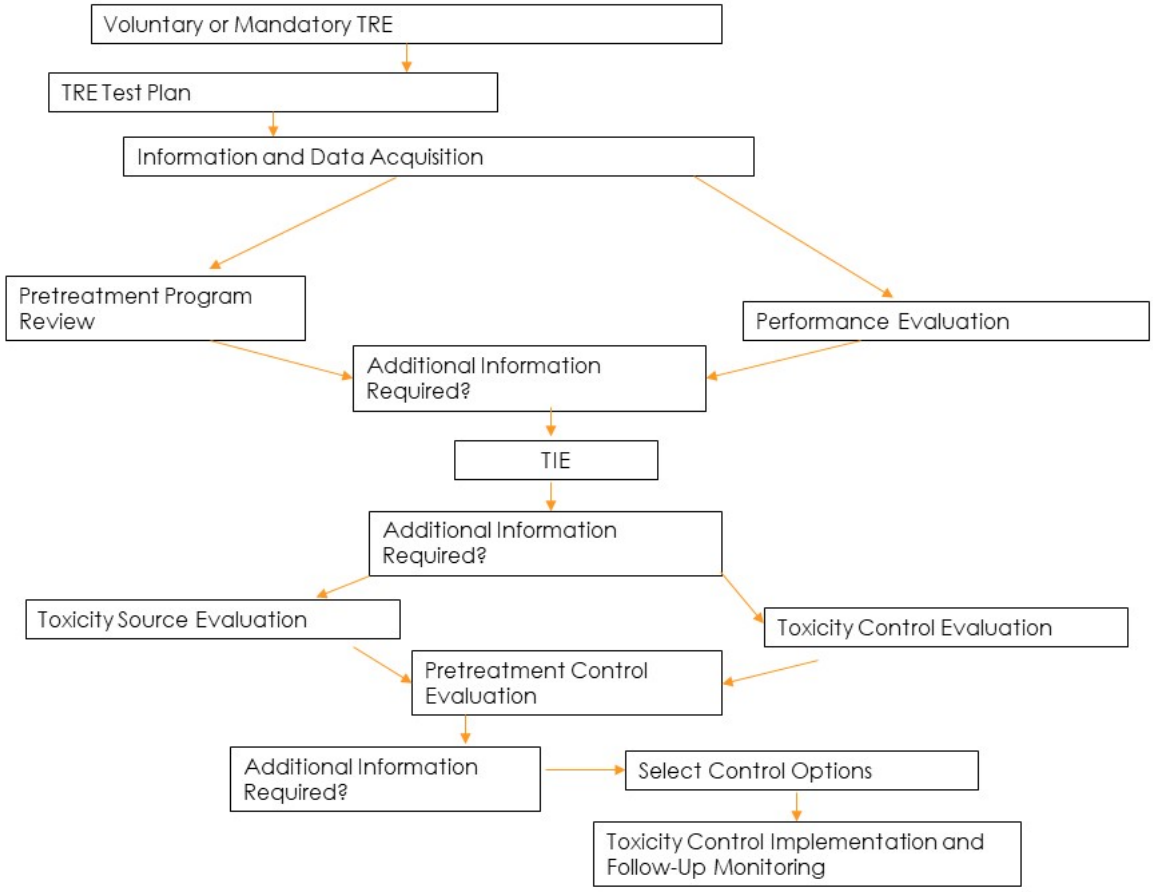
1. Information and Data Acquisition
2. Facility Evaluation
3. Toxicity Identification Evaluation
4. Toxicity Source Evaluation
5. Toxicity Control Evaluation
6. Toxicity Control Implementation

2.2 INFORMATION AND DATA ACQUISITION

The purpose of the data acquisition step of the TRE is to collect and review available information related to WET. This may include facility designs, permit applications, discharge monitoring reports (DMRs), water quality data, geological and surficial geology data, climate and hydrologic data, and mine progression plans. The goal of this phase of the TRE is to obtain sufficient information to evaluate the sources of WET before assessing and selecting a remedial action.

Stantec reviewed publicly available data and site-specific data provided by Colowyo to understand the site conditions and potential contributors to flow and salinity. These data include East Taylor Pond hydrologic model (SedCAD) reports, precipitation data, DMR water quality results, DMR flow rates, and Toxicity Identification Evaluation (TIE) which includes total dissolved solids (TDS) Reduction Testing Report, x-ray diffraction (XRD), and x-ray fluorescence (XRF) results.

Figure 2.4 TRE Flowchart



Flowchart adapted from Figure 1-1. TRE Flow Diagram for Municipal Wastewater Treatment Plants (EPA, Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants, August 1999)

2.3 FACILITY EVALUATION

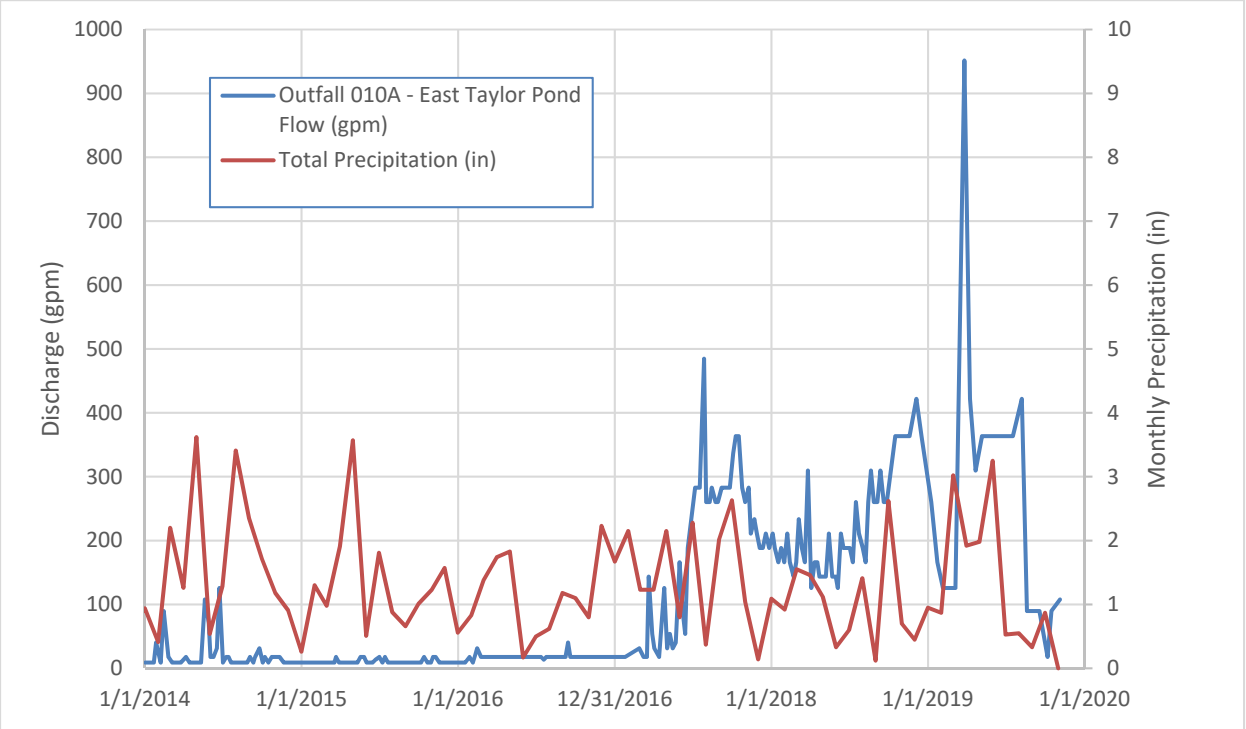
The purpose of facility evaluation step of the TRE is to assess the function of the facility to verify that all systems are working as intended and that WET is not the result of a facility malfunction. The goal of the facility evaluation is to verify that WET is not being caused by the facility.

The East Taylor Pond does not include an active treatment system that can malfunction; however, the water sources, geologic information, mine maps, flow rates, and water quality all relate to the pond function, so reviewing these data provide insight into the sources of the WET.

Instantaneous flow data were recorded approximately every two weeks for DMR reporting. These data indicate an increase in flow rate occurring in June 2017, with the average flow increasing from approximately 20 gallons per minute (gpm) to approximately 250 gpm. Much of the flow originates as a seep near the upstream extent of the East Taylor Pond high water line. Monthly precipitation values were also provided by Colowyo. Communication with Colowyo suggests that reclamation grading increased the

watershed contributing to the East Taylor Pond from approximately 600 acres to 1075 acres in 2017 resulting in an increase in influent flows. There was a corresponding increase in flows from East Taylor Pond in 2017. The flow readings follow seasonal wet and dry cycles. Winter flow rates, representative of baseflow conditions, are approximately 100 gpm, whereas summer flow rates, augmented by summer thunderstorms, are typically 350 gpm. Stantec has used these values for design purposes; however, future data should be evaluated to verify the design flow rates. **Figure 2.2** shows the available precipitation and discharge data since 2014.

Figure 2.5 Discharges from Outfall 010



Stantec has used sample results collected for DMR purposes to summarize the water quality of Outfall 010A. This information is critical in establishing a baseline for treatment technologies and to understand which treatment methods will be effective in reducing WET for this outfall. The October 31, 2019 TIE report from SeaCrest Group was useful in establishing outfall water quality, in addition to the information collected for the state discharge permit. As for most analytical data, there is a degree of variability in analytical results, but Stantec has used maximum values from the differing sources to summarize the water quality as shown in **Table 2.1**.

Table 2.1 Outfall 010 Water Quality

Parameter	Design Value	Units
pH	8.9	Standard Units
Sulfate (SO_4)	1,500	mg/L
Sodium (Na)	945	mg/L
Calcium (Ca)	140	mg/L
Magnesium (Mg)	120	mg/L
Potassium (K)	22	mg/L
Chloride (Cl)	30	mg/L
Bicarbonate (HCO_3)	770	mg/L as $CaCO_3$
Barium (Ba)	0.029	mg/L
Iron (Fe)	0.54	mg/L
Manganese (Mn)	0.21	mg/L
Strontium (Sr)	2.8	mg/L
Total Organic Carbon (TOC)	5	mg/L as C
Silica (SiO_2)	10.7	mg/L

2.4 TOXICITY IDENTIFICATION EVALUATION

Colowyo has been working with The SeaCrest Group, Louisville, CO to conduct the TIE. The TIE concluded the primary toxicant is Total Dissolved Solids (TDS), generally measured as conductivity exceeding 3,500 micromhos per centimeter (µmhos/cm) and/or ionic imbalance. The SeaCrest studies found the contributors to TDS include SO_4, Na, Ca, Mg, K, and Cl (decreasing order), where approximately half of the TDS is comprised of SO_4 and Na.

An excerpt from the SeaCrest Group TIE is provided below which summarizes the results:

> *"Seacrest Group has undertaken the TIE (Toxicity Identification Evaluation) at the request of Colowyo Coal Company L.P. This testing is in response to a WET result that required an automatic compliance response initially in quarter four (Q4) of 2018 and continuing into quarter two (Q2) of 2019 suggesting toxicity to the Ceriodaphnia dubia test species. The manipulations and tests intended to characterize the potential group of toxicants responsible for the observed toxicity included a reverse osmosis (RO) treatment, a C18 SPE column filtration treatment (acting as a negative control for the RO test), and a ground limestone dose treatment. This report represents testing of Total Dissolved Solids (TDS) as the primary toxicant in response to findings from previous tiers. The TIE was performed in accordance with EPA protocols for the conduct of such investigations along with additional testing and chemical analysis."*

> *"This series of tests included an initial toxicity confirmation test followed by a baseline effluent, the RO treated effluent, the C18 filtered effluent, and the limestone treatment effluent. All tests were conducted under full, ten (10) replicate chronic conditions with the permitted dilution series. An aliquot from each effluent was chemically analyzed for characterization and comparison."*
>
> *"The initial and baseline tests exhibited the same toxicity patterns as in previous TIE tiers and quarterly WET testing. Lethal and sublethal toxicity were eliminated in the RO treated effluent as the TDS was substantially removed by the treatment. The limestone treated effluent eliminated all lethal toxicity, but not the sub lethal toxicity. The C 18 filtered effluent did not result in toxicity reduction, and the test can be used to support the conclusion that the toxicant is not organic based. It is believed that further research on limestone and extent of RO treatments would be useful for future testing as an option for toxicity removal."* (from SeaCrest Group TIE Cover Letter)

The primary treatment targets are sodium and sulfate, with potassium and bicarbonate alkalinity as secondary targets.

2.5 TOXICITY SOURCE EVALUATION

This step of the TRE is intended to identify and eliminate the source of the toxicity and eliminate it from the discharged water. EPA documentation recommends evaluating sewer lines and other discharge lines at industrial and commercial sites for toxicants, which does not apply to this project.

The source of the toxicity in the Outfall 010 water is believed to be leaching and seepage of Na and SO_4 from mine spoils. The relatively stable water quality results indicate that source control is not a feasible option for eliminating the WET; however, further evaluation of the source water may be appropriate to confirm the design parameters for flow and water quality.

2.6 TOXICITY CONTROL EVALUATION

The purpose of the toxicity control evaluation step of the TRE is to identify the most-feasible option for treating WET. This process uses the information obtained from previous steps to identify treatment alternatives before evaluating them for effectiveness and cost. The goal of the toxicity control evaluation is to select the most preferable treatment option.

The proposed toxicity control evaluation will progress through a series of assessments, with each step being used to eliminate treatment options that are ineffective, unfeasible, or cost-prohibitive. The process will start with multiple lines of treatment methods, and each line of treatment will be evaluated with increasing detail, starting with a conceptual paper study, followed by a detailed investigation of each option and coordination with vendors, and finishing with bench-scale testing of the selected alternative(s). This evaluation will include active and passive treatment options to control toxicity. Following the Facility Evaluation results, this step will also consider alternative means of reducing the discharge volume from Outfall 010 by using or disposing water onsite or identifying source controls.

The initial analysis consisted of a paper study of all identified treatment technologies. Each technology was evaluated on a conceptual basis for its effectiveness in lowering TDS, and particularly in reducing

sodium and sulfate concentrations. Following the initial evaluation, preferred alternatives were selected for a detailed investigation on the feasibility and cost of each treatment method. Both evaluations consider site limitations such as power supply, access, available area, and maintainability. The treatment options that remain viable following the detailed evaluation will be tested using bench-scale or pilot testing to demonstrate that the treatment technology performs as intended in the initial investigations. Treatment facility vendors will be contacted for testing, design, and costing support throughout the detailed investigation and testing phases of the TRE to refine the details of each option before selecting the preferred treatment technology.

2.7 TOXICITY CONTROL IMPLEMENTATION

Once the control option has been selected, detailed designs will be prepared to construct the treatment technology.

3.0 TREATMENT ALTERNATIVES

Evaluation of literature on toxicity of ionic species on aquatic life suggests that SO_4 and TDS are known to have adverse effects on aquatic life while sodium may have a lesser impact. Early testing data of the Colowyo water and bench scale treatments by SeaCrest compares results from reverse osmosis (RO) treatment and lime treatment. The RO treatment has shown to meet the necessary safety guidelines for aquatic life showing no measurable toxicity effects. The lime treatment, which focused on a reduction in alkalinity, shows improvement in chronic lethality but still shows reproductive impacts.

It is Stantec's opinion that evaluation of SO_4 treatment in this water body may produce the necessary improvement in water quality desired. Sodium removal processes are largely limited to RO, ion exchange, and freeze-thaw/evaporation. The remainder of the treatments considered focus on the removal of SO_4 from the collected drainage and contact water.

3.1 ACTIVE TREATMENT TECHNOLOGIES

Stantec has identified several active treatment technologies. Each of these technologies treats the process stream by concentrating salinity into a brine stream and producing a treated effluent. The result is a residual brine stream that requires disposal which is most easily achieved through evaporation with solids that are periodically collected and sent to a landfill. These technologies include RO, ion exchange, freeze/thaw-evaporation, and electronic distillation. Additional active treatment technologies that reduce salinity by precipitating select ions include barite precipitation, lime precipitation, and ettringite precipitation. Each technology is available in various treatment systems from various vendors.

3.1.1 Reverse Osmosis

Reverse Osmosis/Nanofiltration (NF) technologies remove dissolved solids by forcing water through a semipermeable membrane, with the difference between them being the pore size of the membrane. Reverse osmosis will remove nearly all TDS while nanofiltration will remove most multivalent ions, depending on water chemistry. Additional reagents required for these treatment options are anti-scalant to reduce fouling of the membrane elements and an acid and base for the clean-in-place system. As a by-product of RO and NF, a waste (or concentrate) brine is produced that will have a high concentration of Na, SO_4, and other dissolved ionic components that are removed from the clean, permeate stream. This residual brine will likely have to be managed on site or hauled off site for ultimate disposal. Proceeding with this option would require establishment of power to the area to support the necessary loads for the RO process equipment. Handling of residual brine generated from the RO process is most cost-effectively achieved with evaporation ponds. RO/NF is an option that is shown by current testing to achieve the desired results and lower both chronic and reproductive lethality and should thus be further investigated.

3.1.2 Ion Exchange

Ion exchange is a chemical mass action process where ions in water are removed by the exchange of similar charged ions within a resin bed. This technology would specifically target SO_4 as the primary constituent of removal, although it is likely that bicarbonate alkalinity will also be removed depending on the resin selected. When the resin exchange capacity is reached, an acid, base, or salt would be required for resin regeneration. Similar to RO/NF, the regeneration process would create a waste brine with high concentrations of the constituents removed. This technology can be pursued as a service with offsite regeneration if desired. In either instance, electrical infrastructure would need to be established, albeit for smaller equipment loads than the RO/NF option. Ion exchange treatment for SO_4 is typically implemented as a polishing step, typically achieving 50 mg/L or lower concentrations. Sulfate removal by ion exchange at the measured SO_4 concentrations would require regular regenerations with a resin loading rate of roughly 460 ft^3 per day operating at the diminished winter flows. Further investigation focused on a two-stage resin approach using sodium selective resin followed by SO_4 could be viable with regular accessibility. Given the restrictions for access throughout winter, this is not considered to be an acceptable technology for the Colowyo Mine site.

3.1.3 Freeze-Thaw/Evaporation

Freeze-Thaw/Evaporation (FTE) is a process that combines evaporation and freezing conditions to treat and dispose of produced water. During wintertime, the water is concentrated by partially freezing the water into relatively pure ice and removing/decanting the concentrated unfrozen brine for disposal. During the summertime, the water is evaporated using industrial evaporators. This technology, while partially passive by using the site climate to freeze the water, requires significant management by operations personnel to keep the system operating under winter conditions. It also requires disposal of the decanted brine waste stream and construction of an evaporation system for summertime use. Electrical infrastructure would need to be established. Considering the seasonal nature and operational complexities associated with this option, this technology is not recommended for further evaluation.

3.1.4 Electronic Distillation

Electronic distillation is similar to ion exchange, where ions in water are removed by using the ionic charges of each species. However, instead of a charged resin, electrically charged plates are used to attract and adsorb the ions. Carbon aerogel is commonly used for the plates due to its high capacity to adsorb ions. The voltages of the plates can be used to target Na and SO_4. When the plates' exchange capacities are consumed, the voltage is reversed to repel the constrained ions and the discharge brine is diverted to a containment vessel for disposal. Similar to other technologies, the regeneration process would create a residual waste solution having elevated concentrations of the constituents removed. Electrical infrastructure would need to be established at the site. Considering the proven results of the other options available (i.e. RO and ion exchange), this technology is not recommended for further evaluation.

3.1.5 Barite Precipitation

Barite precipitation would specifically target SO_4 removal through a chemical precipitation process. Either barium chloride or barium hydroxide is added to the process to produce barium sulfate (barite) solids which are removed through gravity settling and media filtration. Additional chemicals required with this process would be a coagulant to enhance settling, along with an acid for pH adjustment as post-treatment if barium hydroxide is used as the precipitating agent. Solids management would be required for the barium sulfate sludge created, likely needing to be hauled offsite for disposal. This process entails an ion for ion replacement. Barium chloride would contribute two Cl ions for each SO_4 ion removed and results in an increase in the NaCl salinity but would reduce the overall TDS by roughly 350 mg/L (assuming 90% replacement). Barium hydroxide is an expensive reagent that is not considered to be economically viable for the amount of SO_4 that would require treatment. Barite precipitation investigation is not recommended to proceed.

3.1.6 Lime Precipitation

Lime precipitation is a water treatment process that uses calcium hydroxide, or hydrated lime, to remove alkalinity and hardness from water through the formation of calcium carbonate which is a nearly insoluble solid. Carbonate levels currently measured in the water suggest that the addition of lime will not generate gypsum ($CaSO_4$) and so this approach will not remove SO_4. Water is mixed in a reactor where the lime slurry is added allowing for the precipitation reaction to occur. Calcium carbonate precipitation rapidly occurs above pH 10.3 and processes are typically maintained around 10.5. The sludge generated from this process is combined with flocculant to allow the precipitated solids to bind together and form larger particles to promote densification and settling. Flocculated solids generated from this process are removed in a clarifier which provides sufficient time for solids to settle and be removed from the bottom (underflow) of the tank. Since precipitation rates are known to be faster when seeded by already precipitated solids, a portion of the settled solids are recirculated back to the first reactor to allow these particles to form even larger particles and settle more effectively. Clarified supernatant is allowed to overflow a weir at the top of the clarifier, collecting the water which is pH-neutralized and then discharged. Neutralization of the water prior to discharge is achieved through use of carbon dioxide sparging, hydrochloric acid, or sulfuric acid addition. In some cases, the clarifier overflow is filtered prior to neutralization. Solids collected from this process can be interned onsite in evaporation ponds or sent to a filter press to further dewater the solids for packaging and disposal. This process by itself is not expected to produce adequate reductions in toxicity given the results of the TIE. This process is an initial step of the ettringite process that is considered for evaluation in the following section.

3.1.7 Ettringite Precipitation

Ettringite precipitation has been shown to be an operationally cost-effective method for precipitating SO_4 from wastewaters, capable of treating to below 200 ppm in ideal cases and able to remove Ni, Cd, Cu, and Zn as metal hydroxides. This method is similar to the lime precipitation process, but it is modified with an aluminum reagent to focus treatment on elevated levels of SO_4 in addition to alkalinity and hardness. The process operates optimally at a pH level of 12 to enable dissolution of aluminum. This increase in pH is achieved with higher lime slurry dosing and will induce the precipitation of brucite ($Mg(OH)_2$) particles in

addition to calcium carbonate. Aluminum is added to this high pH reactor to promote ettringite precipitation to the list of reactions that occur. Aluminum reagents used in the process can be either as aluminum metal (typically from waste metal sources) or an aluminum salt. Aluminum binds to Ca and SO_4 within the water to form a solid ettringite precipitate ($Ca_6Al_2(SO_4)_3(OH)_{12}$ 26 H_2O). This combined slurry is treated with a flocculant prior to a clarifier where the solids separate from the solution and settle to the clarifier bottom for collection. Solids collected from the process are dewatered through use of a filter press and prepared for final disposal. Supernatant from the ettringite clarifier is neutralized with carbon dioxide sparging which creates carbonic acid in-situ. This neutralized water is not expected to require additional clarification based on the existing water analysis. This process is still in the industrial proving stages and produces a large volume of sludge. Early testing of this process shows that it can be effective but would require piloting to properly validate its performance in this application. It is expected that this process would treat SO_4 to an acceptable level. However, it is not recommended to proceed forward as the process does not meet the requested operational parameters of minimal operational intervention.

3.2 PASSIVE TREATMENT TECHNOLOGIES

Sulfate-reducing bioprocesses can be used in the treatment of sulfate-containing waters and effluents. This process utilizes sulfate reducing bacteria (SRBs) cultivated under anaerobic conditions to create an environment where SO_4 ions are electrochemically reduced to sulfides. For passive treatment, reactor bed material is typically composed of biomass and limestone with a cover of sufficient depth to restrict oxygen infiltration into the lower zones. Biomass used for the reactor beds can be any number of feed or waste products from rice, wood chips, or even cardboard. Simple organic carbon (alcohol and sugar solutions) can also be fed into the influent stream of the bioreactor to provide controlled rates of SO_4 reduction. Designs for passive bioreactors in SO_4 treatment are tailored to the influent water expected and while they can tolerate some variation in feed, there are limitations which would require more active intervention to maintain the bed at healthy operating levels. Passive bioreactors are affected by seasonal changes with flow and temperature which cause fluctuation of overall SO_4 reduction. While some metals can be effectively treated using a bioreactor approach, aluminum is known to have detrimental effects on long term life of the bed. The footprint of a bioreactor is based on the acidity of the water being treated and the amount of SO_4 being reduced. The near neutral water at Colowyo suggests that a smaller bioreactor could be used than one used to treat acid mine drainage. Discharge from bioreactors containing biomass are known to contain nitrogen and phosphorus compounds which may require additional treatment. The current wastewaters at Colowyo suggest that a three-stage passive treatment system would be required with an influent pretreatment, anaerobic bioreactor, and a sulfide attenuation cell. Recent flooding of Taylor Creek in the area of East Taylor Pond must be considered in determining an acceptable location. If SO_4 removal by itself is sufficient to bring the water into compliance, this technology can be considered technically viable and is recommended as a line of inquiry for the process.

Implementation of this technology can be considered either as ex-situ or an in-situ configuration with a pond for flow control and total organic carbon (TOC) addition. An ex-situ configuration would have seasonal efficiency variations due to temperature changes but can be designed to the necessary specifications and sized according to the flows and removal efficiencies required. This surface installation would allow access to the reactor for modification if necessary. Expansion of the current pond and

repurposing it would be the basis of the ex-situ approach. As an in-situ application, the geology of the area would be further evaluated to identify the necessary pretreatment/reagent additions to achieve the necessary level of sulfate removal. In each case, monitoring wells downstream would be installed to verify effectiveness and compliance.

3.3 OTHER TREATMENT ALTERNATIVES

Multiple alternatives exist for using or disposing water onsite, and these can be used in conjunction with the preferred treatment alternative to reduce the volume of water that must be treated. Aside from injection, these options are not expected to fully consume the water being discharged from Outfall 010.

Water stored in the East Taylor Pond or in the waste stream may be used onsite for consumptive purposes such as drilling fluid, dust suppression, and moisture conditioning during construction. While large volumes of water can be used onsite, particularly during the summer, the remote location of the pond limits the feasibility of this option. Also, the high flow rate and limited need for water in the winter months reduce the feasibility of this option. Water quality limitations may prevent water usage from the East Taylor Pond. This option does not fully address the volume of water discharging from Outfall 010; however, using water from the pond should be considered when a water source is needed for operations.

Injecting the water into an aquifer is a proven technique for disposing produced water depending on aquifer depth, injection rate required, and water quality. Coal seams are often highly permeable aquifers, but further study would be required to identify the target aquifer and assess potential impacts to the aquifer and Colowyo's operations. This option could be considered as a stand-alone technique or combined with an active treatment technology to dispose of the brine waste stream. This option requires drilling and completion of an injection well, permitting with EPA, and electrical infrastructure for the pumping operations. Colowyo's existing understanding of geology and groundwater resources may be used to minimize the investigations required to permit the injection well. This alternative is currently not under consideration for additional analysis; however, it may warrant additional discussion and consideration at Colowyo's discretion.

Evaporators, or atomizers, can be used to spray the water for enhanced evaporation. This alternative is highly effective in arid climates during the summer months, but there is little opportunity for enhanced evaporation of water during the winter. Regardless of season, only part of the sprayed water evaporates, and the remaining water along with all the salt falls to the surface. Spraying the mist over land (land application) can temporarily improve vegetation by providing extra moisture; however, long-term salt build-up will result in decreased vegetation production. Spraying the mist over the pond eliminates the salt build-up on land, but the salt-laden water returns to the pond, thus decreasing the efficiency of the evaporator. This option does not address water discharging from the outfall during the winter months and is not being considered for further evaluation. It should be considered for use in combination with other technologies to reduce the water volume that needs to be treated.

3.4 SUMMARY OF TREATMENT ALTERNATIVES

The treatment alternatives are summarized in **Table 3.1** below.

Table 3.1 Summary of Treatment Technologies

Method	Type	Summary
Recommended for Further Investigation		
Reverse Osmosis/ Nanofiltration	Active	Established technology known to provide adequate treatment. Electrical infrastructure and residual brine management require further evaluation for this application. System can be fully automated.
Sulfate Bioreactor	Passive	Expected to provide adequate treatment of SO_4 but has no impact on Na levels. Passive processing option once established may meet winter area inaccessibility and minimal operator interaction goals.
Evaporators	Other	This option does not consume all the water discharged from the outfall, but it should be considered to reduce the water volume.
Not Considered for Further Investigation		
Ion Exchange	Active	Treatment approach capable of specifically targeting Na and SO_4 ions. Regeneration of media and residual handling are primary focuses for application. Communication with ion exchange vendors suggests this technology is not viable at the design flow rates and concentrations.
Freeze-Thaw/Evaporation	Active	Treatment will effectively remove salts from water during the winter months, but another technology is required for non-freezing periods. There is also a brine waste stream and requires significant operator interaction.
Electronic Distillation	Active	Treatment will effectively remove salts from water, but there is a brine waste stream, and other technologies are better understood.
Barite Precipitation	Active	Treatment will effectively remove SO_4 from water but has no impact on Na levels. Appropriate reagents are costly and not expected to provide a cost-effective treatment operation.
Lime Precipitation	Active	Not expected to provide the necessary reductions in WET required for the project, as demonstrated in the TIE.
Ettringite Precipitation	Active	Treatment is expected to remove SO_4 but will also precipitate all hardness ions and is the largest solids residual stream volume of the options considered. Fully automated operation is not feasible and would require more regular operator intervention.
Water Use Onsite	Other	This option does not consume all the water discharged from the outfall, but it should be considered to reduce the water volume.
Injection	Other	This option could consume part or all of the water depending on the availability and capacity of aquifers but requires drilling a well.

3.5 ADDITIONAL ANALYSIS OF SELECT TREATMENT ALTERNATIVES

Additional analysis of design details, costs, power and space requirements will be evaluated for the treatment alternatives selected and listed below. Stantec has initiated communication with equipment vendors and treatment professionals to continue the evaluation in January 2020.

- Evaporators
- Reverse osmosis
- Sulfate bioreactor

3.5.1 Evaporators

The seasonal variations in flow and the site climate indicate that using evaporators during the summer months, when flows are higher, can reduce the treatment flow rate to the nominal base flow of 100 gpm. Initial communications with evaporator vendors suggest that 250 gpm can be evaporated using 500 gpm evaporator systems, assuming 50% efficiency during the summer. The evaporators cannot be used during winter months. Additional design requirements include determining the exact location of the evaporation system and power requirements.

3.5.2 Reverse Osmosis/Nanofiltration

The TIE results, Stantec's experience in similar projects, and initial communication with RO vendors suggest that this treatment option can be installed as a "turn-key" solution and provide the desired project goals of treating WET. Additional design requirements include determining the exact footprint required and location of the treatment plant, power requirements, chemical storage, and brine stream residuals management.

3.5.3 Sulfate Bioreactor

Colowyo and Stantec have identified a sulfate bioreactor as a potentially suitable treatment alternative. Stantec will evaluate this system as in-situ and ex-situ alternatives. Both systems treat effluent in the same manner, by reducing and precipitating sulfate, but the in-situ option provides natural insulation for winter conditions and may provide the necessary residence time in a more suitable manner than using tanks above the ground. Additional testing requirements include bench-scale experimentation to verify whether the treatment system will lower SO_4 and TDS concentrations to levels that eliminate WET. Additional design requirements for the ex-situ system include determining the exact footprint required and location of the treatment plant, power requirements, chemical demand and storage, and brine stream management. Additional design requirements for the in-situ system include those listed for the ex-situ system and evaluation of the site soils, geology, and hydrogeology.

3.6 SELECTION OF PREFERRED TREATMENT ALTERNATIVE

Following completion of the additional analyses and testing, Colowyo will select and install the preferred treatment alternative.

4.0 CLOSURE

This report provides the analysis and supporting information needed to evaluate and treat WET at Colowyo's Outfall 010 associated with discharges from the East Taylor Pond. The toxicity assessment provided in this report demonstrates that Colowyo has evaluated WET sources and while treatment options continue to be evaluated, discharged waters can be treated to reduce Na and SO_4 to levels that do not cause exceedances of whole effluent toxicity.

This report has been prepared for Elk Ridge Mining and Reclamation to provide them with a toxicity reduction evaluation to treat waters discharged from the East Taylor Pond. As mutual protection to Colowyo, the public, and Stantec, this report and its figures are submitted for exclusive use by Colowyo. Our report and recommendations should not be reproduced in whole or in part without our express written permission, other than as required in relation to agency review and submittals. The drawings included with the report are for regulatory review and are not intended as detailed construction drawings.

Stantec Consulting Ltd.

Paul Kos, PE

Senior Geological Engineer

Phone: 720-889-6122
paul.kos@stantec.com

5.0 REFERENCES

CDPHE, 2018. Colorado Discharge Permit System (CDPS) Fact Sheet To Permit Number CO0045161, Colowyo Coal Company L.P, Colowyo Coal Mine, Moffat and Rio Blanco Counties. Colorado Department of Public Health & Environment. August 31, 2018.

EPA, 1999. Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants. EPA/833B-99/002. Office of Wastewater Management, United States Environmental Protection Agency, Washington, DC. August 1999.

SeaCrest, 2019. Results of Total Dissolved Solids (TDS) Reduction Testing of the Chronic Toxicity Identification Evaluation (TIE) Conducted for Colowyo Coal Company L.P. on the Colowyo 010A Site. Prepared by SeaCrest Group, Louisville, Colorado. October 31, 2019.

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

March 13, 2020

Submitted via email *eric.mink@state.co.us*

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
Notification of Chronic WET Results – 1Q 2020 and Waiver Request for TIE

Dear Mr. Mink:

On February 28, 2019, the third party laboratory, The SeaCrest Group, provided the enclosed analytical report containing the first quarter 2020 Whole Effluent Toxicity (WET) test results for Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo. Therefore, we are providing the required notification of WET results, in accordance with Part I.D.1.b. of the permit.

Outfall	Species	Reproduction/Growth Results		IWC
		NOEC*	IC25**	
010	*Ceriodaphnia dubia*	60%	59.5%	100%

*NOEC means "no observed effect concentration" at which concentration there are no observable adverse effects on the organisms.
**IC25 means inhibition concentration causing a 25% reduction in the biological measurement.

The Q1 2020 water quality was generally consistent with previous samples, for which a Toxicity Identification Evaluation (TIE) was already conducted. Therefore, the recent TIE and Toxicity Reduction Evaluation also address conditions from Q1 2020. We are requesting written confirmation (email) that no further automatic compliance responses (i.e., separate TIEs or TREs) are required for this outfall.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

Enclosure

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471-11.3(10)a-5

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

February 28, 2020

Angela Aalbers
Colowyo Coal Company
5731 State Highway 13
Meeker, CO 81641

Dear Angela:

Enclosed is the report for chronic biomonitoring tests performed for Colowyo Coal Company on effluent from the 010A discharge. There was statistically significant toxicity to the *Ceriodaphnia dubia* test species at multiple effluent concentrations. The effluent fails WET (Whole Effluent Toxicity) testing requirements for this sampling period.

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

Best regards,

Taylor Couillard-Rodak
WET Laboratory Manager
Enclosure(s): Invoice
Report

500 S. Arthur Avenue, Unit 450 • Louisville, CO 80027 • 303.661.9324 • 303.661.9325 fax • www.seacrestgroup.com

RESULTS OF CHRONIC BIOMONITORING TESTS CONDUCTED FOR COLOWYO COAL COMPANY ON EFFLUENT FROM THE 010A OUTFALL

Prepared for:

Angela Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, CO 81641

Prepared by:

SeaCrest Group
500 S Arthur Ave. Suite 450
Louisville, Colorado 80027-3065
(303) 661-9324

February 28, 2020

TABLE OF CONTENTS

LIST OF TABLES

Chronic Toxicity Test Summary

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

Client: Colowyo Coal Company

Test Procedure Followed:
- *Ceriodaphnia dubia*: EPA/821/R-02-013. Method 1002.0 (2002)
- Fathead minnow: EPA/821/R-02-013. Method 1545.0 (2002)

Sample Number: 420104.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent 1	0850	02-17-2020	1008	02-19-2020
Effluent 2	0745	02-19-2020	0752	02-20-2020
Effluent 3	0835	02-21-2020	1019	02-22-2020

	Ceriodaphnia dubia	Fathead minnow
Test Initiation Time	1510	1620
Test Initiation Date	02-19-2020	02-19-2020
Test Completion Time	1410	1600
Test Completion Date	02-25-2020	02-26-2020

Dilution Water:
- Moderately hard laboratory reconstituted water

Test Organism Source:
- *Ceriodaphnia dubia*
  SeaCrest Group
- Fathead minnow
  SeaCrest Group

Reference Toxicant:
- Sodium Chloride

Abstract of Results

Test Concentrations:	Control (0%), 20%, 40%, 60%, 80%, 100%
Number of Organisms/Concentration:	10 for *Ceriodaphnia dubia* 40 for fathead minnow
Replicates at each Concentration:	10 for *Ceriodaphnia dubia* 4 for fathead minnow

	Ceriodaphnia dubia	Fathead minnow
Test vessel size	30ml	500ml
Exposure volume	15ml	250ml
Pass/Fail Status	**FAIL**	**PASS**
Temperature Range (°C)	24.1 – 25.9	24.1 – 25.9
Dissolved Oxygen Range (mg/L)	6.9 – 8.2	3.5 – 8.6
pH Range	7.8 – 8.3	7.4 – 8.2
	CONTROL (*Cerio*/FHM)	**100%**
Hardness (mg/L as $CaCO_3$)	85/81	782/685/744
Alkalinity (mg/L as $CaCO_3$)	61/64	922/1028/1006
Total residual chlorine (mg/L)	<0.01	<0.01
Total ammonia (mg/L as NH_3)	<0.03	0.32/0.30/0.50

INTRODUCTION

Biomonitoring provides an effective means by which the toxicity of discharges from municipal, industrial, and mining operations can be tested. Among the advantages of biomonitoring is the ability to test complex effluents containing a broad range of contaminants. Biomonitoring, when used in conjunction with chemical analyses, can generate data capable of identifying a much wider range of contaminants.

The Colorado Water Quality Control Division requires certain NPDES permittees to perform acute and/or chronic biomonitoring tests. The chronic test measures significant differences in lethality and in reproduction (*Ceriodaphnia dubia*) or growth (fathead minnow – *Pimephales promelas*) between control and exposed organisms.

The present report discusses the results of chronic biomonitoring tests conducted on effluent from the Colowyo Coal Company 010A discharge. These tests were conducted in accordance with EPA and State of Colorado procedures in February 2020.

MATERIALS AND METHODS

Sample Collection

Two or three gallons of the effluent were collected on three separate dates. Samples were delivered chilled to the SeaCrest lab where they were held at 0-6°C. Chain of custody forms showing sample collection and laboratory arrival times are included (Appendix 1).

Dilution Water

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

Test Organisms

The biomonitoring test used *Ceriodaphnia dubia,* cultured in the SeaCrest laboratory. The organisms are cultured in brood culture boards from which individual females are monitored for survival and reproduction for periods of up to two weeks. Neonates less than 24-hours old, released from third or subsequent broods of eight or more within an 8-hour period, are collected from the brood chambers and used in tests. The animals are fed daily with a mixture of Yeast, Cereal Leaves, and Trout Chow (YCT), produced in-house. This is supplemented with an equal volume of cultured green algae *(Selenastrum capricornutum)* provided by Aquatic Biosystems and Aquatic Research Organisms.

Less than one-day-old fathead minnow, cultured in the laboratory, were also used in the test. Adult fish are maintained in 10-gallon aquaria where females deposit their eggs on the under-surface of split PVC pipe sections. The eggs are collected daily and transferred to aerated containers where they hatch after three to four days. The larval fish are fed newly hatched Brine shrimp *(Artemia* sp.), cultured in-house, at least twice per day.

In-house organisms are tested at least monthly in a reference toxicant test using sodium chloride to monitor overall health and test reproducibility (Appendix 4).

Test Procedures

Upon receipt at the lab, samples are analyzed for alkalinity, hardness, conductivity, dissolved oxygen, ammonia, chlorine, and pH.

Methods used in chemical analysis

Alkalinity	EPA 310.2	Hach 8203	I-2030-85.2
Ammonia	SM4500-NH_3, C-E1997	ASTM D1426-08	
Chlorine	SM4500-Cl D	Hach 10026	
Conductivity	SM2510		
Dissolved Oxygen	SM4500-O	Electrode: G-2001	Winkler (QC): B-F-2001
Hardness	SM2340 B or C	Hach 8213	
pH	SM4500-H+ B-2000		

The test followed procedures in EPA[3] and CDPHE[4] guidelines. Exposure concentrations included control (0%), 20%, 40%, 60%, 80%, and 100% mixtures, diluted with moderately hard laboratory reconstituted water.

Individual *Ceriodaphnia dubia* were placed in 30ml plastic containers containing approximately 15ml of exposure medium. Ten replicates at each concentration were used. The animals were fed daily with the YCT mixture and an equal volume of the green algae *(Selenastrum capricornutum)*. The exposure medium was changed daily in each container and the number of young released overnight were counted and recorded. Young were removed from the containers daily and discarded. Routine measurements were made each day of temperature, dissolved oxygen, and pH before and after the water changes.

Fathead minnow were exposed in 500ml plastic cups to which 250ml of media was replaced daily. Four replicates were used at each concentration. Ten fish, less than 24-hours old, were placed in each cup. The fish were monitored daily for survival and fed live Brine shrimp at least twice per day. After seven days, the fish were removed from the cups, euthanized with isopropyl alcohol, and then placed in aluminum pans and dried in an oven for a minimum of six hours at 100°C. The pans were then weighed on a five-place analytical balance to determine the average dry weight of the fish from each replicate.

Data Analysis

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

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

Variance	Distribution
Bartlett Equality of Variance Test	Shapiro-Wilk W Normality Test

Statistical Difference				
	Survival	Growth	Reproduction	IC_{25}
Ceriodaphnia dubia	Fisher Exact/Bonferroni-Holm Test	N/A	Steel Many-One Rank Sum Test	ICp
Fathead minnow	Dunnett Multiple Comparison Test	Equal Variance t Two-Sample Test	N/A	ICp

RESULTS

Ceriodaphnia dubia 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 10% in the 100% effluent and ranged from 30% - 100% in the remaining effluent concentrations. Control survival was 100%. Statistically significant lethality was measured in the 80% and 100% effluent concentrations when compared to the control. The NOEL (No Observed Effect Level) for lethality was 60% and the LC_{25} (Lethal Concentration 25) for lethality was 65%.

Average number of neonates was 1.1 in the 100% effluent concentration and ranged from 3.2 – 16.5 in the remaining effluent concentrations. Average number of neonates in the control was 18.1 for statistical analyses and test acceptability criteria. Statistically significant differences in the number of neonates were found between the control and the 80% and 100% effluent concentrations. The NOEL for reproduction was 60% and the IC_{25} (Inhibition Concentration 25) for reproduction was 59.5%.

Table 2. Summary of *Ceriodaphnia dubia* test results. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	10	18.1	15	24		
20%	10	16.5	13	18		
40%	10	16.5	11	21		
60%	9	13.5	0	21		
80%	3	3.2	0	11	*	*
100%	1	1.1	0	6	*	*

Fathead minnow Test Results

Fathead minnow results are summarized in Table 3 and are provided on data sheets in Appendix 3. Survival was 75% in the 100% effluent concentration and ranged from 85% - 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 NOEL for lethality was 100% and the LC_{25} for lethality was >100%.

Average weight in the 100% effluent concentration was 0.385mg and ranged from 0.408mg - 0.494mg per individual in the remaining effluent concentrations. Average weight for the control fish was 0.412mg for statistical analyses and test acceptability criteria. No statistically significant differences for growth were measured in any effluent concentration when compared to the control. The NOEL for growth was 100% and the IC_{25} for growth was >100%.

Table 3. Summary of fathead minnow test results. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Alive	Avg. Wt. (mg)	Min.	Max.	Significant Difference	
					Lethality	Growth
Control (0%)	36	0.412	0.340	0.485		
20%	38	0.417	0.362	0.468		
40%	40	0.494	0.340	0.606		
60%	34	0.408	0.256	0.536		
80%	34	0.429	0.298	0.544		
100%	30	0.385	0.299	0.503		

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 4. PMSD for chronic test parameters.

	Survival		Growth		Reproduction	
	Ceriodaphnia dubia	Fathead Minnow	Lower bound	Upper bound	Lower bound	Upper bound
PMSD (% Minimum significant difference)	N/A	N/A	8	35	10	37
			24.7		20.7	

DISCUSSION

A failed test for this discharge occurs when there is an NOEL or IC_{25} less than the IWC (Instream Waste Concentration) of 100%. The NOEL represents the highest effluent concentration at which no statistically significant effect is observed. The IC_{25} represents an estimate of the effluent concentration that would cause a 25 percent reduction of a non-quantal biological measurement. A violation for this discharge occurs when both the NOEL and the IC_{25} are less than the IWC. Since the *Ceriodaphnia dubia* test species demonstrated statistically significant differences meeting these criteria, the discharge fails WET testing requirements for this sampling period.

REFERENCES

1. **Hach Chemical Company.** 2008. *Hach's Water Analysis Handbook.* Fifth Edition. Hach Chemical Company, Loveland, Colorado. Digital Medium.
2. **APHA/AWWA/WEF.** 1998. *Standard Methods for the Examination of Water and Wastewater.* 20th Edition. American Public Health Association, Washington, D.C.
3. **USEPA.** 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA-821-R-02-013. 335 pp.
4. **CDPHE (Colorado Department of Public Health and Environment).** 1998. *Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests.* Water Quality Control Division.
5. **USEPA.** 2000. *Method of Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136). EPA/821/B-00/004.
6. **USEPA.** 2000. *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System Program.* EPA/833/R-00/003.

Appendix 1 – Chain of Custody with Sample Receipt Forms

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: Colowyo Coal Company

P. O./Project Number: OUTFALL 010A

Contact: Andrea Albers

Address: 5731 State Hwy 13 Meeker Co 81621

Phone # 970 824 1219 E-Mail: AALBERS@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
010A	2.17.2020	0850	G	420104.B#1		✓														3	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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
LTFRY7	2.17.2020 1000	UPS		UPS			021920 1008

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 420104.B
Sample #: 1
Date: 021920
Initials: NP

Samples Were:

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

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

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

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

5. Received Within Holding Times Y N
   Notes: within 72 hour maximum hold time

6. Aeration necessary Y N NA
   Notes:

7. Sample Received at Temperature between 0-6° C . Y N NA
   Notes: 5.8 °C

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
   eff: clear, no visible PM

   rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	5.8	8.2	111	8.2	3950				

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

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: Colowyo Coal Company

P. O./Project Number: 010A

Contact: Angela Albers

Address: 3751 Hwy 13 Meeker Co 81621

Phone # 970 824 1219 | E-Mail: AAlbers@tristate.coop

Fax # | Sampler: TFry

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
010A	2.19.2020	0745	G	20104.8 #2		✓														2	Grab

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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	2.19.2020 1000	UPS		UPS		Jean Koivula	022020 0752

SeaCrest Group
, Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 420 OU-B
Date: 02 2020
Sample #: 2
Initials: SR

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

2. Chilled to Ship — Ambient / Chilled (circle one); Wet Ice / Blue Ice (circle one)
Notes:

3. Cooler Received Broken or Leaking — Y / N / NA
Notes:

4. Sample Received Broken or Leaking — Y / N / NA
Notes:

5. Received Within Holding Times — Y / N
Notes:

6. Aeration necessary — Y / N / NA
Notes:

7. Sample Received at Temperature between 0-6° C . — Y / N / NA
Notes: 1.2°c

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
eff: clear, slight PoM
rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	1.2	7.7	104 %	8.2	4080				

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

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: Colowyo Coal Co
P. O./Project Number: Qu Chronic WET Test
Contact: Angela Aalbers
Address: 5731 State HWY 13 Meeker CO 81641
Phone #970-824-1219 E-Mail: aaalbers@tristatehg.org
Fax # Sampler: A. Aalbers
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
010A	2/21/20	0835	Grab	420 104.8 #3		X														2	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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Aalbers	2/21/20 11:30	UPS		UPS		Dan Rainey	02.22.20 @ 1019

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 420 104.B#
Date: 022220
Sample #: #3
Initials: SR

Samples Were:

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

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

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

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

5. Received Within Holding Times
   Notes:
   Y N

6. Aeration necessary
   Notes:
   Y N NA

7. Sample Received at Temperature between 0-6° C
   Notes: 5.9°C
   Y N NA

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
   eff: Clear, Many Poma
   rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	5.9°C	8.0	116	8.0	1090				

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 *Ceriodaphnia dubia* Test

WET TEST REPORT FORM – CHRONIC

Permittee: Colowyo Coal Company **Outfall:** 010A
Permit No.: CO-0045161

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

Test Start Time	Test Start Date	Test End Time	Test End Date
1510	02-19-2020	1410	02-25-2020

Test Results	Lethality/TCP3B	Reproduction/TKP3B
S code: NOEL	60%	60%
	FAIL	**FAIL**
P code: LC_{25}/IC_{25}	65%	59.5%
	FAIL	**FAIL**
T code:	65%	60%

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	90
% Survival for day 2	100	100	100	100	80	50
% Survival for day 3	100	100	100	90	40	30
% Survival for day 4	100	100	100	90	40	20
% Survival for day 5	100	100	100	90	40	10
% Survival for day 6	100	100	100	90	30	10
Mean 3 Brood Total	18.1	16.5	16.5	13.5	3.2	1.1

Hardness (mg/L) – Receiving Water: N/A Effluent: **782/685/744** Recon Water: 85
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 922/1028/1006 Recon Water: 61
Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 7.9/8.0 100%: 8.2/8.2
Total Ammonia as NH_3 (mg/L) - Effluent: 0.32/0.30/0.50

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: Sarah Adler, Margie Glenn, and Daniela Thornton

Signature *Date* 28 February 2020

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Colowyo Lab #: 420 104.B Site: 010A
IWC %: 100 Template #: 5 Dilution Water: MH20 - 004 Sample Date: 021720
Age & Source: cerio 021920 2057 Test Start: 021920 1510 Test End: 022520 1410
Test Conditions:

	0	1	2	3	4	5	6	7	8	Total
(C)	0	0	0	6	10	0	8			24
	0	0	0	5	7	0	9			21
0	0	0	0	4	0	6	6			16
	0	0	0	5	0	7	5			17
	0	0	0	1	0	7	10			18
	0	0	0	4	6	0	8			18
	0	0	0	4	6	0	9			19
	0	0	0	4	0	6	5			15
	0	0	0	3	5	0	8			16
	0	0	0	5	0	5	7			17
DO	7.0	7.0 | 7.1	7.2 | 6.9	7.7 | 7.0	7.2 | 7.1	7.2 | 7.0	7.1			STAT
Temp	24.1	25.3 | 24.1	25.7 | 24.1	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2			18.1
pH	7.9	8.1 | 8.0	8.0 | 8.1	8.0 | 8.2	7.9 | 7.9	8.0 | 7.9	8.0			ACCP
Cond	316	313	315	321	320	320				
(1)	0	0	0	6	5	7	0			18
	0	0	0	4	4	0	6			14
20	0	0	0	0	4	4	7			15
	0	0	0	6	0	6	5			17
	0	0	0	0	4	3	6			13
	0	0	0	4	5	0	7			16
	0	0	0	4	5	0	9			18
	0	0	0	3	0	6	9			18
	0	0	0	4	6	0	8			18
	0	0	0	2	0	7	9			18
DO	7.2	7.0 | 7.2	7.2 | 7.1	7.7 | 7.2	7.2 | 7.2	7.2 | 7.0	7.2			
Temp	24.1	25.3 | 24.1	25.7 | 24.4	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2			16.5
pH	7.9	8.1 | 8.2	8.0 | 8.0	8.0 | 8.2	7.9 | 8.0	8.0 | 8.1	8.0			
Cond	1242	1177	1212	1240	1255	1229				
	0	1	2	3	4	5	6	7	8	Total
(2)	0	0	0	5	6	8	9			19
	0	0	0	0	0	5	6			11
40	0	0	0	4	0	6	7			17
	0	0	0	5	0	8	5			18
	0	0	0	5	0	7	9			21
	0	0	0	4	6	0	7			17
	0	0	0	1	4	0	8			13
	0	0	0	5	0	7	7			19
	0	0	0	3	5	0	6			14
	0	0	0	4	0	5	7			16
DO	7.5	7.0 | 7.3	7.2 | 7.2	7.7 | 7.4	7.2 | 7.3	7.2 | 7.1	7.3			
Temp	24.1	25.3 | 24.1	25.7 | 24.8	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2			16.5
pH	8.0	8.1 | 8.2	8.1 | 8.0	8.0 | 8.2	7.9 | 8.0	8.0 | 8.1	8.1			
Cond	1856	1900	1879	1872	1930	1905				
(3)	0	0	0	5	5	0	9			19
	0	0	0	3	5	0	6			14
60	0	0	0	4	0	7	7			18
	0	0	0	4	0	6	4			14
	0	0	0	2	0	6	7			13
	0	0	0	4	4	0	6			14
	0	0	0	0	5	8	5			21
	0	0	0	3	0	4	7			14
	0	0	0	1	3	0	4			8
	0	0	0	0 D						0 D
DO	7.7	7.1 | 7.4	7.3 | 7.4	7.8 | 7.6	7.3 | 7.4	7.3 | 7.1	7.3			
Temp	24.1	25.3 | 24.1	25.7 | 25.2	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2			13.5
pH	8.1	8.1 | 8.2	8.2 | 7.9	8.1 | 8.1	8.0 | 8.0	8.1 | 8.1	8.1			
Cond	2700	2760	2760	2680	2690	2650				

MG

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0	0	3 4-1	0			4
	0	0	0	2	4	0	5			11
30	0	0	0	0 D						0
	0	0	0 D							0
	0	0	0	0 D						0
	0	0	0	0	4	6	0			10
	0	0	0	0 D						0
	0	0	0	0 D						0
	0	0	0 D							0
	0	0	0	1	0	5 +1	0 D			7
DO	8.0	7.1 | 7.5	7.3 | 7.6	7.8 | 7.8	7.3 | 7.4	7.3 | 7.2	7.4 |			3.2
Temp	24.1	25.3 | 24.1	25.7 | 25.5	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2 |			
pH	8.2	8.1 | 8.2	8.2 | 7.9	8.1 | 8.1	8.0 | 8.0	8.1 | 8.1	8.2 |			
Cond	3330	3360	3420	3430	3360	3410				
(5)	0	0	0 D							0
	0	0	0	0 D						0
100	0	0 D	0							0
	0	0	0	0 D						0
	0	0	0 D							0
	0	0	0	0	2 D					2
	0	0	0	0	3	0 D				3
	0	0	0	0	2	4	0			6
	0	0	0 D							0
	0	0	0 D							0
DO	8.2	7.1 | 7.7	7.3 | 7.7	7.8 | 8.0	7.3 | 7.5	7.3 | 7.2	7.5 |			1.1
Temp	24.1	25.3 | 24.1	25.7 | 25.9	25.3 | 24.8	25.3 | 24.1	25.4 | 24.1	25.2 |			
pH	8.2	8.1 | 8.2	8.3 | 7.8	8.1 | 8.0	8.0 | 8.0	8.1 | 8.1	8.2 |			
Cond	4020	4080	3970	4110	4100	4070				
Algae	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO	ABS/ARO				
YCT	1907	1.707	2001	2001	2001	2001				
H_2O	1	2	1	13	12	3				
Initials	SK	MC	DT	SA	MC	MC	SA			

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	782	685	744				85		
Alkalinity	922	1028	1006				61		
Chlorine	<0.01	<0.01	<0.01				<0.01		
Ammonia	0.32	0.30	0.50				<0.03		

1. Exposure Chamber
   - Total Capacity: 30 ml
   - Test Solution Surface Area: _____ cm^2
   - 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,): active and mobile
6. Comments:

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

1	2	3	4	5	6	7	8	9	10
A5	A9	B3	B7	C6	D2	D3	E4	E5	E9

CETIS Analytical Report

Report Date: 25 Feb-20 16:09 (p 1 of 1)
Test Code/ID: 420104cd / 18-7155-9562

Ceriodaphnia 7-d Survival and Reproduction Test

Not Applicable

Analysis ID:	17-6915-0128	Endpoint:	7d Survival Rate	CETIS Version:	CETISv1.9.6
Analyzed:	25 Feb-20 16:09	Analysis:	STP 2xK Contingency Tables	Status Level:	1
Batch ID:	03-6583-7521	Test Type:	Reproduction-Survival (7d)	Analyst:	Lab Tech
Start Date:	18 Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Mod-Hard Synthetic Water
Ending Date:	25 Feb-20	Species:	Ceriodaphnia dubia	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Branchiopoda	Source:	In-House Culture Age:
Sample ID:	11-7369-5124	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	19 Feb-20	CAS (PC):		Station:	Effluent
Sample Age:	24h	Client:	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	60	80	69.28	1.667

Fisher Exact/Bonferroni-Holm Test

Control	vs	Group	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	1.0000	Exact	1.0000	Non-Significant Effect
		40	1.0000	Exact	1.0000	Non-Significant Effect
		60	0.5000	Exact	1.0000	Non-Significant Effect
		80*	0.0015	Exact	0.0062	Significant Effect
		100*	0.0001	Exact	3.0E-04	Significant Effect

Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	10	0	10	1	0	0.0%
20		10	0	10	1	0	0.0%
40		10	0	10	1	0	0.0%
60		9	1	10	0.9	0.1	10.0%
80		3	7	10	0.3	0.7	70.0%
100		1	9	10	0.1	0.9	90.0%

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test

Not Applicable

Analysis ID:	15-2631-7324	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	25 Feb-20 16:09	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	03-6583-7521	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	18 Feb-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	25 Feb-20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:**
Sample ID:	11-7369-5124	**Code:**	420104.B	**Project:**	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	19 Feb-20	**CAS (PC):**		**Station:**	Effluent
Sample Age:	24h	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	941596	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
LC5	50	43.33	62	2	1.613	2.308
LC10	60	46.67	64	1.667	1.562	2.143
LC15	61.67	50	66	1.622	1.515	2
LC20	63.33	53.33	68	1.579	1.471	1.875
LC25	65	56.67	70	1.538	1.429	1.765
LC40	70	64	80	1.429	1.25	1.562
LC50	73.33	68	83.33	1.364	1.2	1.471

7d Survival Rate Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	D	10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
20		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
40		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
60		10	0.9000	0.0000	1.0000	0.3162	35.14%	10.0%	9/10	0.9	10.0%
80		10	0.3000	0.0000	1.0000	0.4830	161.00%	70.0%	3/10	0.3	70.0%
100		10	0.1000	0.0000	1.0000	0.3162	316.20%	90.0%	1/10	0.1	90.0%

CETIS Analytical Report

Report Date: 25 Feb-20 16:09 (p 1 of 1)
Test Code/ID: 420104cd / 18-7155-9562

Ceriodaphnia 7-d Survival and Reproduction Test

Not Applicable

Analysis ID:	18-0371-9391	Endpoint:	Reproduction	CETIS Version:	CETISv1.9.6
Analyzed:	25 Feb-20 16:09	Analysis:	Nonparametric-Control vs Treatments	Status Level:	1
Batch ID:	03-6583-7521	Test Type:	Reproduction-Survival (7d)	Analyst:	Lab Tech
Start Date:	18 Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Mod-Hard Synthetic Water
Ending Date:	25 Feb-20	Species:	Ceriodaphnia dubia	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Branchiopoda	Source:	In-House Culture Age:
Sample ID:	11-7369-5124	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	19 Feb-20	CAS (PC):		Station:	Effluent
Sample Age:	24h	Client:	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	60	80	69.28	1.667	20.69%

Steel Many-One Rank Sum Test

Control	vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	91.5	75	4	18	CDF	0.4046	Non-Significant Effect
		40	94.5	75	5	18	CDF	0.5100	Non-Significant Effect
		60	77	75	3	18	CDF	0.0654	Non-Significant Effect
		80*	55	75	0	18	CDF	3.8E-04	Significant Effect
		100*	55	75	0	18	CDF	3.8E-04	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2746.08	549.217	5	41.03	<1.0E-37	Significant Effect
Error	722.9	13.387	54			
Total	3468.98		59			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	17.84	15.09	0.0032	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9372	0.9459	0.0041	Non-Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	18.1	16.18	20.02	17.5	15	24	0.8492	14.84%	0.00%
20		10	16.5	15.14	17.86	17.5	13	18	0.6009	11.52%	8.84%
40		10	16.5	14.31	18.69	17	11	21	0.969	18.57%	8.84%
60		10	13.5	9.231	17.77	14	0	21	1.887	44.20%	25.41%
80		10	3.2	-0.03101	6.431	0	0	11	1.428	141.14%	82.32%
100		10	1.1	-0.3485	2.548	0	0	6	0.6403	184.08%	93.92%

Ceriodaphnia 7-d Survival and Reproduction Test

Not Applicable

Analysis ID:	14-8408-8280	Endpoint:	Reproduction	CETIS Version:	CETISv1.9.6
Analyzed:	25 Feb-20 16:09	Analysis:	Linear Interpolation (ICPIN)	Status Level:	1
Batch ID:	03-6583-7521	Test Type:	Reproduction-Survival (7d)	Analyst:	Lab Tech
Start Date:	18 Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Mod-Hard Synthetic Water
Ending Date:	25 Feb-20	Species:	Ceriodaphnia dubia	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Branchiopoda	Source:	In-House Culture Age:
Sample ID:	11-7369-5124	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	19 Feb-20	CAS (PC):		Station:	Effluent
Sample Age:	24h	Client:	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	17147	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	11.31	5.771	46.76	8.84	2.139	17.33
IC10	41.4	11.54	60.72	2.415	1.647	8.663
IC15	47.43	17.31	61.97	2.108	1.614	5.776
IC20	53.47	37.41	63.35	1.87	1.579	2.673
IC25	59.5	46.14	64.78	1.681	1.544	2.167
IC40	65.13	56.53	69.42	1.535	1.44	1.769
IC50	68.64	62.2	73.03	1.457	1.369	1.608

Reproduction Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	10	18.1	15	24	2.685	14.84%	0.0%	18.1	0.0%
20		10	16.5	13	18	1.9	11.52%	8.84%	16.5	8.84%
40		10	16.5	11	21	3.064	18.57%	8.84%	16.5	8.84%
60		10	13.5	0	21	5.968	44.20%	25.41%	13.5	25.41%
80		10	3.2	0	11	4.517	141.10%	82.32%	3.2	82.32%
100		10	1.1	0	6	2.025	184.10%	93.92%	1.1	93.92%

Appendix 3 – Data Sheets for Fathead Minnow Test

WET TEST REPORT FORM – CHRONIC

Permittee: Colowyo Coal Company **Outfall:** 010A
Permit No.: CO-0045161

Test Type: Routine ☒ Accelerated ☐ Screen ☐
Test Species: Fathead minnow **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1620	02-19-2020	1600	02-26-2020

Test Results	Lethality/TCP6C	Growth/TKP6C
S code: NOEL	100%	100%
	PASS	**PASS**
P code: LC_{25}/IC_{25}	>100%	>100%
	PASS	**PASS**
T code:	>100%	>100%

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	98	98
% Survival for day 2	93	100	100	90	93	93
% Survival for day 3	93	95	100	90	85	90
% Survival for day 4	93	95	100	88	85	83
% Survival for day 5	93	95	100	88	85	78
% Survival for day 6	90	95	100	88	85	75
% Survival for day 7	90	95	100	85	85	75
Mean Dry Wt. (mg)	0.412	0.417	0.494	0.408	0.429	0.385

Hardness (mg/L) – Receiving Water: N/A Effluent: 782/685/744 Recon Water: 81
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 922/1028/1006 Recon Water: 64
Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 8.0/7.8 100%: 8.1/8.1
Total Ammonia as NH_3 (mg/L) - Effluent: 0.32/0.30/0.50

Were all Test Conditions in Conformance with Division Guidelines? YES ☐ NO ☒
If **NO**, list deviations from test specifications: DO fell below 4.0 mg/L in overnight test chambers.

Laboratory: SeaCrest Group
Comments:
Analyst's Name: Sean Rainey and Daniel Hillenburg

Signature [signature] *Date* 28 February 2020

SeaCrest Group
Louisville, CO

Fathead Minnow Chronic Benchsheet

Form #: 103a
Effective: January 2009

Client: COLOWWD Site: 010A Lab #: 420 104-B Sample Date: 022720 WC: 100 Dilution H_2O: MH20-008
Test Start: 022720 - 1620 Test End: 022820 - 1600 Species Info: FHM-0219 Template Test Conditions

Conc	Read	0	1		2		3		4		5		6		7
0	DO	8.3	5.6	6.8	6.6	6.6	5.2	6.8	4.7	6.8	5.2	6.8	5.5	7.4	5.1
	Temp	24.1	24.1	24.1	24.5	24.1	24.2	24.1	24.4	25.1	24.1	24.9	24.1	24.1	24.2
	pH	8.0	7.7	8.0	7.7	8.2	7.9	8.2	7.7	8.1	7.4	8.0	7.6	8.1	7.8
	Cond	320	315		320		320		318		317		320		
20	DO	8.3	5.6	7.0	6.1	6.8	5.0	7.0	4.6	7.0	5.0	6.8	5.3	7.4	4.9
	Temp	24.1	24.2	24.2	24.6	24.1	24.6	24.1	24.4	25.1	24.1	25.1	24.3	24.1	24.2
	pH	8.2	7.7	8.2	7.7	8.1	7.9	8.1	7.8	8.1	7.5	8.0	7.7	8.0	7.9
	Cond	1158	1106		1170		1157		1137		1160		1042		
40	DO	8.4	5.6	7.5	5.7	6.8	4.5	7.4	4.5	7.1	4.7	6.9	4.9	7.5	4.7
	Temp	24.1	24.3	24.3	24.8	24.1	24.6	24.1	24.3	25.2	24.1	25.3	24.5	24.1	24.2
	pH	8.2	7.8	8.2	7.8	8.0	8.0	8.1	7.9	8.1	7.6	8.0	7.8	7.9	8.0
	Cond	1871	1856		1900		1867		1934		1900		1836		
60	DO	8.5	5.7	7.5	5.3	6.9	4.5	7.6	4.3	7.2	4.5	7.0	4.5	7.6	4.5
	Temp	24.1	24.3	24.3	24.8	24.1	24.8	24.1	24.3	25.3	24.1	25.3	24.7	24.1	24.1
	pH	8.2	7.9	8.2	7.9	7.9	8.1	8.2	8.0	8.1	7.6	8.0	7.8	7.9	8.0
	Cond	2630	2620		2680		2641		2700		2630		2650		
80	DO	8.6	5.7	8.0	4.9	6.9	3.5	7.8	4.2	7.4	4.3	7.1	3.9	7.7	4.3
	Temp	24.1	24.4	24.4	25.0	24.1	24.9	24.1	24.2	25.4	24.1	25.7	24.9	24.1	24.1
	pH	8.2	8.0	8.1	8.0	7.9	8.2	8.1	8.1	8.1	7.7	8.0	7.9	7.9	8.1
	Cond	3280	3340		3330		3330		3310		3368		3380		
100	DO	8.6	5.7	8.4	4.5	6.9	3.5	8.1	4.1	7.3	4.1	7.1	3.6	7.7	4.1
	Temp	24.1	24.5	24.5	25.2	24.1	25.0	24.1	24.2	25.5	24.1	25.9	25.0	24.1	24.1
	pH	8.1	8.0	8.1	8.0	7.9	8.2	8.1	8.2	8.1	7.8	8.0	8.0	7.9	8.1
	Cond	3920	3900*		3910		3890		3930		3910		3930		
	DO														
	Temp														
	pH														
	Cond														
Initials		SR	SR		SR		SR		DH		DH		SR		DH
Water #		1	1		1		2		3		3		2		
CO_2															

	Eff 1	Eff 2	Eff 3	Rcv 1	Rcv 2	Rcv 3	Recon	Recon
Hard	782	685	744				81	
Alk	922	1028	1006				64	
Chlor	<0.01	<0.01	<0.01				<0.01	
NH_3	0.32	0.30	0.36				<0.03	
NH_3								

Exposure Chamber

Total Capacity:	500 mL
Test Solution Volume:	250 mL
Test Solution Surface Area:	50.24 cm
Water Depth (constant):	6.5 cm
(cyclic):	to ____ cm

Screened Animal Enclosures
Not Used: x
Used: ____ cm Diameter

Feeding	0	1	2	3	4	5	6	7
AM		✓	✓	✓	✓	✓	✓	✓
Initials		SR	SR	SR	DH	DH	SR	DH
PM	✓	✓	✓	✓	✓	✓	✓	
Initials	SR	SR	SR	SR	DH	DH	SR	

	0	1	2	3	4	5	6	7	#	Fish & Tare	Tare	Fish Wt mg	Ave wt
	10	10	10	10	10	10	9	9	#1	1.13314	1.12918	0.396	STAT
	10	10	9	9	9	9	9	9	#2	1.14416	1.13990	0.426	0.412
	10	10	10	10	10	10	10	10	#3	1.15726	1.15241	0.485	ACCP
	10	10	8	8	8	8	8	8	#4	1.12849	1.12509	0.340	
	10	10	10	9	9	9	9	9	#5	1.15246	1.14831	0.415	
	10	10	10	10	10	10	10	10	#6	1.15386	1.15024	0.362	
	10	10	10	10	10	10	10	10	#7	1.13622	1.13198	0.424	
	10	10	10	9	9	9	9	9	#8	1.14124	1.13656	0.468	0.417
	10	10	10	10	8	8	10	10	#9	1.16199	1.15741	0.458	
	10	10	10	10	10	10	10	10	#10	1.13416	1.12891	0.606	
	10	10	10	10	10	10	10	10	#11	1.13219	1.12646	0.573	
	10	10	10	10	10	10	10	10	#12	1.13608	1.13268	0.340	0.494
	10	10	7	7	7	7	7	6	#13	1.12851	1.12595	0.256	
	10	10	10	10	9	9	9	9	#14	1.13013	1.12644	0.369	
	10	10	9	9	9	9	9	9	#15	1.15585	1.15115	0.470	
	10	10	10	10	10	10	10	10	#16	1.15199	1.14663	0.536	0.408
	10	9	9	7	7	7	7	7	#17	1.15710	1.15412	0.298	
	10	10	10	10	10	10	10	10	#18	1.13961	1.13473	0.488	
	10	10	8	7	7	7	7	7	#19	1.13266	1.12881	0.385	
	10	10	10	10	10	10	10	10	#20	1.12681	1.12137	0.544	0.429
	10	9	9	8	7	7	7	7	#21	1.15840	1.15469	0.371	
	10	10	8	8	6	6	6	6	#22	1.16099	1.15800	0.299	
	10	11	10	10	10	9	9	9	#23	1.13348	1.12845	0.503	
	10	10	10	10	10	9	8	8	#24	1.13368	1.13002	0.366	0.385
	10												
	10												
	10												
	10												
	10								pretest	#25	1.14908	1.14900	

Condition/appearance of surviving organisms and Comments
Mobile and active
*3920 *10-8

Feeding Schedule
Not Fed:
Fed Daily: 2x/day
Fed Irregularly:
(describe):
Food Used: <24hr Artemia

Aeration:
None: ____
@ ~ 100 bubbles/min
Before Use #1: ____ minutes
Before Use #2: ____ minutes
Before Use #3: ____ minutes

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — SeaCrest Group

Analysis ID:	14-2727-0194	Endpoint:	7d Survival Rate	CETIS Version:	CETISv1.9.6
Analyzed:	27 Feb-20 13:19	Analysis:	Parametric-Control vs Treatments	Status Level:	1
Batch ID:	17-6698-8174	Test Type:	Growth-Survival (7d)	Analyst:	
Start Date:	19 Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Reconstituted Water
Ending Date:	25 Feb-20	Species:	Pimephales promelas	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Actinopterygii	Source:	In-House Culture Age:
Sample ID:	03-5379-7820	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	18 Feb-20	CAS (PC):		Station:	010A
Sample Age:	24h	Client:	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	100	>100	n/a	1	23.48%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	-0.67	2.4	0.28	6	CDF	0.9592	Non-Significant Effect
		40	-1.4	2.4	0.28	6	CDF	0.9941	Non-Significant Effect
		60	0.48	2.4	0.28	6	CDF	0.6549	Non-Significant Effect
		80	0.46	2.4	0.28	6	CDF	0.6645	Non-Significant Effect
		100	1.7	2.4	0.28	6	CDF	0.1666	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.296382	0.0592763	5	2.3	0.0921	Non-Significant Effect
Error	0.47151	0.026195	18			
Total	0.767892		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Levene Equality of Variance Test	4.3	4.2	0.0095	Unequal Variances
	Mod Levene Equality of Variance Test	2.7	4.2	0.0522	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.95	0.88	0.3455	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.90	0.77	1.00	0.90	0.80	1.00	0.04	9.07%	0.00%
20		4	0.95	0.86	1.00	0.95	0.90	1.00	0.03	6.08%	-5.56%
40		4	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00%	-11.11%
60		4	0.85	0.57	1.00	0.90	0.60	1.00	0.09	20.38%	5.56%
80		4	0.85	0.57	1.00	0.85	0.70	1.00	0.09	20.38%	5.56%
100		4	0.75	0.54	0.96	0.75	0.60	0.90	0.07	17.21%	16.67%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.3	1.1	1.5	1.2	1.1	1.4	0.062	9.93%	0.00%
20		4	1.3	1.2	1.5	1.3	1.2	1.4	0.047	7.07%	-6.08%
40		4	1.4	1.4	1.4	1.4	1.4	1.4	0	0.00%	-12.57%
60		4	1.2	0.85	1.6	1.2	0.89	1.4	0.11	18.54%	4.41%
80		4	1.2	0.81	1.6	1.2	0.99	1.4	0.12	20.22%	4.20%
100		4	1.1	0.81	1.3	1	0.89	1.2	0.078	14.73%	15.62%

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test

SeaCrest Group

Analysis ID:	05-7623-8548	Endpoint:	7d Survival Rate	CETIS Version:	CETISv1.9.6
Analyzed:	27 Feb-20 13:19	Analysis:	Linear Interpolation (ICPIN)	Status Level:	1
Batch ID:	17-6698-8174	Test Type:	Growth-Survival (7d)	Analyst:	
Start Date:	19 ~~18~~ Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Reconstituted Water
Ending Date:	~~25~~ 26 Feb-20	Species:	Pimephales promelas	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Actinopterygii	Source:	In-House Culture Age:
Sample ID:	03-5379-7820	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	~~18~~ 19 Feb-20	CAS (PC):		Station:	010A
Sample Age:	24h	Client:	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1165782	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
LC5	49.5	42	106	2.02	0.9455	2.38
LC10	59	44.2	117	1.695	0.8553	2.262
LC15	88.5	34.3	n/a	1.13	n/a	2.915
LC20	98	36.4	n/a	1.02	n/a	2.747
LC25	>100	n/a	n/a	<1	n/a	n/a
LC40	>100	n/a	n/a	<1	n/a	n/a
LC50	>100	n/a	n/a	<1	n/a	n/a

7d Survival Rate Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	D	4	0.900	0.800	1.000	0.082	9.07%	0.0%	36/40	0.95	0.0%
20		4	0.950	0.900	1.000	0.058	6.08%	-5.56%	38/40	0.95	0.0%
40		4	1.000	1.000	1.000	0.000	0.00%	-11.1%	40/40	0.95	0.0%
60		4	0.850	0.600	1.000	0.173	20.40%	5.56%	34/40	0.85	10.5%
80		4	0.850	0.700	1.000	0.173	20.40%	5.56%	34/40	0.85	10.5%
100		4	0.750	0.600	0.900	0.129	17.20%	16.7%	30/40	0.75	21.1%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.900	0.900	1.000	0.800
20		0.900	1.000	1.000	0.900
40		1.000	1.000	1.000	1.000
60		0.600	0.900	0.900	1.000
80		0.700	1.000	0.700	1.000
100		0.700	0.600	0.900	0.800

Fathead Minnow 7-d Larval Survival and Growth Test

SeaCrest Group

Analysis ID:	06-6174-8453	Endpoint:	Mean Dry Biomass-mg	CETIS Version:	CETISv1.9.6
Analyzed:	27 Feb-20 13:41	Analysis:	Parametric-Two Sample	Status Level:	1
Batch ID:	17-6698-8174	Test Type:	Growth-Survival (7d)	Analyst:	
Start Date:	19 ~~18~~ Feb-20	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Reconstituted Water
Ending Date:	25 ~~25~~ Feb-20	Species:	Pimephales promelas	Brine:	Not Applicable
Test Length:	7d 0h	Taxon:	Actinopterygii	Source:	In-House Culture Age:
Sample ID:	03-5379-7820	Code:	420104.B	Project:	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	Material:	POTW Effluent	Source:	NPDES Permit # (XX99999999)
Receipt Date:	19 ~~18~~ Feb-20	CAS (PC):		Station:	010A
Sample Age:	24h	Client:	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	24.69%

Equal Variance t Two-Sample Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	-0.148	1.94	0.072	6	CDF	0.5562	Non-Significant Effect
		40	-1.22	1.94	0.131	6	CDF	0.8661	Non-Significant Effect
		60	0.0586	1.94	0.133	6	CDF	0.4776	Non-Significant Effect
		80	-0.272	1.94	0.121	6	CDF	0.6028	Non-Significant Effect
		100	0.516	1.94	0.102	6	CDF	0.3121	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.027829	0.0055658	5	0.615	0.6901	Non-Significant Effect
Error	0.162975	0.0090542	18			
Total	0.190804		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	3.81	15.1	0.5776	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.957	0.884	0.3737	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.412	0.316	0.508	0.411	0.34	0.485	0.0302	14.68%	0.00%
20		4	0.417	0.348	0.486	0.419	0.362	0.468	0.0218	10.43%	-1.33%
40		4	0.494	0.302	0.687	0.515	0.34	0.606	0.0604	24.45%	-20.04%
60		4	0.408	0.213	0.602	0.42	0.256	0.536	0.0611	29.99%	0.97%
80		4	0.429	0.255	0.603	0.436	0.298	0.544	0.0546	25.48%	-4.13%
100		4	0.385	0.249	0.521	0.369	0.299	0.503	0.0427	22.19%	6.56%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.396	0.426	0.485	0.34
20		0.415	0.362	0.424	0.468
40		0.458	0.606	0.573	0.34
60		0.256	0.369	0.47	0.536
80		0.298	0.488	0.385	0.544
100		0.371	0.299	0.503	0.366

Fathead Minnow 7-d Larval Survival and Growth Test

SeaCrest Group

Analysis ID:	19-9632-9423	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	27 Feb-20 13:41	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	17-6698-8174	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	19 ~~18~~ Feb-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	26 ~~25~~ Feb-20	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:**
Sample ID:	03-5379-7820	**Code:**	420104.B	**Project:**	WET Quarterly Compliance Test (1Q)
Sample Date:	17 Feb-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	19 ~~18~~ Feb-20	**CAS (PC):**		**Station:**	010A
Sample Age:	24h	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1803669	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	59.3	8.17	n/a	1.686	n/a	12.24
IC10	92.7	22	n/a	1.079	n/a	4.539
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Mean Dry Biomass-mg Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	4	0.412	0.34	0.485	0.0605	14.70%	0.0%	0.441	0.0%
20		4	0.417	0.362	0.468	0.0435	10.40%	-1.33%	0.441	0.0%
40		4	0.494	0.34	0.606	0.121	24.40%	-20.0%	0.441	0.0%
60		4	0.408	0.256	0.536	0.122	30.00%	0.97%	0.418	5.18%
80		4	0.429	0.298	0.544	0.109	25.50%	-4.13%	0.418	5.18%
100		4	0.385	0.299	0.503	0.0854	22.20%	6.56%	0.385	12.8%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.396	0.426	0.485	0.34
20		0.415	0.362	0.424	0.468
40		0.458	0.606	0.573	0.34
60		0.256	0.369	0.47	0.536
80		0.298	0.488	0.385	0.544
100		0.371	0.299	0.503	0.366

Appendix 4 – QA/QC and Reference Toxicant Test Charts

SeaCrest Group

Quality Assurance Check List – Chronic Whole Effluent Toxicity Test

Client: Colowyo Coal Company **SeaCrest Sample No.:** 420104.B

Species Tested: *Ceriodaphnia dubia* and fathead minnow

Start Date of Test (*Ceriodaphnia dubia*)	Start Date of Test (Fathead minnow)
02-19-2020	02-19-2020

Sample received in lab properly preserved (0-6°C)?	Y
Sample received at laboratory within 36 hours of collection?	N*
Sample delivered on ice or equivalent?	Y
Test initiated within 36-hours of collection?	N*
Test protocol conforms to CDPHE guidelines (*Ceriodaphnia dubia*)?	Y
Test protocol conforms to CDPHE guidelines (fathead minnow)?	Y
Average test temp. ±1°C (*Ceriodaphnia dubia*)?	Y
Average test temp. ±1°C (fathead minnow)?	Y
DO level ≥4.0mg/L; no super-saturation (*Ceriodaphnia dubia*)?	Y
DO level ≥4.0mg/L; no super-saturation (fathead minnow)?	N**
Survival in control ≥90%, ≥80% for chronic (*Ceriodaphnia dubia*)?	Y
Survival in control ≥90%, ≥80% for chronic (fathead minnow)?	Y
Ceriodaphnia dubia neonates <24-hours old?	Y
Fathead minnow larvae <24-hours old?	Y
Appropriate reference toxicity test conducted?	Y
Lab. Ref. Tox. test results within the confidence limits for the lab?	Y

* Sample #1 was received outside of the 36 hour hold time, but within the maximum 72 hour hold time. Sample was sufficiently chilled by client.

** DO fell below 4.0 mg/L in overnight test chambers.

Signature _____ *Date* 28 February 2020

Position: WET Laboratory Manager

SeaCrestGroup
An Environmental Services Company

METHOD QC

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	1/7/2020	100.00%	100.00%	2.12%	± 5.00%
2320 B	Alkalinity - Total	1/13/2020	96.00%	101.20%	0.00%	± 5.00%
2320 B	Alkalinity - Total	1/20/2020	98.40%	98.96%	-0.89%	± 5.00%
2320 B	Alkalinity - Total	1/27/2020	96.00%	98.65%	-3.43%	± 5.00%
4500 NH_3 D	Ammonia	1/10/2020	95.80%	96.66%	-1.18%	± 10.00%
4500 NH_3 D	Ammonia	1/14/2020	96.05%	97.20%	-3.49%	± 10.00%
4500 NH_3 D	Ammonia	1/22/2020	98.60%	94.80%	-0.14%	± 10.00%
4500 NH_3 D	Ammonia	1/24/2020	103.60%	104.80%	-2.38%	± 10.00%
4501 NH_3 D	Ammonia	1/29/2020	103.20%	95.98%	-0.77%	± 10.00%
4500 Cl D	Chlorine	1/21/2020	103.13%	106.25%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	1/8/2020	98.25%	99.82%	-0.98%	± 5.00%
2340 B	Hardness - Total	1/14/2020	98.20%	100.00%	-2.04%	± 5.00%
2340 B	Hardness - Total	1/21/2020	100.00%	101.00%	1.77%	± 5.00%
2340 B	Hardness - Total	1/29/2020	100.00%	100.79%	0.47%	± 5.00%

		Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	1/3/2020	N/A	98.59%	98.59%	± 5.00%
4500 O	DO - Winkler	1/7/2020	N/A	98.55%	98.55%	± 5.00%
4500 O	DO - Winkler	1/16/2020	N/A	100.00%	98.53%	± 5.00%
4500 O	DO - Winkler	1/27/2020	N/A	100.01%	100.00%	± 5.00%

		Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	1/20/2020	100.00025%	0.03%	107.20%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	1/20/2020	100.00095%	0.00%	97.15%	±20%, ± 15%

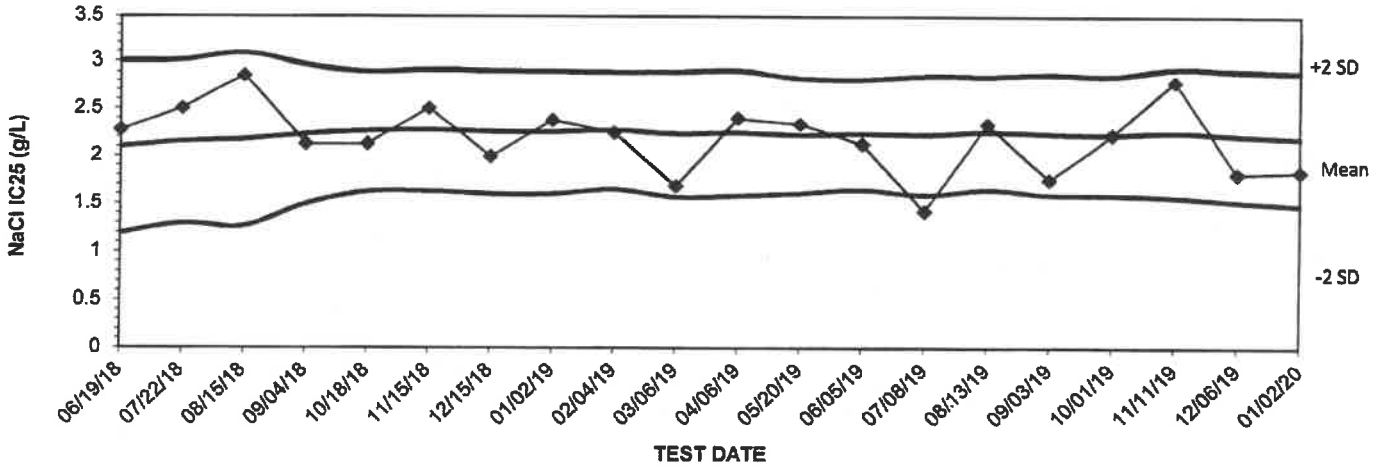
Signature: Kara Olivia

Date: 1/31/2020

Signature:

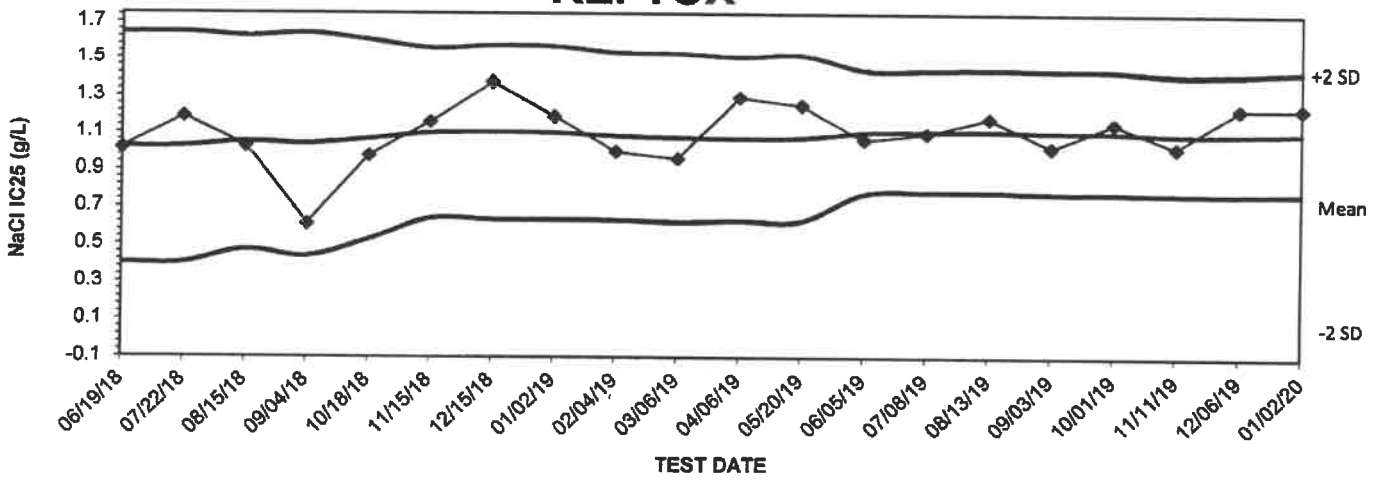
Date: 31 January 2020

CERIODAPHNIA SURVIVAL IC25 NaCl REFTOX



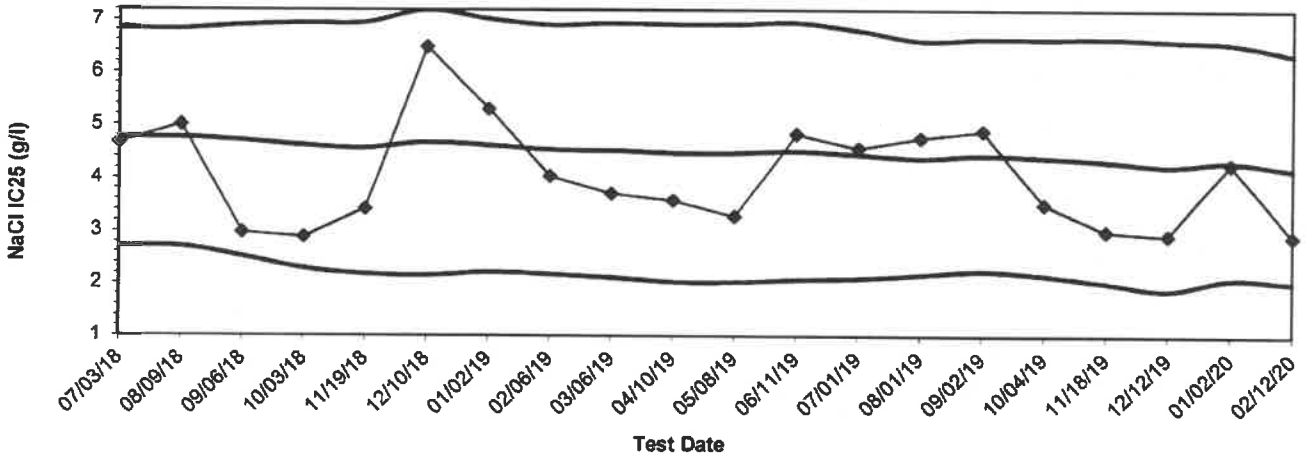
Date	IC25	Mean	-2 SD	+2 SD
06/19/18	2.2692	2.0957	1.1883	3.0032
07/22/18	2.5000	2.1497	1.2907	3.0086
08/15/18	2.8571	2.1726	1.2640	3.0812
09/04/18	2.1250	2.2258	1.4889	2.9627
10/18/18	2.1250	2.2599	1.6218	2.8979
11/15/18	2.5000	2.2725	1.6261	2.9188
12/15/18	1.9924	2.2520	1.5983	2.9057
01/02/19	2.3745	2.2498	1.5982	2.9014
02/04/19	2.2423	2.2693	1.6462	2.8924
03/06/19	1.6792	2.2302	1.5662	2.8942
04/06/19	2.3947	2.2431	1.5772	2.9089
05/20/19	2.3330	2.2195	1.6078	2.8311
06/05/19	2.1250	2.2334	1.6457	2.8210
07/08/19	1.4167	2.2234	1.5876	2.8592
08/13/19	2.3333	2.2495	1.6450	2.8541
09/03/19	1.7500	2.2317	1.5906	2.8727
10/01/19	2.2190	2.2220	1.5869	2.8572
11/11/19	2.7910	2.2438	1.5629	2.9248
12/06/19	1.8120	2.2111	1.5158	2.9063
01/02/20	1.8330	2.1831	1.4761	2.8900

CERIODAPHNIA REPRODUCTION IC25 NaCl
REFTOX



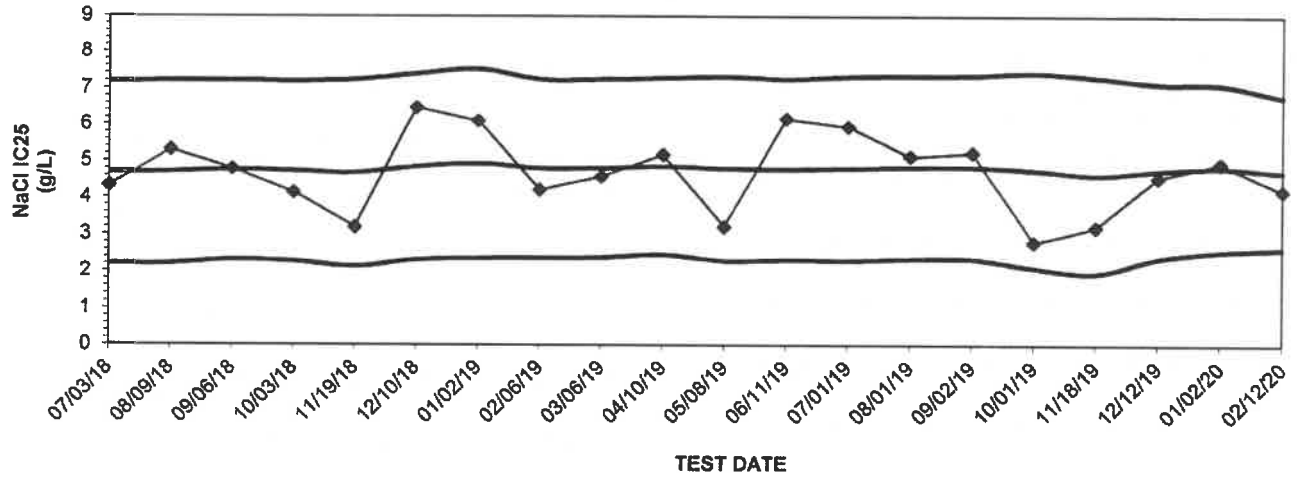
Date	IC25	Mean	-2 SD	+2 SD
06/19/18	1.0137	1.0217	0.4008	1.6425
07/22/18	1.1886	1.0234	0.4008	1.6460
08/15/18	1.0246	1.0483	0.4711	1.6255
09/04/18	0.6078	1.0377	0.4356	1.6398
10/18/18	0.9733	1.0632	0.5239	1.6026
11/15/18	1.1578	1.0979	0.6375	1.5584
12/15/18	1.3741	1.1028	0.6324	1.5733
01/02/19	1.1897	1.1007	0.6324	1.5690
02/04/19	0.9971	1.0817	0.6299	1.5335
03/06/19	0.9597	1.0739	0.6192	1.5286
04/06/19	1.2943	1.0687	0.6275	1.5098
05/20/19	1.2523	1.0731	0.6262	1.5200
06/05/19	1.0625	1.1043	0.7718	1.4369
07/08/19	1.0976	1.1102	0.7829	1.4376
08/13/19	1.1825	1.1125	0.7837	1.4412
09/03/19	1.0209	1.1060	0.7752	1.4367
10/01/19	1.1530	1.1050	0.7750	1.4351
11/11/19	1.0220	1.0921	0.7709	1.4132
12/06/19	1.2340	1.0938	0.7698	1.4178
01/02/20	1.2370	1.1021	0.7722	1.4321

FHM SURVIVAL IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
07/03/18	4.6667	4.7709	2.7030	6.8387
08/09/18	5.0040	4.7651	2.7007	6.8294
09/06/18	2.9714	4.7066	2.5096	6.9036
10/03/18	2.8846	4.6130	2.2785	6.9475
11/19/18	3.4074	4.5641	2.1716	6.9566
12/10/18	6.4714	4.6726	2.1478	7.1974
01/02/19	5.3000	4.6168	2.2099	7.0237
02/06/19	4.0378	4.5386	2.1704	6.9069
03/06/19	3.7006	4.5270	2.1107	6.9432
04/10/19	3.5725	4.4785	2.0291	6.9279
05/08/19	3.2727	4.4779	2.0273	6.9286
06/11/19	4.8330	4.5167	2.0721	6.9613
07/01/19	4.5714	4.4518	2.0981	6.8055
08/01/19	4.7632	4.3831	2.1680	6.5982
09/02/19	4.8920	4.4388	2.2377	6.6400
10/04/19	3.5000	4.3948	2.1577	6.6319
11/18/19	3.0000	4.3304	2.0157	6.6451
12/12/19	2.9230	4.2327	1.8683	6.5972
01/02/20	4.2730	4.3146	2.0847	6.5445
02/12/20	2.9000	4.1690	2.0112	6.3269

FHM GROWTH IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
07/03/18	4.3186	4.6879	2.1990	7.1768
08/09/18	5.3043	4.7061	2.2045	7.2078
09/06/18	4.7865	4.7629	2.3137	7.2122
10/03/18	4.1318	4.7278	2.2638	7.1917
11/19/18	3.1832	4.6770	2.1291	7.2249
12/10/18	6.4714	4.8436	2.3063	7.3809
01/02/19	6.0965	4.9313	2.3525	7.5101
02/06/19	4.2083	4.8042	2.3693	7.2390
03/06/19	4.5795	4.8091	2.3766	7.2416
04/10/19	5.1689	4.8637	2.4540	7.2734
05/08/19	3.1977	4.8012	2.2871	7.3152
06/11/19	6.1639	4.7836	2.3157	7.2516
07/01/19	5.9415	4.8088	2.3034	7.3142
08/01/19	5.1270	4.8424	2.3399	7.3449
09/02/19	5.2270	4.8440	2.3405	7.3474
10/01/19	2.7880	4.7576	2.0987	7.4165
11/18/19	3.1860	4.6211	1.9471	7.2950
12/12/19	4.5530	4.7439	2.3593	7.1285
01/02/20	4.9410	4.8270	2.5500	7.1041
02/12/20	4.1900	4.6963	2.6215	6.7710

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

July 20, 2020

Submitted via email jacob.dyste@state.co.us.

Mr. Jacob Dyste
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: CDPS Permit #CO-0045161
Colowyo Mine, Outfall 010
Notification of Chronic WET Results – 2Q 2020

Dear Mr. Dyste:

On June 29, 2019, the third party laboratory, The SeaCrest Group, provided the enclosed analytical report containing the second quarter 2020 Whole Effluent Toxicity (WET) test results for Outfall 010 at the Colowyo Coal Company, LP (Colowyo) Colowyo Mine (CDPS Permit #CO-0045161). Tri-State Generation and Transmission Association (Tri-State) is the parent of Colowyo. Therefore, we are providing the required notification of WET results, in accordance with Part I.D.1.b. of the permit.

Outfall	Species	Reproduction/Growth Results		IWC
		NOEC*	IC25**	
010	*Ceriodaphnia dubia*	40%	41.4%	100%

*NOEC means "no observed effect concentration" at which concentration there are no observable adverse effects on the organisms.
**IC25 means inhibition concentration causing a 25% reduction in the biological measurement.

The facility's Colorado Discharge Permit System (CDPS) permit was recently amended on May 29, 2020 to remove the automatic compliance responses (Toxicity Identification Evaluation and Toxicity Reduction Evaluation). Therefore, we will be continuing the progress on addressing site conditions by the 2023 deadline.

If you have any questions on this submittal, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Chris Gilbreath at 303-254-3291 (cgilbreath@tristategt.org).

Sincerely,

DocuSigned by:
Barbara Walz
A5D5C24494CD4A7...

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:der

Enclosure

cc: Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471-11.3(10)a-5

SeaCrestGroup
AN ENVIRONMENTAL SERVICES COMPANY

June 29, 2020

Angela Aalbers
Colowyo Coal Company
5731 State Highway 13
Meeker, CO 81641

Dear Angela:

Enclosed is the report for chronic biomonitoring tests performed for Colowyo Coal Company on effluent from the 010A discharge. There was statistically significant toxicity to the both test species at multiple effluent concentrations. The effluent fails WET (Whole Effluent Toxicity) testing requirements for this sampling period.

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

Best regards,

Taylor Couillard-Rodak
WET Laboratory Manager
Enclosure(s): Invoice
Report

RESULTS OF CHRONIC BIOMONITORING TESTS CONDUCTED FOR COLOWYO COAL COMPANY ON EFFLUENT FROM THE 010A OUTFALL

Prepared for:

Angela Aalbers
Colowyo Coal Company
5731 State Hwy 13
Meeker, CO 81641

Prepared by:

SeaCrest Group
500 S Arthur Ave. Suite 450
Louisville, Colorado 80027-3065
(303) 661-9324

June 29, 2020

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LIST OF TABLES

Chronic Toxicity Test Summary

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

Client: Colowyo Coal Company

Test Procedure Followed:
- *Ceriodaphnia dubia*: EPA/821/R-02-013. Method 1002.0 (2002)
- Fathead minnow: EPA/821/R-02-013. Method 1545.0 (2002)

Sample Number: 420265.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent 1	0830	06-15-2020	1713	06-15-2020
Effluent 2	0730	06-17-2020	0850	06-18-2020
Effluent 3	0750	06-19-2020	0847	06-20-2020

	Ceriodaphnia dubia	Fathead minnow
Test Initiation Time	1300	1225
Test Initiation Date	06-16-2020	06-16-2020
Test Completion Time	1200	1240
Test Completion Date	06-22-2020	06-23-2020

Dilution Water:
- Moderately hard laboratory reconstituted water

Test Organism Source:
- *Ceriodaphnia dubia*
  SeaCrest Group
- Fathead minnow
  SeaCrest Group

Reference Toxicant:
- Sodium Chloride

Abstract of Results

Test Concentrations:	Control (0%), 20%, 40%, 60%, 80%, 100%
Number of Organisms/Concentration:	10 for *Ceriodaphnia dubia* 40 for fathead minnow
Replicates at each Concentration:	10 for *Ceriodaphnia dubia* 4 for fathead minnow

	Ceriodaphnia dubia	**Fathead minnow**
Test vessel size	30ml	500ml
Exposure volume	15ml	250ml
Pass/Fail Status	**FAIL**	**PASS**
Temperature Range (°C)	24.1 – 25.9	24.4 – 25.9
Dissolved Oxygen Range (mg/L)	6.5 – 8.0	3.0 – 7.8
pH Range	7.9 – 8.3	7.7 – 8.3
	CONTROL (*Cerio*/FHM)	**100%**
Hardness (mg/L as $CaCO_3$)	84/88	802/786/872
Alkalinity (mg/L as $CaCO_3$)	61/57	950/890/1155
Total residual chlorine (mg/L)	<0.01	0.01/<0.01/<0.01
Total ammonia (mg/L as NH_3)	<0.03	0.14/0.11/.30

INTRODUCTION

Biomonitoring provides an effective means by which the toxicity of discharges from municipal, industrial, and mining operations can be tested. Among the advantages of biomonitoring is the ability to test complex effluents containing a broad range of contaminants. Biomonitoring, when used in conjunction with chemical analyses, can generate data capable of identifying a much wider range of contaminants.

The Colorado Water Quality Control Division requires certain NPDES permittees to perform acute and/or chronic biomonitoring tests. The chronic test measures significant differences in lethality and in reproduction (*Ceriodaphnia dubia*) or growth (fathead minnow – *Pimephales promelas*) between control and exposed organisms.

The present report discusses the results of chronic biomonitoring tests conducted on effluent from the Colowyo Coal Company 010A discharge. These tests were conducted in accordance with EPA and State of Colorado procedures in June 2020.

MATERIALS AND METHODS

Sample Collection

Two or three gallons of the effluent were collected on three separate dates. Samples were delivered chilled to the SeaCrest lab where they were held at 0-6°C. Chain of custody forms showing sample collection and laboratory arrival times are included (Appendix 1).

Dilution Water

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

Test Organisms

The biomonitoring test used *Ceriodaphnia dubia,* cultured in the SeaCrest laboratory. The organisms are cultured in brood culture boards from which individual females are monitored for survival and reproduction for periods of up to two weeks. Neonates less than 24-hours old, released from third or subsequent broods of eight or more within an 8-hour period, are collected from the brood chambers and used in tests. The animals are fed daily with a mixture of Yeast, Cereal Leaves, and Trout Chow (YCT), produced in-house. This is supplemented with an equal volume of cultured green algae *(Selenastrum capricornutum)* provided by Aquatic Biosystems.

Less than one-day-old fathead minnow, cultured in the laboratory, were also used in the test. Adult fish are maintained in 10-gallon aquaria where females deposit their eggs on the under-surface of split PVC pipe sections. The eggs are collected daily and transferred to aerated containers where they hatch after three to four days. The larval fish are fed newly hatched Brine shrimp *(Artemia* sp.), cultured in-house, at least twice per day.

In-house organisms are tested at least monthly in a reference toxicant test using sodium chloride to monitor overall health and test reproducibility (Appendix 4).

Test Procedures

Upon receipt at the lab, samples are analyzed for alkalinity, hardness, conductivity, dissolved oxygen, ammonia, chlorine, and pH.

Methods used in chemical analysis

Alkalinity	EPA 310.2	Hach 8203	I-2030-85.2
Ammonia	SM4500-NH_3, C-E1997	ASTM D1426-08	
Chlorine	SM4500-Cl D	Hach 10026	
Conductivity	SM2510		
Dissolved Oxygen	SM4500-O	Electrode: G-2001	Winkler (QC): B-F-2001
Hardness	SM2340 B or C	Hach 8213	
pH	SM4500-H+ B-2000		

The test followed procedures in EPA[3] and CDPHE[4] guidelines. Exposure concentrations included control (0%), 20%, 40%, 60%, 80%, and 100% mixtures, diluted with moderately hard laboratory reconstituted water.

Individual *Ceriodaphnia dubia* were placed in 30ml plastic containers containing approximately 15ml of exposure medium. Ten replicates at each concentration were used. The animals were fed daily with the YCT mixture and an equal volume of the green algae *(Selenastrum capricornutum)*. The exposure medium was changed daily in each container and the number of young released overnight were counted and recorded. Young were removed from the containers daily and discarded. Routine measurements were made each day of temperature, dissolved oxygen, and pH before and after the water changes.

Fathead minnow were exposed in 500ml plastic cups to which 250ml of media was replaced daily. Four replicates were used at each concentration. Ten fish, less than 24-hours old, were placed in each cup. The fish were monitored daily for survival and fed live Brine shrimp at least twice per day. After seven days, the fish were removed from the cups, euthanized with isopropyl alcohol, and then placed in aluminum pans and dried in an oven for a minimum of six hours at 100°C. The pans were then weighed on a five-place analytical balance to determine the average dry weight of the fish from each replicate.

Data Analysis

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

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

Variance	Distribution
Bartlett Equality of Variance Test	Shapiro-Wilk W Normality Test

Statistical Difference				
	Survival	Growth	Reproduction	IC_{25}
Ceriodaphnia dubia	Fisher Exact/Bonferroni-Holm Test	N/A	Steel Many-One Rank Sum Test	ICp
Fathead minnow	Dunnett Multiple Comparison Test	Dunnett Multiple Comparison Test	N/A	ICp

RESULTS

Ceriodaphnia dubia 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 and ranged from 30% - 100% in the remaining effluent concentrations. Control survival was 100%. Statistically significant lethality was measured in the 60%, 80%, and 100% effluent concentrations when compared to the control. The NOEL (No Observed Effect Level) for lethality was 40% and the LC_{25} (Lethal Concentration 25) for lethality was 50%.

Average number of neonates was 0.0 in the 100% effluent concentration and ranged from 1.1 – 17.1 in the remaining effluent concentrations. Average number of neonates in the control was 19.4 for statistical analyses and test acceptability criteria. Statistically significant differences in the number of neonates were found between the control and the 60%, 80%, and 100% effluent concentrations. The NOEL for reproduction was 40% and the IC_{25} (Inhibition Concentration 25) for reproduction was 41.4%.

Table 2. Summary of *Ceriodaphnia dubia* test results. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	10	19.4	8	38		
20%	10	17.1	6	34		
40%	10	15.3	7	33		
60%	5	4.7	0	9	*	*
80%	3	1.1	0	7	*	*
100%	0	0.0	0	0	*	*

Fathead minnow Test Results

Fathead minnow results are summarized in Table 3 and are provided on data sheets in Appendix 3. Survival was 70% in the 100% effluent concentration and ranged from 68% - 98% in the remaining effluent concentrations. Control survival was 95%. Statistically significant lethality was measured in the 80% and 100% effluent concentrations when compared to the control. The NOEL for lethality was 60% and the LC_{25} for lethality was 77.5%.

Average weight in the 100% effluent concentration was 0.349mg and ranged from 0.378mg - 0.469mg per individual in the remaining effluent concentrations. Average weight for the control fish was 0.325mg for statistical analyses and test acceptability criteria. No statistically significant differences for growth were measured in any effluent concentration when compared to the control. The NOEL for growth was 100% and the IC_{25} for growth was >100%.

Table 3. Summary of fathead minnow test results. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Alive	Avg. Wt. (mg)	Min.	Max.	Significant Difference	
					Lethality	Growth
Control (0%)	38	0.325	0.295	0.348		
20%	38	0.378	0.356	0.390		
40%	39	0.469	0.435	0.501		
60%	39	0.437	0.333	0.553		
80%	27	0.394	0.302	0.472	*	
100%	28	0.349	0.284	0.398	*	

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 4. PMSD for chronic test parameters.

PMSD (% Minimum significant difference)	Survival		Growth		Reproduction	
	Ceriodaphnia dubia	Fathead Minnow	Lower bound	Upper bound	Lower bound	Upper bound
	N/A	N/A	12	30	13	47
			29.4		39.8	

DISCUSSION

A failed test for this discharge occurs when there is an NOEL or IC_{25} less than the IWC (Instream Waste Concentration) of 100%. The NOEL represents the highest effluent concentration at which no statistically significant effect is observed. The IC_{25} represents an estimate of the effluent concentration that would cause a 25 percent reduction of a non-quantal biological measurement. A violation for this discharge occurs when both the NOEL and the IC_{25} are less than the IWC. Since the *Ceriodaphnia dubia* test species demonstrated statistically significant differences meeting these criteria, the discharge fails WET testing requirements for this sampling period.

REFERENCES

1. **Hach Chemical Company.** 2008. *Hach's Water Analysis Handbook.* Fifth Edition. Hach Chemical Company, Loveland, Colorado**.** Digital Medium.
2. **APHA/AWWA/WEF.** 1998. *Standard Methods for the Examination of Water and Wastewater.* 20th Edition. American Public Health Association, Washington, D.C.
3. **USEPA.** 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA-821-R-02-013. 335 pp.
4. **CDPHE (Colorado Department of Public Health and Environment).** 1998. *Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests.* Water Quality Control Division.
5. **USEPA.** 2000. *Method of Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136). EPA/821/B-00/004.
6. **USEPA**. 2000. *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System Program.* EPA/833/R-00/003.

Appendix 1 – Chain of Custody with Sample Receipt Forms

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: Colowyo Coal Company
P. O./Project Number: Pond 010A
Contact: Angela Aalbers
Address: 5731 Hwy 13 Meeker Co 81641
Phone # 970 824 5219 E-Mail: AAALBERS@TRISTATEGT.ORG
Fax # Sampler: AA/TF
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
010A	6.15.2020	0830	G	420265BH1		✓															3	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)

Special Instructions/Comments:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
	6.15.2020 1713		061520 1713				

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: **420** 2651B
Sample #: 1
Date: 061520
Initials: TJR

Samples Were:

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

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

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

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

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

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

7. Sample Received at Temperature between 0-6° C . — Y N (NA)
   Notes: same day sample

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
   effluent: pale yellow, some PM
   Receiving N/A
   Presence of native species — Y (N)

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	20.3	6.6	79.9	8.1	3640				

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

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CHAIN OF CUSTODY

500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
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Client/Project Name: Colowyo Coal Company
P. O./Project Number: 270871
Contact: Angela Aalbers
Address: 5731 State HWY 13 meeker CO 81641
Phone # 970-824-1219 E-Mail: aaalbers@tristate.org
Fax # Sampler: Angela Aalbers
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
OIOA	6/17/20	07:30	~~G~~ COA	420265.B #2		X															2	gal

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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Aalbers	6/17/20 11:30	UPS		UPS			061820 850

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 420265.B
Sample #: 2
Date: 061820
Initials: MG

Samples Were:

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

2. Chilled to Ship — Ambient / Chilled
   Notes:
   Wet Ice / Blue Ice

3. Cooler Received Broken or Leaking — Y / N / NA
   Notes:

4. Sample Received Broken or Leaking — Y / N / NA
   Notes:

5. Received Within Holding Times — Y / N
   Notes:

6. Aeration necessary — Y / N / NA
   Notes:

7. Sample Received at Temperature between 0-6° C . — Y / N / NA
   Notes: 5.9

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
   effluent: Slightly yellow, some PM
   Receiving
   Presence of native species — Y / N

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	5.9	8.0	116	8.1	4070				

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

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CHAIN OF CUSTODY

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Client/Project Name: Colowyo Coal Company
P. O./Project Number: 270871
Contact: Angela Aalbers
Address: 5731 State Hwy 13 Meeker, CO 81641
Phone # 970-824-1219 E-Mail: aaalbers@tristate.coop
Fax # Sampler: Angela Aalbers
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
010A	6/19/20	07:50	G	420263#3		X															2	2

Turnaround Requirements (Analytical Testing Only)

X 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:

Relinquished By (1)		Received By (1)		Relinquished By (2)		Received By (2)	
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Angela Aalbers	6/19/20 11:30	UPS		UPS		D. Thornton	6/20/20 8:47

SeaCrest Group
Louisville, CO

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: **420** 265.B Sample #: 3
Date: 062020 Initials: DT
Samples Were:
1. (Shipped) Hand Delivered Messengered (circle one)
Notes: UPS

2. Chilled to Ship Ambient (Chilled)
Notes:
Wet Ice (Blue Ice)

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

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

5. Received Within Holding Times (Y) N
Notes:

6. Aeration necessary Y (N) NA
Notes:

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

8. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):
effluent: clear, moderate pm
Receiving
Presence of native species Y (N)

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Time	Aeration DO (mg/L)	Aeration DO (%Sat)	Aeration pH
	5.5	6.8	102	8.1	4110				

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 *Ceriodaphnia dubia* Test

WET TEST REPORT FORM – CHRONIC

Permittee: Colowyo Coal Company **Outfall:** 010A
Permit No.: CO-0045161

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

Test Start Time	Test Start Date	Test End Time	Test End Date
1300	06-16-2020	1200	06-22-2020

Test Results	Lethality/TCP3B	Reproduction/TKP3B
S code: NOEL	40%	40%
	FAIL	**FAIL**
P code: LC_{25}/IC_{25}	50%	41.4%
	FAIL	**FAIL**
T code:	50%	41.4%

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	80
% Survival for day 2	100	100	100	70	60	50
% Survival for day 3	100	100	100	70	40	30
% Survival for day 4	100	100	100	60	30	10
% Survival for day 5	100	100	100	50	30	10
% Survival for day 6	100	100	100	50	30	0
Mean 3 Brood Total	19.4	17.1	15.3	4.7	1.1	0.0

Hardness (mg/L) – Receiving Water: N/A Effluent: 802/786/872 Recon Water: 84
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 950/890/1155 Recon Water: 61
Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 8.3/7.9 100%: 8.1/8.1
Total Ammonia as NH_3 (mg/L) - Effluent: 0.14/0.11/.30

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: Sarah Adler and Margie Glenn

Signature *Date* 24 June 2020

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

Permittee: Colowyo Lab #: 420 265.B Site: 010A
IWC %: 100 Template #: 5 Dilution Water: MH20-012 Sample Date: 061520
Age & Source: cerio 061620 1065 Test Start: 061620 1300 Test End: 062220 1200
Test Conditions:

	0	1	2	3	4	5	6	7	8	Total	
(C)	0	0	0	0	4	6	12			22	
	0	0	0	0	4	7	9			20	
0	0	0	0	6	0	11	7			24	
	0	0	0	6	0	11	17			34	
	0	0	0	0	4	7	4			15	
	0	0	0	0	4	5	0			9	
	0	0	0	0	6	12	18			38	
	0	0	0	0	0	6	10			16	
	0	0	0	0	4	4	0			8	
	0	0	0	0	3	5	0			8	
DO	6.8	6.8 6.8	6.9 7.0	6.8 6.8	6.8 6.8	6.9 7.0	7.0				
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	25.3			19.4	
pH	8.3	8.1 8.3	8.1 8.3	8.2 8.3	8.1 8.3	8.2 8.3	7.9				
Cond	299	319	318	319	322	313					
(1)	0	0	0	6	0	13	15			34	
	0	0	0	0	4	6	7			17	
20	0	0	0	5	0	9	14			28	
	0	0	0	6	0	11	13			30	
	0	0	0	0	4	2	0			6	
	0	0	0	0	3	4	0			7	
	0	0	0	0	7	7	0			14	
	0	0	0	0	4	6	4			14	
	0	0	0	0	4	7	0			11	
	0	0	0	0	4	5 +1	0			10	
DO	6.8	6.8 6.8	6.8 7.2	6.8 6.9	6.8 6.8	6.9 7.1	7.0				
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	25.3			17.1	
pH	8.3	8.1 8.3	8.1 8.3	8.2 8.3	8.1 8.3	8.2 8.2	7.9				
Cond	1111	1170	1155	1174	1214	1256					
	0	1	2	3	4	5	6	7	8	Total	
(2)	0	0	0	6	0	10	8			24	
	0	0	0	0	4	6	4			14	
40	0	0	0	5	0	10	8			23	
	0	0	0	5	0	12	16			33	
	0	0	0	0	4	0	5			9	
	0	0	0	0	4	4	6			14	
	0	0	0	0	4	4	4			12	
	0	0	0	0	0	3	6			9	
	0	0	0	0	2	5	0			7	
	0	0	0	0	3	5	0			8	
DO	6.9	6.7 6.8	6.7 7.4	6.7 7.0	6.8 6.8	6.9 7.3	7.0				
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	25.2			15.3	
pH	8.3	8.1 8.3	8.1 8.2	8.2 8.2	8.1 8.2	8.2 8.1	8.0				
Cond	1761	1887	1878	1848	1853	1890					
(3)	0	0	0 D							0	D
	0	0	0	0	4	4	0			8	
60	0	0	0	3 +2	0 D					5	D
	0	0	0 D							0	D
	0	0	0	0	0	6 D				6	D
	0	0	0	0	3	4	0			7	
	0	0	0 D							0	D
	0	0	0	0	0	4	5			9	
	0	0	0	0	2	5	0			7	
	0	0	0	0	1	4	2			5	
DO	6.9	6.7 6.8	6.7 7.6	6.7 7.1	6.8 6.8	6.8 7.9	6.5				
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	25.3			4.7	
pH	8.3	8.1 8.3	8.2 8.2	8.3 8.2	8.1 8.2	8.3 8.1	8.0				
Cond	2530	2720	2740	2670	2730	2670					

TJR

SeaCrest Group
Louisville, CO

Ceriodaphnia Chronic Benchsheet

Form #: 101a
Effective: January 2009

	0	1	2	3	4	5	6	7	8	Total
(4)	0	0	0	0	2	1	0			3
	0	0	0 D							0 D
80	0	0	0 D							0 D
	0	0	0 D							0 D
	0	0	0 D							0 D
	0	0	0	0	0	3	4			7
	0	0	0	0 D						0 D
	0	0	0	0	0 D					0 D
	0	0	0	0 D						0 D
	0	0	0	0	0	1	0			1
DO	7.0	6.6 6.8	6.6 7.8	6.6 7.2	6.8 6.8	6.7 7.6	6.0			1.1
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	23.3			
pH	8.2	8.1 8.2	8.2 8.2	8.3 8.2	8.1 8.1	8.2 8.1	8.1			
Cond	3170	3410	3370	3340	3420	3250				
(5)	0	0 D	0							0
	0	0	0 D							0 D
100	0	0	0	0	0 D					0 D
	0	0	0 D							0 D
	0	0	0	0 D						0 D
	0	0 D	0							0 D
	0	0	0	0 D						0 D
	0	0	0	0	0 D					0 D
	0	0	0	0	0	0	0 D			0 D
	0	0	0 D							0 D
DO	7.0	6.6 6.8	6.5 8.0	6.6 7.3	6.8 6.8	6.7 7.7	6.8			6.0
Temp	25.6	25.5 25.0	25.1 24.8	25.2 24.2	25.0 25.9	25.0 24.1	23.3			
pH	8.1	8.1 8.2	8.2 8.1	8.3 8.2	8.1 8.1	8.3 8.0	8.1			
Cond	3820	4070	4070	4080	4110	4090				
Algae	ABS	ABS	ABS	ABS	ABS	ABS				
YCT	2003	2003	2003	2003	2003	2003	1			
H_2O	1	1	2	1	3	3				
Initials	SA	SA	SA	SA	SA	MK	MK			

	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3
Hardness	802	786	872				84		
Alkalinity	950	890	1155				61		
Chlorine	0.01	<0.01	<0.01				<0.01		
Ammonia	0.14	0.11	0.30				<0.03		

1. Exposure Chamber
   Total Capacity: 30 ml
   Test Solution Volume: 15 ml
   Test Solution Surface Area: _____ cm^2
   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 & mobile

6. Comments: _____

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

1	2	3	4	5	6	7	8	9	10
D6	A6	A7	A8	B2	B5	B8	B9	C6	C7

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **SeaCrest Group**

Analysis ID:	05-9913-8829	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	22 Jun-20 13:41	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Batch ID:	09-8312-9039	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	22 Jun-20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Test Length:	6d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:**
Sample ID:	06-7801-5273	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	16 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	22 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	n/a	**Client:**	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	40	60	48.99	2.5

Fisher Exact/Bonferroni-Holm Test

Control	vs	Group	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	1.0000	Exact	1.0000	Non-Significant Effect
		40	1.0000	Exact	1.0000	Non-Significant Effect
		60*	0.0163	Exact	0.0488	Significant Effect
		80*	0.0015	Exact	0.0062	Significant Effect
		100*	0.0000	Exact	2.7E-05	Significant Effect

Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	10	0	10	1	0	0.0%
20		10	0	10	1	0	0.0%
40		10	0	10	1	0	0.0%
60		5	5	10	0.5	0.5	50.0%
80		3	7	10	0.3	0.7	70.0%
100		0	10	10	0	1	100.0%

CETIS Analytical Report

Test Code/ID: 420265cd / 05-8855-3832

Ceriodaphnia 7-d Survival and Reproduction Test — SeaCrest Group

Analysis ID:	02-1548-0731	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	22 Jun-20 13:41	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	09-8312-9039	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	22 Jun-20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Test Length:	6d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:**
Sample ID:	06-7801-5273	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	16 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	22 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	n/a	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1958276	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
LC5	42	41.25	45	2.381	2.222	2.424
LC10	44	42.5	50	2.273	2	2.353
LC15	46	43.75	55	2.174	1.818	2.286
LC20	48	45	60	2.083	1.667	2.222
LC25	50	46.25	63.33	2	1.579	2.162
LC40	56	50	73.33	1.786	1.364	2
LC50	60	52.5	81.82	1.667	1.222	1.905

7d Survival Rate Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	D	10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
20		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
40		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
60		10	0.5000	0.0000	1.0000	0.5270	105.40%	50.0%	5/10	0.5	50.0%
80		10	0.3000	0.0000	1.0000	0.4830	161.00%	70.0%	3/10	0.3	70.0%
100		10	0.0000	0.0000	0.0000	0.0000		100.0%	0/10	0	100.0%

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **SeaCrest Group**

Analysis ID:	14-7465-5841	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.6
Analyzed:	22 Jun-20 13:41	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Batch ID:	09-8312-9039	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	22 Jun-20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Test Length:	6d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:**
Sample ID:	06-7801-5273	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	16 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	22 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	n/a	**Client:**	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	40	60	48.99	2.5	39.75%

Steel Many-One Rank Sum Test

Control vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	20	96.5	76	1	18	CDF	0.5362	Non-Significant Effect
	40	92.5	76	3	18	CDF	0.3976	Non-Significant Effect
	60*	58.5	76	2	18	CDF	8.5E-04	Significant Effect
	80*	55	76	0	18	CDF	3.1E-04	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2626.08	656.52	4	10.91	2.9E-06	Significant Effect
Error	2708.4	60.1867	45			
Total	5334.48		49			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	23.65	13.28	9.4E-05	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.933	0.9367	0.0072	Non-Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	19.4	11.91	26.89	18	8	38	3.311	53.96%	0.00%
20		10	17.1	9.935	24.27	14	6	34	3.167	58.57%	11.86%
40		10	15.3	9.155	21.44	13	7	33	2.716	56.14%	21.13%
60		10	4.7	2.221	7.179	5.5	0	9	1.096	73.74%	75.77%
80		10	1.1	-0.533	2.733	0	0	7	0.7219	207.53%	94.33%
100		10	0	0	0	0	0	0	0		100.00%

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **SeaCrest Group**

Analysis ID:	06-0427-8596	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.6
Analyzed:	22 Jun-20 13:41	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	09-8312-9039	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	22 Jun-20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Test Length:	6d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:**
Sample ID:	06-7801-5273	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	16 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	22 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	n/a	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	399088	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	8.435	2.422	41.48	11.86	2.411	41.29
IC10	16.87	4.844	42.95	5.928	2.328	20.64
IC15	26.78	7.266	44.43	3.734	2.251	13.76
IC20	37.56	9.688	45.91	2.663	2.178	10.32
IC25	41.42	12.11	47.4	2.415	2.11	8.257
IC40	46.91	19.38	52.07	2.132	1.921	5.161
IC50	50.57	39.21	55.39	1.978	1.805	2.55

Reproduction Summary			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	10	19.4	8	38	10.47	53.96%	0.0%	19.4	0.0%
20		10	17.1	6	34	10.02	58.57%	11.86%	17.1	11.86%
40		10	15.3	7	33	8.59	56.14%	21.13%	15.3	21.13%
60		10	4.7	0	9	3.466	73.74%	75.77%	4.7	75.77%
80		10	1.1	0	7	2.283	207.50%	94.33%	1.1	94.33%
100		10	0	0	0	0		100.0%	0	100.0%

Appendix 3 – Data Sheets for Fathead Minnow Test

WET TEST REPORT FORM – CHRONIC

Permittee: Colowyo Coal Company **Outfall:** 010A
Permit No.: CO-0045161

Test Type: Routine ☒ Accelerated ☐ Screen ☐
Test Species: Fathead minnow **IWC:** 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1225	06-16-2020	1240	06-23-2020

Test Results	Lethality/TCP6C	Growth/TKP6C
S code: NOEL	60%	100%
	FAIL	**PASS**
P code: LC_{25}/IC_{25}	77.5%	>100%
	FAIL	**PASS**
T code:	77.5%	>100%

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	98	100	100	100	100	85
% Survival for day 3	95	100	100	100	93	75
% Survival for day 4	95	98	100	98	85	73
% Survival for day 5	95	95	98	98	80	73
% Survival for day 6	95	95	98	98	73	73
% Survival for day 7	95	95	98	98	68	70
Mean Dry Wt. (mg)	0.325	0.378	0.469	0.437	0.394	0.349

Hardness (mg/L) – Receiving Water: N/A Effluent: 802/786/872 Recon Water: 88
Alkalinity (mg/L) – Receiving Water: N/A Effluent: 950/890/1155 Recon Water: 57
Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 8.3/7.9 100%: 8.1/8.1
Total Ammonia as NH_3 (mg/L) - Effluent: 0.14/0.11/.30

Were all Test Conditions in Conformance with Division Guidelines? YES ☐ NO ☒
If **NO**, list deviations from test specifications: DO fell below 4.0 mg/L in overnight test chambers.

Laboratory: SeaCrest Group
Comments:
Analyst's Name: Sean Rainey, Sarah Adler, and Daniel Hillenburg

Signature *Date* 29 June 2020

SeaCrest Group
Louisville, CO

Fathead Minnow Chronic Benchsheet

Form #: 103a
Effective: January 2009

Client Colowyo | Site 010 A | Lab # 420 Z65.B | Sample Date 061520 | IWC 100 | Dilution H_2O MH20 - 025
Test Start 061820 - 1225 | Test End 062320 - 1240 | Species Info IHFHM - 0616 | Template | Test Conditions

Conc	Read	0	1		2		3		4		5		6		7	0	1	2	3	4	5	6	7	#	Fish & Tare	Tare	Fish Wt mg	Ave wt
C	DO	6.8	6.0	6.9	5.9	7.0	4.0	7.1	4.0	6.8	5.3	6.9	4.9	6.9	5.6	10	10	10	10	10	10	10	10	#1	1.14761	1.14466	0.295	0.325
	Temp	24.9	25.9	25.6	25.0	24.5	25.1	24.6	24.8	24.4	25.7	25.0	25.4	25.0	25.6	10	10	10	9	9	9	9	9	#2	1.1496	1.13879	0.317	
	pH	8.3	8.0	8.3	8.0	8.3	7.9	8.3	7.7	8.3	8.0	8.3	7.9	8.3	7.9	10	10	10	10	10	10	10	10	#3	1.13382	1.13034	0.348	
	Cond	295	300		300		293		299		298		316			10	10	9	9	9	9	9	9	#4	1.14394	1.14056	0.338	
20	DO	6.8	6.0	7.0	5.9	7.1	4.0	7.1	4.0	6.8	5.0	6.7	4.6	7.0	5.4	10	10	10	10	10	10	10	10	#5	1.15449	1.15064	0.385	0.378
	Temp	25.1	25.9	25.6	25.2	24.5	25.3	24.6	24.8	24.5	25.4	25.1	25.4	25.0	25.4	10	10	10	10	10	10	10	10	#6	1.14663	1.14221	0.382	
	pH	8.3	8.0	8.3	8.0	8.2	7.9	8.3	7.8	8.3	8.0	8.3	7.9	8.3	7.9	10	10	10	10	9	9	9	9	#7	1.13485	1.13095	0.390	
	Cond	1053	1175		1147		1154		1086		1079		1022			10	10	10	10	10	9	9	9	#8	1.13665	1.13309	0.356	
40	DO	6.7	6.0	7.1	5.8	7.2	4.0	7.2	4.0	6.9	4.7	7.3	4.2	7.1	5.2	10	10	10	10	10	10	10	10	#9	1.13737	1.13261	0.476	0.469
	Temp	25.2	25.8	25.5	25.4	24.6	25.5	24.5	25.0	24.6	25.5	25.2	25.4	25.0	25.3	10	10	10	10	10	10	10	10	#10	1.13776	1.13275	0.501	
	pH	8.2	8.0	8.2	8.1	8.2	8.0	8.2	7.9	8.2	8.0	8.2	7.9	8.2	8.0	10	10	10	10	10	10	10	10	#11	1.13119	1.12684	0.435	
	Cond	1737	1796		1662		1483		1359		1320		1884			10	10	10	10	10	9	9	9	#12	1.13501	1.13036	0.465	
60	DO	6.7	6.1	7.2	5.8	7.4	4.0	7.2	4.0	6.9	4.6	7.5	3.8	7.3	5.0	10	10	10	10	10	10	10	10	#13	1.14094	1.13611	0.483	0.437
	Temp	25.3	25.8	25.5	25.6	24.8	25.6	24.5	25.0	24.7	25.6	25.3	25.4	25.0	25.2	10	10	10	10	9	9	9	9	#14	1.13275	1.12898	0.377	
	pH	8.2	8.0	8.2	8.1	8.2	8.0	8.2	7.9	8.2	8.0	8.1	7.9	8.2	8.0	10	10	10	10	10	10	10	10	#15	1.13547	1.13214	0.333	
	Cond	1995	2660		1835		1622		1478		1446		2760			10	10	10	10	10	10	10	10	#16	1.13753	1.13200	0.553	
80	DO	6.6	6.1	7.3	5.7	7.5	4.0	7.3	4.0	7.0	4.3	7.7	3.4	7.4	4.8	10	10	10	10	9	8	8	7	#17	1.13928	1.13537	0.391	0.394
	Temp	25.4	25.7	25.4	25.7	24.9	25.8	24.4	25.3	24.9	25.5	25.4	25.4	25.0	25.1	10	10	10	9	8	8	7	7	#18	1.13823	1.13413	0.410	
	pH	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.0	8.2	8.0	8.1	7.9	8.1	8.1	10	10	10	9	8	7	6	5	#19	1.14991	1.14689	0.302	
	Cond	3020	3350		1966		1745		1586		1555		3400			10	10	10	9	9	9	8	8	#20	1.13929	1.13457	0.472	
100	DO	6.6	6.1	7.4	5.7	7.6	4.0	7.3	4.0	7.0	4.0	7.8	3.0	7.5	4.6	10	10	10	7	6	6	6	6	#21	1.14683	1.14399	0.284	0.349
	Temp	25.5	25.7	25.4	25.9	24.9	25.9	24.4	25.3	25.1	25.9	25.5	25.4	25.0	25.0	10	10	6	5	5	5	5	5	#22	1.15301	1.14956	0.345	
	pH	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.0	8.1	7.9	8.1	8.1	10	10	10	10	10	10	10	10	#23	1.15422	1.15024	0.398	
	Cond	3640	4000		3920		1828		1650		1610		4070			10	10	8	8	8	8	8	7	#24	1.14564	1.14197	0.367	
	DO															10												
	Temp															10												
	pH															10												
	Cond															10												
Initials		DH	DH		SR		SR		SR		SR		SA		SR									pretest	#25	1.12336	1.12327		
Water #		1	1		2		2		2		3		3															
CO_2																												

	Eff 1	Eff 2	Eff 3	Rcv 1	Rcv 2	Rcv 3	Recon	Recon
Hard	802	786	872				88	
Alk	950	890	1155				~~60~~ 57	
Chlor	0.01	<0.01	<0.01				<0.01	
NH_3	0.14	0.11	0.30				<0.03	
NH_3								

Exposure Chamber

Total Capacity:	500	mL
Test Solution Volume:	250	mL
Test Solution Surface Area:	50.24	cm
Water Depth (constant):	6.5	cm
(cyclic):	to	cm

Screened Animal Enclosures
Not Used: x
Used: ____ cm Diameter

Feeding	0	1	2	3	4	5	6	7
AM		✓	✓	✓	✓	✓	✓	✓
Initials		SR	SR	SR	SR	SR	SA	SR
PM	✓	✓	✓	✓	✓	✓	✓	
Initials	DH	SR	SR	SR	SR	SR	SA	

Feeding Schedule
Not Fed:
Fed Daily: 2x/day
Fed Irregularly:
(describe):
Food Used: <24hr Artemia

Aeration:
None: ____ @ ~ 100 bubbles/min
Before Use #1: (____ minutes
Before Use #2: (____ minutes
Before Use #3: (____ minutes

Condition/appearance of surviving organisms and Comments
- mobile + active

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **SeaCrest Group**

Analysis ID:	20-4896-5747	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	24 Jun-20 13:40	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	08-7881-6458	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	23 Jun-20	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:**
Sample ID:	11-4028-7000	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	15 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	15 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	24h	**Client:**	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	60	80	69.28	1.667	17.67%

Dunnett Multiple Comparison Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	20	0	2.407	0.245	6	CDF	0.8333	Non-Significant Effect
	40	-0.3996	2.407	0.245	6	CDF	0.9244	Non-Significant Effect
	60	-0.3996	2.407	0.245	6	CDF	0.9244	Non-Significant Effect
	80*	3.549	2.407	0.245	6	CDF	0.0048	Significant Effect
	100*	3.059	2.407	0.245	6	CDF	0.0136	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.692171	0.138434	5	6.659	0.0011	Significant Effect
Error	0.374209	0.0207894	18			
Total	1.06638		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	7.554	15.09	0.1826	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9052	0.884	0.0278	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	0.00%
20		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	0.00%
40		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	-2.63%
60		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	-2.63%
80		4	0.6750	0.4748	0.8752	0.7000	0.5000	0.8000	0.0629	18.64%	28.95%
100		4	0.7000	0.3563	1.0000	0.6500	0.5000	1.0000	0.1080	30.86%	26.32%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	0.00%
20		4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	0.00%
40		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	-3.06%
60		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	-3.06%
80		4	0.9687	0.7557	1.182	0.9912	0.7854	1.107	0.06694	13.82%	27.19%
100		4	1.019	0.5805	1.457	0.9386	0.7854	1.412	0.1377	27.03%	23.44%

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **SeaCrest Group**

Analysis ID:	00-4930-3878	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	24 Jun-20 13:41	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	08-7881-6458	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	23 Jun-20	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:**
Sample ID:	11-4028-7000	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	15 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	15 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	24h	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	2017168	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
LC5	63.5	57.9	66.7	1.575	1.499	1.727
LC10	67	62.2	73.93	1.493	1.353	1.608
LC15	70.5	65.15	80.9	1.418	1.236	1.535
LC20	74	67.72	n/a	1.351	n/a	1.477
LC25	77.5	70.03	n/a	1.29	n/a	1.428
LC40	>100	n/a	n/a	<1	n/a	n/a
LC50	>100	n/a	n/a	<1	n/a	n/a

7d Survival Rate Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	D	4	0.9500	0.9000	1.0000	0.0577	6.08%	0.0%	38/40	0.9625	0.0%
20		4	0.9500	0.9000	1.0000	0.0577	6.08%	0.0%	38/40	0.9625	0.0%
40		4	0.9750	0.9000	1.0000	0.0500	5.13%	-2.63%	39/40	0.9625	0.0%
60		4	0.9750	0.9000	1.0000	0.0500	5.13%	-2.63%	39/40	0.9625	0.0%
80		4	0.6750	0.5000	0.8000	0.1258	18.64%	28.95%	27/40	0.6875	28.57%
100		4	0.7000	0.5000	1.0000	0.2160	30.86%	26.32%	28/40	0.6875	28.57%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9000	1.0000	0.9000
20		1.0000	1.0000	0.9000	0.9000
40		1.0000	1.0000	1.0000	0.9000
60		1.0000	0.9000	1.0000	1.0000
80		0.7000	0.7000	0.5000	0.8000
100		0.6000	0.5000	1.0000	0.7000

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **SeaCrest Group**

Analysis ID:	11-6444-1511	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	24 Jun-20 13:54	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	08-7881-6458	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	23 Jun-20	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:**
Sample ID:	11-4028-7000	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	15 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	15 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	24h	**Client:**	Colowyo		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	29.35%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		20	-1.359	2.407	0.095	6	CDF	0.9937	Non-Significant Effect
		40	-3.658	2.407	0.095	6	CDF	1.0000	Non-Significant Effect
		60	-2.831	2.407	0.095	6	CDF	0.9999	Non-Significant Effect
		80	-1.75	2.407	0.095	6	CDF	0.9981	Non-Significant Effect
		100	-0.6067	2.407	0.095	6	CDF	0.9529	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0583564	0.0116713	5	3.727	0.0172	Significant Effect
Error	0.0563657	0.0031314	18			
Total	0.114722		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	11.83	15.09	0.0372	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.966	0.884	0.5708	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.3245	0.2871	0.3619	0.3275	0.295	0.348	0.01177	7.25%	0.00%
20		4	0.3783	0.3541	0.4024	0.3835	0.356	0.39	0.007597	4.02%	-16.57%
40		4	0.4693	0.4257	0.5128	0.4705	0.435	0.501	0.01368	5.83%	-44.61%
60		4	0.4365	0.2774	0.5956	0.43	0.333	0.553	0.04999	22.90%	-34.52%
80		4	0.3938	0.2819	0.5056	0.4005	0.302	0.472	0.03514	17.85%	-21.34%
100		4	0.3485	0.2718	0.4252	0.356	0.284	0.398	0.02409	13.83%	-7.40%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.295	0.317	0.348	0.338
20		0.385	0.382	0.39	0.356
40		0.476	0.501	0.435	0.465
60		0.483	0.377	0.333	0.553
80		0.391	0.41	0.302	0.472
100		0.284	0.345	0.398	0.367

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **SeaCrest Group**

Analysis ID:	07-9894-3642	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	24 Jun-20 13:54	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	08-7881-6458	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	23 Jun-20	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Test Length:	7d 0h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:**
Sample ID:	11-4028-7000	**Code:**	420265.B	**Project:**	WET Quarterly Compliance Test (2Q)
Sample Date:	15 Jun-20	**Material:**	POTW Effluent	**Source:**	NPDES Permit # (XX99999999)
Receipt Date:	15 Jun-20	**CAS (PC):**		**Station:**	010A
Sample Age:	24h	**Client:**	Colowyo		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	418389	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	85.19	48.17	n/a	1.174	n/a	2.076
IC10	94.07	57.83	n/a	1.063	n/a	1.729
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Mean Dry Biomass-mg Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	4	0.3245	0.295	0.348	0.02353	7.25%	0.0%	0.4021	0.0%
20		4	0.3783	0.356	0.39	0.01519	4.02%	-16.57%	0.4021	0.0%
40		4	0.4693	0.435	0.501	0.02736	5.83%	-44.61%	0.4021	0.0%
60		4	0.4365	0.333	0.553	0.09998	22.90%	-34.52%	0.4021	0.0%
80		4	0.3938	0.302	0.472	0.07027	17.85%	-21.34%	0.3938	2.08%
100		4	0.3485	0.284	0.398	0.04819	13.83%	-7.4%	0.3485	13.34%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.295	0.317	0.348	0.338
20		0.385	0.382	0.39	0.356
40		0.476	0.501	0.435	0.465
60		0.483	0.377	0.333	0.553
80		0.391	0.41	0.302	0.472
100		0.284	0.345	0.398	0.367

Appendix 4 – QA/QC and Reference Toxicant Test Charts

SeaCrest Group

Quality Assurance Check List – Chronic Whole Effluent Toxicity Test

Client: Colowyo Coal Company **SeaCrest Sample No.:** 420265.B

Species Tested: *Ceriodaphnia dubia* and fathead minnow

Start Date of Test (*Ceriodaphnia dubia*)	**Start Date of Test (Fathead minnow)**
06-16-2020	06-16-2020

Sample received in lab properly preserved (0-6°C)?	**N***
Sample received at laboratory within 36 hours of collection?	**Y**
Sample delivered on ice or equivalent?	**Y**
Test initiated within 36-hours of collection?	**Y**
Test protocol conforms to CDPHE guidelines (*Ceriodaphnia dubia)*?	**Y**
Test protocol conforms to CDPHE guidelines (fathead minnow)?	**Y**
Average test temp. ±1°C (*Ceriodaphnia dubia*)?	**Y**
Average test temp. ±1°C (fathead minnow)?	**Y**
DO level ≥4.0mg/L; no super-saturation (*Ceriodaphnia dubia*)?	**Y**
DO level ≥4.0mg/L; no super-saturation (fathead minnow)?	**N****
Survival in control ≥90%, ≥80% for chronic (*Ceriodaphnia dubia*)?	**Y**
Survival in control ≥90%, ≥80% for chronic (fathead minnow)?	**Y**
Ceriodaphnia dubia neonates <24-hours old?	**Y**
Fathead minnow larvae <24-hours old?	**Y**
Appropriate reference toxicity test conducted?	**Y**
Lab. Ref. Tox. test results within the confidence limits for the lab?	**Y**

* Sample #1 was received at 20.3°C on the same day as sampling.

** DO fell below 4.0 mg/L in overnight test chambers.

Signature _____ *Date* 29 June 2020

Position: WET Laboratory Manager

SeaCrestGroup
AN ENVIRONMENTAL SURVICEN COMPANY

METHOD QC

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	5/5/2020	100.00%	96.85%	-3.92%	± 5.00%
2320 B	Alkalinity - Total	5/14/2020	104.80%	101.30%	1.83%	± 5.00%
2320 B	Alkalinity - Total	5/20/2020	103.20%	97.80%	1.36%	± 5.00%
2320 B	Alkalinity - Total	5/26/2020	103.20%	98.12%	1.04%	± 5.00%
4500 NH_3 D	Ammonia	5/7/2020	103.00%	98.20%	-4.18%	± 10.00%
4500 NH_3 D	Ammonia	5/14/2020	103.00%	99.26%	-6.12%	± 10.00%
4500 NH_3 D	Ammonia	5/21/2020	103.00%	101.00%	3.32%	± 10.00%
4500 NH_3 D	Ammonia	5/28/2020	103.00%	101.60%	0.92%	± 10.00%
4500 Cl D	Chlorine	5/30/2020	96.88%	96.88%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	5/4/2020	101.75%	98.69%	1.38%	± 5.00%
2340 B	Hardness - Total	5/12/2020	98.20%	101.00%	-1.23%	± 5.00%
2340 B	Hardness - Total	5/22/2020	100.00%	101.00%	-1.54%	± 5.00%
2340 B	Hardness - Total	5/26/2020	98.25%	102.37%	0.66%	± 5.00%

		Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	5/4/2020	N/A	98.51%	97.06%	± 5.00%
4500 O	DO - Winkler	5/11/2020	N/A	97.06%	95.59%	± 5.00%
4500 O	DO - Winkler	5/22/2020	N/A	100.00%	97.33%	± 5.00%
4500 O	DO - Winkler	5/30/2020	N/A	97.18%	98.57%	± 5.00%

		Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	5/19/2020	99.99622%	1.05%	106.12%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	5/19/2020	100.27024%	0.00%	99.70%	±20%, ± 15%

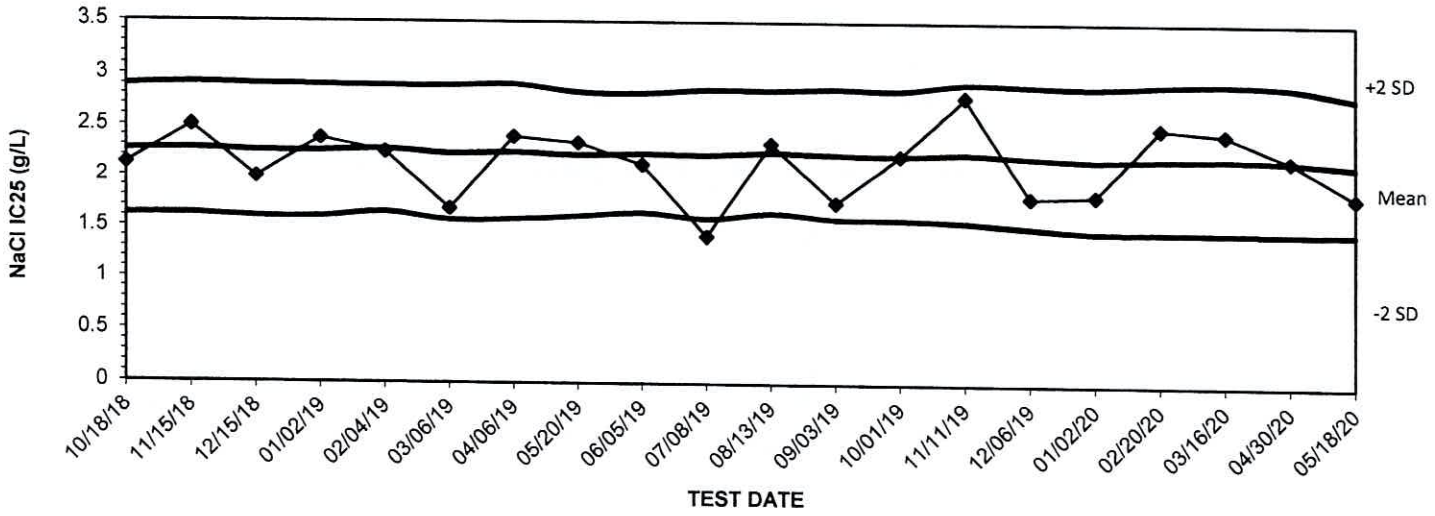
Signature: Kara Olivia

Date: 6/1/2020

Signature:

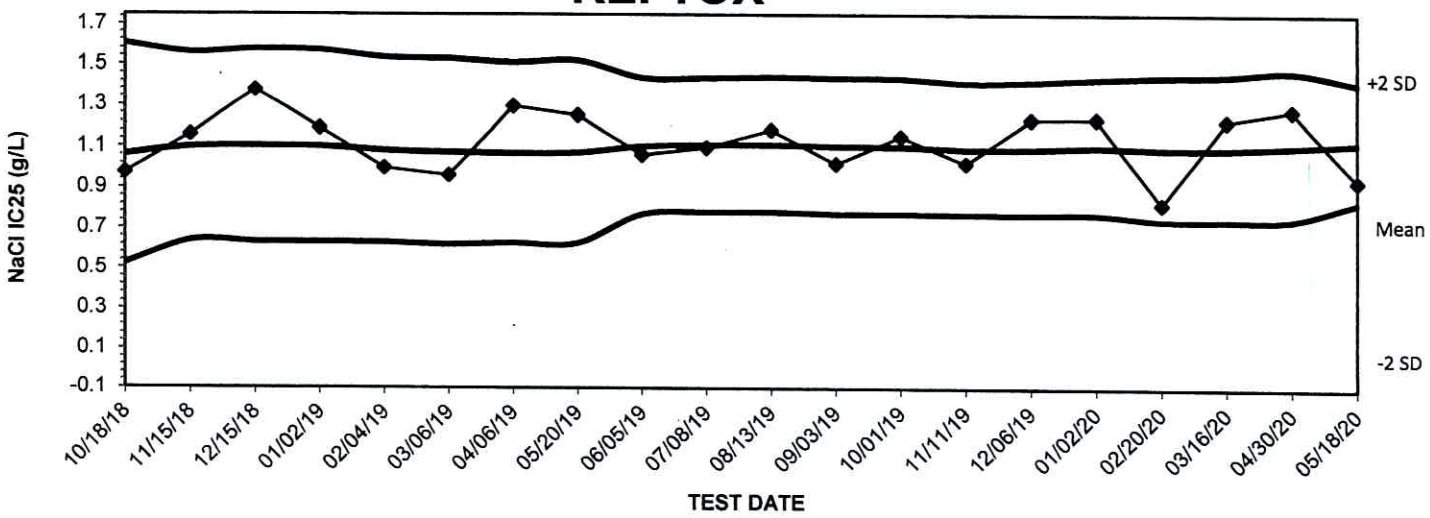
Date: 1 June 2020

CERIODAPHNIA SURVIVAL IC25 NaCl REFTOX



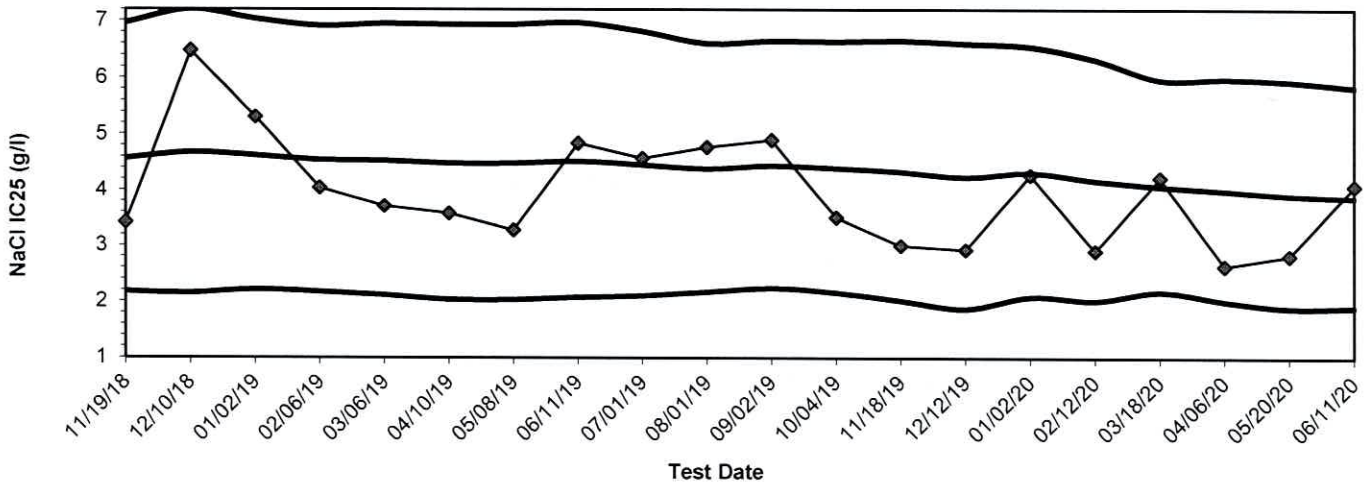
Date	IC25	Mean	-2 SD	+2 SD
10/18/18	2.1250	2.2599	1.6218	2.8979
11/15/18	2.5000	2.2725	1.6261	2.9188
12/15/18	1.9924	2.2520	1.5983	2.9057
01/02/19	2.3745	2.2498	1.5982	2.9014
02/04/19	2.2423	2.2693	1.6462	2.8924
03/06/19	1.6792	2.2302	1.5662	2.8942
04/06/19	2.3947	2.2431	1.5772	2.9089
05/20/19	2.3330	2.2195	1.6078	2.8311
06/05/19	2.1250	2.2334	1.6457	2.8210
07/08/19	1.4167	2.2234	1.5876	2.8592
08/13/19	2.3333	2.2495	1.6450	2.8541
09/03/19	1.7500	2.2317	1.5906	2.8727
10/01/19	2.2190	2.2220	1.5869	2.8572
11/11/19	2.7910	2.2438	1.5629	2.9248
12/06/19	1.8120	2.2111	1.5158	2.9063
01/02/20	1.8330	2.1831	1.4761	2.8900
02/20/20	2.5000	2.1987	1.4784	2.9190
03/16/20	2.4480	2.2072	1.4792	2.9352
04/30/20	2.2000	2.1929	1.4774	2.9085
05/18/20	1.8330	2.1441	1.4811	2.8072

CERIODAPHNIA REPRODUCTION IC25 NaCl
REFTOX



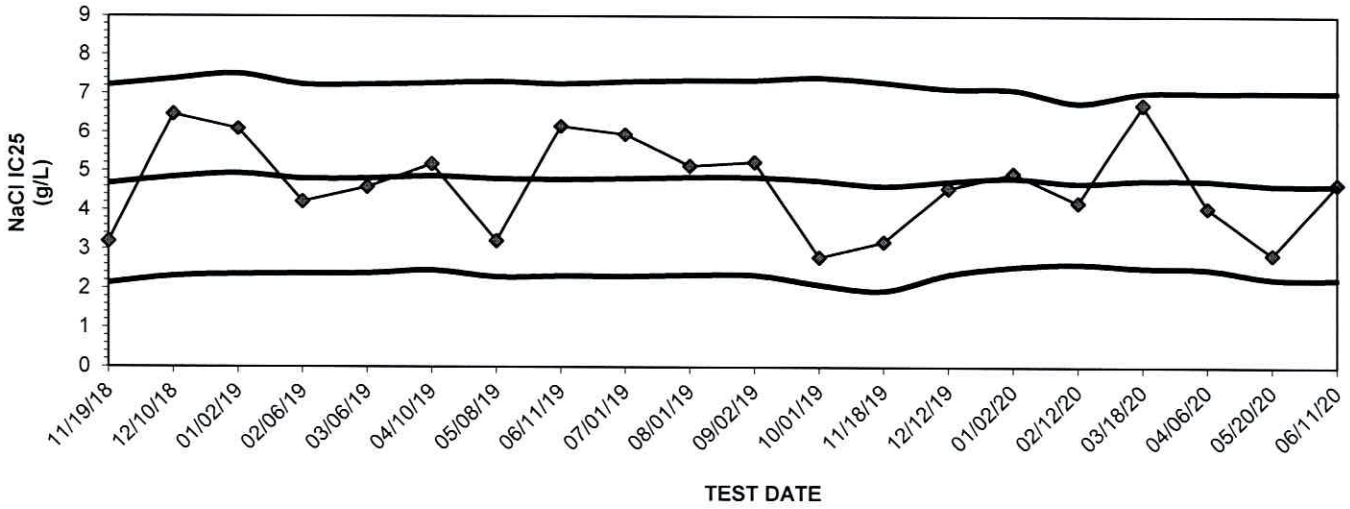
Date	IC25	Mean	-2 SD	+2 SD
10/18/18	0.9733	1.0632	0.5239	1.6026
11/15/18	1.1578	1.0979	0.6375	1.5584
12/15/18	1.3741	1.1028	0.6324	1.5733
01/02/19	1.1897	1.1007	0.6324	1.5690
02/04/19	0.9971	1.0817	0.6299	1.5335
03/06/19	0.9597	1.0739	0.6192	1.5286
04/06/19	1.2943	1.0687	0.6275	1.5098
05/20/19	1.2523	1.0731	0.6262	1.5200
06/05/19	1.0625	1.1043	0.7718	1.4369
07/08/19	1.0976	1.1102	0.7829	1.4376
08/13/19	1.1825	1.1125	0.7837	1.4412
09/03/19	1.0209	1.1060	0.7752	1.4367
10/01/19	1.1530	1.1050	0.7750	1.4351
11/11/19	1.0220	1.0921	0.7709	1.4132
12/06/19	1.2340	1.0938	0.7698	1.4178
01/02/20	1.2370	1.1021	0.7722	1.4321
02/20/20	0.8240	1.0926	0.7418	1.4435
03/16/20	1.2270	1.0946	0.7411	1.4481
04/30/20	1.2790	1.1073	0.7462	1.4684
05/18/20	0.9375	1.1238	0.8360	1.4115

FHM SURVIVAL IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
11/19/18	3.4074	4.5641	2.1716	6.9566
12/10/18	6.4714	4.6726	2.1478	7.1974
01/02/19	5.3000	4.6168	2.2099	7.0237
02/06/19	4.0378	4.5386	2.1704	6.9069
03/06/19	3.7006	4.5270	2.1107	6.9432
04/10/19	3.5725	4.4785	2.0291	6.9279
05/08/19	3.2727	4.4779	2.0273	6.9286
06/11/19	4.8330	4.5167	2.0721	6.9613
07/01/19	4.5714	4.4518	2.0981	6.8055
08/01/19	4.7632	4.3831	2.1680	6.5982
09/02/19	4.8920	4.4388	2.2377	6.6400
10/04/19	3.5000	4.3948	2.1577	6.6319
11/18/19	3.0000	4.3304	2.0157	6.6451
12/12/19	2.9230	4.2327	1.8683	6.5972
01/02/20	4.2730	4.3146	2.0847	6.5445
02/12/20	2.9000	4.1690	2.0112	6.3269
03/18/20	4.2190	4.0659	2.1719	5.9599
04/06/20	2.6330	3.9908	2.0044	5.9771
05/20/20	2.8120	3.9065	1.8832	5.9297
06/11/20	4.0740	3.8642	1.8990	5.8293

FHM GROWTH IC25 NaCl REFTOX



Date	IC25	Mean	-2 SD	+2 SD
11/19/18	3.1832	4.6770	2.1291	7.2249
12/10/18	6.4714	4.8436	2.3063	7.3809
01/02/19	6.0965	4.9313	2.3525	7.5101
02/06/19	4.2083	4.8042	2.3693	7.2390
03/06/19	4.5795	4.8091	2.3766	7.2416
04/10/19	5.1689	4.8637	2.4540	7.2734
05/08/19	3.1977	4.8012	2.2871	7.3152
06/11/19	6.1639	4.7836	2.3157	7.2516
07/01/19	5.9415	4.8088	2.3034	7.3142
08/01/19	5.1270	4.8424	2.3399	7.3449
09/02/19	5.2270	4.8440	2.3405	7.3474
10/01/19	2.7880	4.7576	2.0987	7.4165
11/18/19	3.1860	4.6211	1.9471	7.2950
12/12/19	4.5530	4.7439	2.3593	7.1285
01/02/20	4.9410	4.8270	2.5500	7.1041
02/12/20	4.1900	4.6963	2.6215	6.7710
03/18/20	6.7190	4.7754	2.5236	7.0271
04/06/20	4.0590	4.7630	2.4979	7.0281
05/20/20	2.8660	4.6469	2.2521	7.0417
06/11/20	4.6820	4.6419	2.2479	7.0360

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

July 30, 2020

Submitted via email (andrea.stucky@state.co.us) only, due to COVID-19

Ms. Andrea Stucky
Water Quality Control Division
Colorado Department of Public Health & Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

RE: Compliance Schedule CS010 Status/Progress Report
CDPS Permit No. CO-0045161
Colowyo Coal Company, L.P. – Colowyo Coal Mine

Dear Ms. Stucky:

In accordance with Part I.E.1. of the Colowyo Coal Company, L.P. – Colowyo Coal Mine Colorado Discharge Permit System (CDPS) Permit No. CO-0045161, we are submitting the enclosed Narrative Conditions Form to address the compliance schedule progress report (CS010) on meeting the total recoverable iron limits by August 1, 2022 at Outfalls 006 (AEL only), 010 (AEL only), 021, 022, 023, 024, and 025. Tri-State Generation and Transmission Association, Inc. (Tri-State) is the facility's parent company.

If you have any questions on the progress report, please contact Chantell Johnson (303-254-3185 office, 303-482-6219 mobile, or cjohnson@tristategt.org) or Chris Gilbreath (303-254-3291 or cgilbreath@tristategt.org).

Sincerely,

DocuSigned by:
Barbara Walz
A5D5C24494CD4A7...

Barbara A. Walz
Senior Vice President
Policy & Compliance
Chief Compliance Officer

BAW:CJ

Enclosure

cc: WQCD Records Center (via email – *cdphe.wqrecordscenter@state.co.us*)
Chris Gilbreath (via email)
Chantell Johnson (via email)
File G471 – 11.3(10)a-1

COLORADO
Water Quality Control Division
Department of Public Health & Environment

Permit Narrative Conditions Division Routing
Date received_____
Data entered_____
Permits Reviewed_____
Enforcement Reviewed_____
Engineering Reviewed_____

PERMIT NARRATIVE CONDITIONS REPORT FORM

Please print or type all information.

You must use this form whenever you are submitting any documents to the Water Quality Control Division (besides permit modification applications and annual reports) that are required by your permit, including documents you are submitting to comply with items listed in your permit's compliance schedules or any other reports or Special Studies required by your permit.

All items must be filled out completely and correctly.

Colorado Dept of Public Health and Environment
Water Quality Control Division - Records
4300 Cherry Creek Dr South WQCD-P-B2
Denver, CO 80246-1530

MAIL ORIGINAL FORM WITH INK SIGNATURES TO THE FOLLOWING ADDRESS:
FAXED or EMAILED FORMS WILL NOT BE ACCEPTED.

PART A. IDENTIFICATION OF PERMIT Please write the permit number

PERMIT NUMBER CO-0045161

TYPE OF PERMIT (Check as many as apply):
Individual Permit X
Domestic Wastewater Treatment Facility Discharging to Groundwater_____
Domestic Wastewater Treatment Facility Discharging to Surface Water_____
Industrial/Mining X
Dewatering_____
Other (Please describe)_____

PART B. PERMITTEE INFORMATION (form should be signed by the legal contact listed here)

Company Name: Colowyo Coal Company L.P.
Mailing Address: P.O. Box 33695
City: Denver State: CO Zipcode: 80233-0695
Legal Contact Name: Barbara A. Walz Phone Number: 303.452.6111
Title: Senior Vice President, Policy & Compliance, Chief Compliance Officer Email: bwalz@tristategt.org

PERMIT NARRATIVE CONDITIONS REPORT FORM (continued)

PART C. FACILITY/PROJECT INFORMATION

Facility/Project Name	Colowyo Coal Mine		
Location (address)	5731 State Highway 13		
City	Meeker	County	Moffat & Rio Blanco
Local Contact Name	Chantell Johnson	Phone Number	303.254.3185
Title	Senior Environmental Planner	Email	cjohnson@tristategt.org

PART D. CONTENTS AND PURPOSE OF SUBMISSION

1. **What is the nature of the attached document?**

   Status Report ☑
   Mixing Zone Study ☐
   Tracer Study ☐
   Sediment Control Plan ☐
   Documentation of Installation of Temperature Monitoring Equipment ☐
   Salinity Study ☐
   Inflow/Infiltration Study ☐
   85 Percent Removal Waiver Report ☐
   Groundwater Study ☐
   Seepage Rate Study ☐
   Other (please describe)_____

2. **Is this document submitted to comply with a compliance schedule in your permit? YES** ☑ **NO** ☐

3. **If this is a compliance schedule document, please answer the following:**
   a. **What is the name or description of the compliance schedule? (For example, Activities to Meet Total Ammonia Final Limits)**

      Activities to Meet Final Limits (outfalls 006 (AEL only), 010 (AEL only), 021, 022, 023, 02

   b. **What is the "code" in the compliance schedule chart for this item** CS010

PERMIT NARRATIVE CONDITIONS REPORT FORM (continued)

PART E. ADDITIONAL DESCRIPTION INFORMATION INCLUDED (a summary of information attached)

Since the permit was effective on October 1, 2018, the only applicable outfall that has discharged is Outfall 010. Therefore, the water quality (specifically total recoverable iron condition) of Outfalls 006, 021, 022, 023, 024, and 025 will be evaluated after discharges commence.

Sampling at Outfall 010 has been completed on the 2x/month frequency for total recoverable iron. The sampling data from July 2019 through June 2020 is provided in two attached time-series graphs (Graph 1 - all data, and Graph 2 - monthly averages). During this period, all discharges were lower than the 2022 Alternate Effluent Limitation (AEL) for precipitation-related discharges from this outfall (1.0 mg/L or 1,000 ug/L). However, as noted in the 2019 compliance schedule report, one 2019 sample during spring runoff contained iron concentrations higher than the 2022 AEL. Therefore, the source of iron appears to be from sediment runoff during more significant precipitation events (snow melt and/or high intensity rain). We are continuing to reclaim the areas that will eventually drain to the East Taylor Pond and ultimately to Outfall 010. Revegetation is intended to control sediment, which ultimately will address any presence of iron in soils. Monitoring will continue under this permit, and depending on the results, source control options will be considered.

A drainage study is also planned to evaluate the impact of any discharge from this outfall and other outfalls on downstream segments. The results from these studies will be reported to the Division in accordance with the permit compliance schedule, and any related permit modifications will be requested when sufficient information is available.

- **PART E. CERTIFICATION Required Signatures**

  "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.
  "I understand that submittal of this application is for coverage under the State of Colorado Discharge Permit System until such time as the application is amended or the certification is transferred, inactivated, or expired."

DocuSigned by:
Barbara Walz
A5D5C24494CD4A7...

7/30/2020

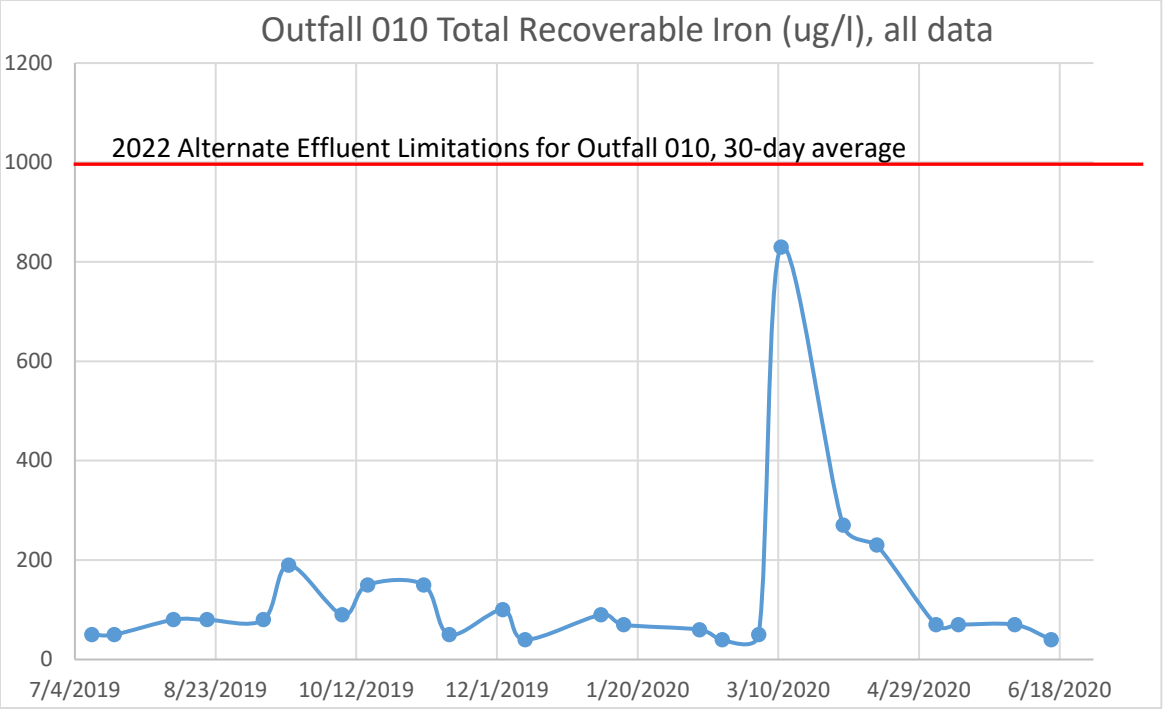
Signature of **Legally Responsible Party** | Date Signed

Barbara A. Walz | Senior Vice President, Policy & Compliance, Chief Compliance Officer

Name (printed) | Title

PERMIT NARRATIVE CONDITIONS REPORT FORM
CDPS PERMIT #CO-0045161

Graph 1. Time-Series Graph of Total Recoverable Iron at Outfall 010 (July 2019 – June 2020), all individual readings



Graph 2. Time-Series Graph of Monthly Average Total Recoverable Iron at Outfall 010 (July 2019 – June 2020)